A suggested assessment framework for CBSE science, mathematics and English for classes 6 to 10

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The Central Board of Secondary Education (CBSE) is a national Board under the Ministry of Education, Govt. of India. The Board has more than 25,000 schools affiliated to it in India and overseas, in 25 countries. These include the Kendriya Vidyalayas, the Jawahar Navodaya Vidyalayas, Central Tibetian Schools, Schools run/aided by the State Governments and Private Schools. The Board's main objective is to encourage quality education focussed on holistic development of learners. It motivates schools and teachers to adopt learner centric enquiry based pedagogies and use innovative methods to achieve academic excellence. The Board is committed to providing a stress-free learning environment that will develop competent, confident and enterprising citizens who will promote harmony and peace in the world.

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Alpha*Plus* is a leading education assessment consultancy based in Manchester, England. Alpha*Plus* works across schools, vocational and professional markets both internationally and in the UK to deliver projects for a large number of clients each year. We work in partnership with our clients to ensure that we deliver educationally valid solutions that meet their needs. We work with partner organisations and our expert associates to support our core staff to ensure high levels of expertise that deliver outcomes which improve teaching, learning and assessment, based on sound evidence and best practice.

Foreword

We are honoured to partner with the Central Board of Secondary Education to bring you this publication. We want to acknowledge here the amazing work done by CBSE teachers who joined the global teaching community in shifting from face-to-face classrooms to virtual classrooms almost instantaneously in response to the Covid-19 pandemic closures.

I would also like to thank the Alpha*Plus* team of UK experts who worked collaboratively with CBSE to create this publication, and the British Council project team for their overall management of the project.

This publication is a part of the CBSE competency-based education project and supports the assessment of NCERT-recommended learning outcomes. High quality assessment, curriculum and pedagogy are the golden triangle of any education system and when these are made available to young people in an enabling environment it has a profound impact on learning outcomes. This project focuses on two of the three critical areas, assessment and pedagogy, and is aligned to the NCERT curriculum.

India has already set out to achieve its knowledge ambitions through the new National Education Policy 2020. This sets out the road map India has chosen for itself on this journey as it shifts its focus from access to high quality education and innovation promoting conceptual and deep learning.

Education is one of the key pillars of cultural relations and an important aspect of the British Council's work in India and across the world. We hope that this project will truly transform young people's experience of assessment and learning in CBSE schools across the country and we look forward to the opportunity to work with the Ministry of Education in the future.

All the best and happy teaching!

Barbara Wickham OBE
Director India, British Council

Foreword

Central Board of Secondary Education with more than 25,000 schools in its network, in both rural and urban settings, has been committed to excellence in education. Since inception, the Board has been taking initiatives to meet the continually evolving requirements of the changing school education system.

The shift to the digital world and the recent pandemic has dramatically altered ways of teaching and learning. In the digitalised global world, the use and application of knowledge by learners has become of crucial importance. Competency Based Education (CBE) is an alternative to ensure a future ready generation proficient in relevant skills. CBSE with its focus on holistic education is facilitating this progression to CBE where learners would gain mastery of 21st century skills.

It becomes critical to reinvent the ways of teaching and learning in the classrooms. CBSE in partnership with British Council has initiated a systematic process to progressively move towards a competency-based education and assessment process. Under this project, an intervention for Science, Math and English (Reading) from classes 6 – 10 is planned which aims to strengthen system capacity; orient teachers to adopt relevant pedagogy, design and deliver competency-based assessments; and create a conducive environment that facilitates high-quality competency-based education.

CBSE is working towards a seamless transition to CBE for which policy-makers, school regulators and teachers are on-board as champions of change. It is intended that the resources and tools to implement their learning on the ground developed as a part of this programme will be made available as widely as possible through digital and physical means.

I would like to thank British Council for coming forward to partner with CBSE in this ever-important agenda.

Manoj Ahuja
Chairman, CBSE

CBSE assessment specifications

This document sets out the approach we have taken to the design of the assessment specifications for the CBSE end of class tests and how the documents produced can be used by CBSE and teachers to create tests which meet the demands of the relevant aspects of the NCERT curriculum and CBSE syllabuses.

1.1. Remit

Alpha*Plus* were commissioned by the British Council to design and create assessment specifications based on the NCERT curriculum for English reading, maths and science for CBSE. The specifications were required to cover classes 6-10 end of class written tests and were to use the CBSE syllabus documents as a basis for the content to be assessed against the NCERT curriculum.

This work is the second of a series of five projects commissioned by the British Council in India to help support a transition to a competency-based education and assessment system. The first project was a review of the current assessment approach carried out by UK NARIC. The third and fourth projects will involve upskilling assessment designers and item writers and producing a bank of questions which can be used by CBSE and/or teachers to create the end of class tests. The final project is to support teachers in moving to a pedagogy which supports the aims of the NCERT curriculum.

1.2. Approach

The NCERT curriculum is based on a series of learning outcomes and pedagogical approaches with some examples of content/context suggested. The focus of the curriculum is on the students developing a broad range of skills within the relevant subject areas which support their progression in school and more widely as global citizens.

These learning outcomes set out at a relatively high level the skills that students are expected to be able to demonstrate and are written in a way that facilitate the teaching of the content of any of the different Indian exam boards. In other words the NCERT curriculum is not a definitive national curriculum which sets out what should be taught in each of the classes for each subject.

The intention of the NCERT curriculum is that students should develop higher order thinking skills that better prepare them for later life, rather than a focus on learning of facts. Whilst the NCERT curriculum is well known to teachers it is not universally well understood and there is a significant amount of teaching practice which still focuses on students learning facts and teaching to the text book rather than developing these broader skills.

In commissioning Alpha*Plus* to produce assessment specifications for a suite of end subjects for CBSE the British Council expects that the tests which will be produced (using items created in a later project) will encourage teachers to focus on higher order thinking skills and move away from rote learning. The expectation is that there will be a positive washback effect from the assessments on the pedagogy employed by teachers. This change will also be supported by the final project which will produce learning resources and train teachers on the best way to deliver the NCERT curriculum intentions.

1.2.1. Defining the assessment content

The first step in the process was to review the NCERT curriculum and identify how the relevant CBSE syllabus which sets out the content to be taught could be married to the curriculum. This mapping produced a 'Learning Ladder' which identified both pedagogy and learning outcomes from the NCERT curriculum which is then aligned with the content from the CBSE syllabus. This learning ladder is presented so that the assessment content is linked directly to the NCERT curriculum which will facilitate amendments to be made if the curriculum changes in future.

As part of the initial review of the NCERT curriculum the learning outcomes and pedagogical approaches related solely to writing, listening and speaking skills were removed from the English reading learning ladder as the assessment focusses solely on reading skills.

1.2.2. Creating design principles

As the first stage in a series of projects (of which the design of the assessment specifications is the second) the British Council had contracted UK NARIC to review the approach taken by CBSE to the design of their standard X exams. This review produced a report detailing the strengths and weaknesses of the approach when compared to other international examples. It identified a number of recommendations which CBSE could adopt in order to strengthen its assessment approach. This report and the recommendations were then used to identify the high level approach to the design of the assessments. These became the high level design principles against which the assessment specifications were created.

1.2.3. Producing the assessment specifications

The assessment specifications were designed to sample the assessment content set out in the learning ladders and using the design principles. The size of the assessment and the length of time allowed are a balance between sampling enough content to allow the assessments to be valid and show what students know and can do and not being so long that the administration of the assessments is a burden for both the student and the school to deliver. The assessments are generally shorter for lower classes as there is less content to sample and shorter tests are more reasonable for younger students.

Assessment objectives specific for each subject were created using the learning outcomes in the NCERT curriculum as a starting point to identify the high-level skills which needed to be assessed. These assessment objectives are similar to those used in other international qualifications for 11 to 16 year old students and are applied to all classes, though the proportion varies for each class. Generally, there are a greater proportion of higher order thinking skills assessed in classes 9 and 10 than in the lower classes.

Each subject takes a slightly different approach because of the nature of the subject and the skills and content that they need to cover.

For English the focus on assessing reading means the assessments are relatively shorter in classes 6-8 than the other subjects as teachers would also be expected to assess student's listening, speaking and writing skills. This changes at class 9 with the introduction of literature skills into the assessment and with more extended response questions which

significantly increases the length of the assessment.

For maths the need to assess students' abilities to use a calculator and in mental maths means that two separate assessments are required. The mental maths skills are more important in lower classes so are more heavily weighted in these classes and hence the non-calculator tests are longer. For classes 9 and 10 the non-calculator assessments are proportionally shorter but for all classes there is a total time of 2 hours split across two assessments.

In science the emphasis is on assessing the ability of students to apply their knowledge and analyse data and evaluate information and this increases in classes 9 and 10. Aspects of practical skills can be assessed in written tests but the students ability to manipulate equipment and carry out practical procedures cannot be assessed in a written test so these skills should be assessed by the teacher through lab books, projects and practical assessments.

1.2.4. Creating example items

In order to illustrate the approach to be taken when creating the actual assessments some exemplar items were created. These illustrate the types of questions which can be used and the way in which questions can be linked together, particularly in English with common sources used and in science with questions linked to a common theme.

The items also demonstrate the approach to marking using both point based mark schemes and level of response mark schemes for extended response questions. The level of response mark schemes used in English reading and science are generic and will be used throughout the assessment items produced for that subject with changes to the indicative content for each question.

1.3. Documents

The following documents exist:

- Learning Ladder – sets out the content for each class for each subject

- Assessment objectives – set out the skills to be assessed and the proportion of marks for each

- Assessment specification – sets out the guidance for test duration, number of marks, content coverage, question types, mark scheme approach and rubric requirements.

- Example items – illustrate the types of items which

can be used and how they can be grouped.

1.4. Using the documents to create tests

The assessment specification and the learning ladder should be used to identify the specific topic areas which will be covered in an assessment and the item writers should then be commissioned to produce items which meet the required content and assessment objectives. This step is the creation of the detailed blue print for a specific test. This is beyond the design of the assessment specification and hence the scope of this project.

If a bank of items are created then items can be tagged with metadata showing content and assessment objectives coverage and this can be used to select items from the bank to meet the requirements, though it is likely that a small number of items may need to be commissioned to complete the tests to ensure a balanced content and assessment objectives coverage is achieved.

The example items would serve as a guide to item writers on the style and type of questions which can be used to cover specific assessment objectives.

1.5. Acknowledgements

High level design principles for CBSE end of year VI-X assessments

This document sets out the high-level design principles for the CBSE end of year tests for classes VI, VII, VIII, IX and X. These assessments are end of year tests and are designed to assess the content of the NCERT curriculum for that class and for class IX and X the relevant content of the CBSE syllabus.

1.1. Aim and underpinning principles

The design of the assessments will take into account the review of the CBSE Standard X syllabus and assessments carried out by UK NARIC where they have made a number of recommendations which would also be relevant to end of year summative tests for class VI-X. These are:

- Create subject specific assessment objectives

- Assess a more significant proportion of higher order thinking skills such as analysis and evaluation

- Reduce the proportion of assessment on recall of knowledge

- Increase the assessment of fundamental skills in real-world contexts

- Use authentic source materials and scenarios

- Use more diagrams and other visual materials

- Use more structured questions which link together to vary the demand throughout the assessment

- Use language which is accessible to all levels of student ability

- Use a limited range of command words consistently

- Use improved level of response and point based mark schemes

1.2. Purpose of the assessments

The purpose of the assessments is a summative test which will allow students to demonstrate what they know and can do but also give them and their teachers some formative information about areas of strength and development needs. The outcomes of the tests will allow:

- the students to judge how well they have mastered different aspects of the curriculum for that class;

- the teacher to understand how well the students have performed and identify broad areas of strength and improvement for their teaching of that class;

- CBSE to understand how well schools are adopting a competency-based education approach to identify areas of good practice which can be shared and tailor and target training and support.

Currently the adoption of teaching which supports competency-based education is not uniform in CBSE schools and a proportion of the teaching is to the text book and focusses on memorising knowledge. The assessments will support a move to competency-based education by assessing higher order thinking skills, as well as the underpinning knowledge, in line with the requirements of the relevant NCERT curricula (and the CBSE syllabi for classes IX and X). These assessments may well see students perform less well in early years of use because the teaching is not aligned to the assessment, but the aim is for there to be a washback effect from the assessments into the teaching pedagogy so that the results will improve with time.

The class X assessments can be used to help students prepare for the Standard X examinations but will not replace them. CBSE can use ideas from the assessment designs to feed into the Standard X assessments as they deem appropriate.

1.3. General approach to the design

The assessments are medium stakes and should be sat under exam conditions but can be taken in a classroom in or across scheduled lesson time. The assessments will be managed and marked by the teachers and results will be made available to students by the teachers. These results will be a total mark and marks broken down by assessment objective and major areas of the domain (content to be assessed) so it is clear to students and teachers

where strengths and development areas exist. The assessments will not be designed to create standardised scores or age standardised scores as this would be difficult to operationalise as it would require pre-testing of items and a large data capture and issue exercise by CBSE for tests in live use.

1.4. High level design principles

Area	Approach
Assessment type	The assessments will be written tests administered by teachers
Reporting outcomes	• Assessments will be reported as total scores from teacher marking with a simple mechanism devised for teachers to show marks by assessment objectives and major domain area. • Report breakdown of score to student at question level
Content to be assessed	Use NCERT curricula and CBSE syllabus for years VI to X assessments
Content to be assessed	The main areas of the domain will be identified and assessed every time but different aspects of these areas can be assessed in different assessments
Content to be assessed	The assessments will be designed to mostly assess the content from the relevant class but at times it will be necessary to reward students for showing what they know and can do from lower class work, particularly in Maths and Science where underpinning content is needed.
Content to be assessed	Content which can be assessed in a written exam including indirect assessment will form part of the assessment domain (e.g. science practical skills)
Assessment Objectives (AOs)	Create subject specific assessment objectives
Assessment Objectives (AOs)	Have consistent assessment objectives across classes but vary weighting
Assessment Objectives (AOs)	Higher order skills will be assessed in increasing proportions from class VI to class X
Assessment presentation	Use separate question papers and answer sheets
Assessment structure	Assessments will follow a set structure which will be predefined and will allow items to be written against.
Assessment question types	Design assessments to use authentic sources and artwork
Managing demand	Vary the demand of the assessment overall from low to high but with fluctuations throughout the assessment
Managing demand	Have question types spread across the assessment
Assessment length	Increase total assessment length from Class VI to X
Assessment length	Maximum total length of assessment will be three hours for class X
Assessment length	Maximum length of any one assessment will be 2 hours
Assessment length	Time will be built into the English assessments for students to read source materials before answering questions.
Optionality	There will be no optional questions in the assessments

Marks	The relationship between the length of the assessment and the number of marks needs to be clarified – waiting for CBSE discussion to confirm. Assume about 1 ½ minutes per mark unless there is good reason not to (e.g. reading time for English).
Mark schemes	No half marks will be used in the assessments
Mark schemes	Mark schemes will be point based and level of response where appropriate
Mark schemes	Level of response mark schemes will be generic with indicative content
Use of calculators	Allow calculators to be used in science and one maths assessment but not the second maths assessment.

English

Assessment objectives – English reading

This document sets out the assessment objectives for CBSE English reading and their percentage weighting for the CBSE end of year tests for the different classes from VI to X. For classes IX and X, it includes both the reading and the literature assessments.

No.	Description of Assessment Objective	VI	VII	VIII	IX	X
AO1	Show understanding of explicit meanings	40-48	40-48	40-48	23	23
AO2	Show understanding of implicit meanings and perspectives	40-48	40-48	40-48	23	23
AO3	Comment on the effect of writers' use of language and structure	-	-	-	27	27
AO4	Communicate a personal response to texts [what is read], supported by textual reference	12-16	12-16	12-16	27	27

CBSE End of year test assessment specification

This document sets out the approach to the assessment for the following subject and class:

Subject	Class
English	VI, VII and VIII

Assessment title	Reading
Duration	45 minutes
Total number of marks	25
Percentage AO1	40 - 48%
Percentage AO2	40 - 48%
Percentage AO3	0%
Percentage AO4	12- 16%

Assessment objectives

The assessment objectives are of similar style to those used in international qualifications such as IGCSE English as a second language and have parallel content criteria to CEFR.

No.	Description of Assessment Objective
AO1	Show understanding of explicit meanings
AO2	Show understanding of implicit meanings and perspectives
AO3	Comment on the effect of writers' use of language and structure
AO4	Communicate a personal response to texts [what is read], supported by textual reference

Overall assessment structure

The 45-minute duration is split into two parts, each having a separate text on which to base questions. The duration for each part is approximately equal. The texts are referred to as Text A and Text B. The reading time is included in the assessment duration.

The questions will cover key skills in three assessment objectives. AO1 and AO2 are each weighted at 40-48% of the Reading Section; AO4 is weighted at 12-16%. The questions assess skills in relation to unseen source materials. The relevant skills will have been practised during the year; there is no content to learn other than language knowledge.

There are up to two slightly longer answer questions, assessing higher order skills:

- a personal response to Text A and/or B assessing AO4.

All other questions are short answer or objective questions. The number of marks in total for each text will vary from between 10 and 15 marks.

Source texts

Source material for Text A should be informative by nature whereas source material for Text B should be from prose fiction. This is to facilitate breadth of reading skills.

Source A texts may include letters, recounts, biographies and autobiographies, newspaper and magazine articles, webpages, advertisements (where words rather than images predominate), and explanations. The texts chosen should include factual information and ideas/opinions.

Source B texts may include extracts from short stories and novels. The texts chosen should provide opportunities for students to respond personally to

characters, settings, ideas, events, etc.

Over time, a range of texts chosen should include texts offering perspectives about life at regional, national and global levels. Texts should not be chosen which have the potential to cause distress to students, for example, texts dealing with violence, abuse, the use of harmful substances, bereavement.

The assessment structure is the same for Classes VI, VII and VIII. The progression in level of demand is marked by the different lengths of texts and by their level of linguistic challenge.

For Class VI, each text should have approximately 150 words, with a maximum word count of 300-350 words across both texts.

For Class VII, each text should have approximately 200 words, with a maximum word count of 400-450 words across both texts.

For Class VIII, each text should have approximately 250 words, with a maximum word count of 500-550 words across both texts.

All texts should have:

- a title in bold
- a preamble in italics explaining the context (such as the writer, text type, time of publication, setting the scene for the text/extract)
- line numbers after every five lines.

Dictionaries are not allowed in the examination. Difficult words in the opening sentences of a text should be amended or glossed to remove barriers to students' understanding of key points at the start of the text which might unduly affect their response to later aspects of the text. Glosses should be concise. Not all words should be glossed (particularly towards the end of a text), as this would remove a level of suitable challenge for more confident students.

Assessment details

Reading

The questions on each text should work through the paper in order, with a generally increasing level of demand. This means that the final questions on each text should usually be based on the latter part of each text or refer to the whole text.

All questions are compulsory. There are no options.

AOs targeted	Question type	Possible command words
AO1	short answer & MCQ	Identify
		Give
		Select/ Find and copy
AO2	short answer & MCQ	Identify
		Give
		Select
AO4	slightly more extended answer	Explain
		Comment on
		Give your opinion of

Questions may begin with imperative verbs, known as command words or direct questions can be used instead: e.g. who/ what/ where/ when/ how/ why.

All questions will be marked using point-based mark schemes.

CBSE End of year test assessment specification

This document sets out the approach to the assessment for the following subject and class:

Subject	Class
English	IX and X

Assessment title	Section A: Reading
Duration	60 minutes
Total number of marks	30
Percentage AO1	30%
Percentage AO2	30%
Percentage AO3	20%
Percentage AO4	20%

Assessment objectives

The assessment objectives are of similar style and broadly similar demand to those used in international qualifications such as GCSE and IGCSE.

No.	Description of Assessment Objective
AO1	Show understanding of explicit meanings
AO2	Show understanding of implicit meanings and perspectives
AO3	Comment on the effect of writers' use of language and structure
AO4	Communicate a personal response to texts [what is read], supported by textual reference

Overall assessment structure

The 1-hour duration is split into two equal parts, each having a separate text on which to base questions. The duration for each part is 30 minutes. The texts are referred to as Text A and Text B. The reading time is included in the section duration.

The questions will cover key skills in all four assessment objectives. AO1 and AO2 are each weighted at 30% of the Reading Section; AO3 and AO4 are each weighted at 20%. The questions assess skills in relation to unseen source materials. The

relevant skills will have been practised during the year; there is no content to learn for Section A.

There are two extended answer questions, assessing higher order skills:

- a summary question on Text A assessing AO1 and AO2
- an analysis question on Text B assessing AO3 and AO4.

All other questions are short answer or objective questions.

Source texts

Source material for Text A should be informative by nature whereas source material for Text B should be from prose fiction or prose non-fiction that is more literary in style. This is to facilitate the setting of items targeting the relevant AOs.

Source A texts may include newspaper articles, magazine articles, webpages, advertisements (where words rather than images predominate), brochures, marketing material or speeches. The texts chosen should include factual information and ideas/opinions.

Source B texts may include extracts from autobiographies or memoirs, travel writing, short stories, novels or speeches. The texts chosen should provide opportunities for students to respond

personally to the ways in which writers use language and structure to convey ideas, events, people/ characters, setting etc.

Over time, a range of texts chosen should include texts offering perspectives about life at regional, national and global levels. Texts should not be chosen which have the potential to cause distress to students, for example, texts dealing with violence, abuse, the use of harmful substances, bereavement.

The assessment structure is the same for both Class IX and Class X. The progression in level of demand is marked by the different lengths of texts and by their level of linguistic challenge.

For Class IX, each text should have approximately 325 words, with a maximum word count of 630-670 words across both texts.

For Class X, each text should have approximately 375 words, with a maximum word count of 730-770 words across both texts.

All texts should have:

• a title in bold

• a preamble in italics explaining the context (such as the writer, text type, time of publication, setting the scene for the text/extract)

• line numbers after every five lines.

Dictionaries are not allowed in the examination. Difficult words in the opening sentences of a text should be amended or glossed to remove barriers to students' understanding of key points at the start of the text which might unduly affect their response to later aspects of the text. Glosses should be concise. Not all words should be glossed (particularly towards the end of a text), as this would remove a level of suitable challenge for more confident students.

Assessment details

Section A: Reading

The items highlighted in blue are illustrated in the example assessment items.

The questions on each text should work through the paper in order, with a generally increasing level of demand. This means that the final questions on each text should usually be based on the latter part of each text.

All questions are compulsory. There are no options.

Text A: non-fiction information text

Question number	Marks	AOs targeted	Question type	Possible command words
1	3	AO1	short answer & MCQ	Identify Give Select
2	2	AO2	short answer & MCQ	Identify Give Select
3	2	AO3 + AO4 equally	slightly more extended answer	Explain Comment on
4	8	AO1 + AO2 equally	summary question based on a specified section of the text; extended answer, marked using level descriptors	Summarise Outline

Questions 1, 2 and 3 will be marked using point-based mark schemes. Question 4 will be marked using a level of response mark scheme.

Level descriptors for question 4

Level	Descriptors	Mark
4	• Clear understanding of text, with mostly clear focus • A wide range of points, expressed in own words for the most part	7-8
3	• Text generally understood, and task generally addressed • A range of points, generally expressed in own words	5-6
2	• Evidence of some understanding, with some focus on the task • A grasp of some relevant points, with occasional use of own words	3-4
1	• Little understanding of text and/or task • Simple points, lifted from the text	1-2
0	Nothing to reward	0

Text B: more literary non-fiction or prose fiction text

Question number	Marks	AOs targeted	Question type	Possible command words
5	2	AO1	MCQ	Identify Give Select
6	3	AO2	short answer	Identify Give Select
7	10	AO3 + AO4 equally	analysis question based on a specified section of the text; extended answer, marked using level descriptors	Analyse Explore

Questions 5 and 6 will be marked using point-based mark schemes. Question 7 will be marked using a level of response mark scheme.

Level of response descriptors for question 7

Level	Descriptors	Mark
5	• A sustained critical analysis of the ways in which the writer achieves her effects • A sustained, convincing personal response to the task	9-10
4	• A well-developed and clear analysis of the ways in which the writer achieves her effects • Clear, well-developed personal response to the task	7-8
3	• A generally reasonably developed explanation of some effects • Reasonably competent personal response to the task	5-6
2	• Some straightforward comment on some features of the writing • Some evidence of a personal response, under-developed	3-4
1	• Limited evidence of a critical awareness • Limited awareness of the task	1-2
0	Nothing to reward	0

Items usually begin with imperative verbs, known as command words. However, where items warrant it, direct questions can be used instead: e.g.

• What is the reason for this?

• How does the writer show…?

CBSE end of year test assessment specification

This document sets out the approach to the assessment for the following subject and class:

Subject	Class
English: Literature	IX and X

Assessment title	Section C: Literature
Duration	60 minutes
Total number of marks	30
Percentage AO1	17%
Percentage AO2	17%
Percentage AO3	33%
Percentage AO4	33%

Assessment objectives

The assessment objectives for Literature are the same as for the Reading section, though the weightings differ. AO1 and AO2 are each weighted at 17%; AO3 and AO4 are each weighted at 33%. They are mapped to questions of similar style and demand to those used in international qualifications such as GCSE and IGCSE.

No.	Description of Assessment Objective
AO1	Show understanding of explicit meanings
AO2	Show understanding of implicit meanings and perspectives
AO3	Comment on the effect of writers' use of language and structure
AO4	Communicate a personal response to texts [what is read], supported by textual reference

Overall assessment structure

This assessment specification is specifically for Class X, aimed at set texts for that year. The template can also be used for Class IX with its different set texts. The difference in level of demand of the assessment should be reflected in the choice of set texts for each year.

The Literature assessment is currently the third and final section of the 3-hour CBSE paper. However, having the Literature assessment as a separate 1-hour paper for the end of class tests is likely to improve manageability of the paper for both students and teachers. Students are likely to perform better in a separate assessment of Literature rather than in the final hour of a combined language and literature paper. Teachers may find a discrete 1-hour Literature assessment gives them greater flexibility in scheduling the assessments.

The 1-hour duration of the Literature section is split into two equal parts:

Part 1: Poetry

Part 2: Prose

The duration for each part is 30 minutes.

The questions will cover key skills in all four assessment objectives. AO1 and AO2 are each weighted at 20% of the Literature Section; AO3 and AO4 are each weighted at 30%. All questions assess skills in relation to prepared texts. The dominant item type for the Literature section is the extended answer question, a reasonable approach for the assessment of set texts that have been studied in class and an approach common to GCSE and IGCSE assessments in Literature. However, there are some short answer items that provide a relatively gentle lead-in to the extended question on Poetry.

There are two extended answer questions, assessing higher order skills:

- an analysis question on poetry assessing AO3
- an evaluation question on a Prose text, where the dominant assessment objective is AO4.

Dictionaries are not allowed in the examination.

Set texts

Poetry

Students are expected to study all 11 poems in the Set Texts list during the course of the year. One poem will be printed on the question paper so that items can be set that require analysis of the detail of the poem, with the dominant focus on AO3, analysing the ways in which the writer uses language and structure to achieve particular effects. This will assess those analytical skills practised in lessons during the year.

Over time, many of the poems will be assessed, but CBSE should avoid predictability, meaning they should not set all the poems in order until the last one on the list has been assessed. Ideally, the set list of poems should be refreshed at intervals, perhaps introducing three 'new' poems (at the same time as removing three 'old' poems) every 2-3 years.

Prose

CBSE should ensure that all students have questions set on the prose text they have studied. Having fewer texts of a similar level of challenge will assist in achieving comparability of demand across this part of the Literature section of the overall paper.

The current discursive essays require extended personal responses to the set prose texts. The proposed general essay questions, also discursive, require a closer focus on the text. The dominant assessment focus is AO4, giving developed personal responses to their chosen text, supported by relevant textual references. Extended answers will be marked using levels descriptors, which reflect the dominance of AO4 but also understanding of explicit (AO1) and implicit (AO2) meanings. Because the set prose texts are not allowed in the examination, close analysis of writers' techniques (AO3) is not assessed.

Assessment details

Section C: Literature

Examples of assessment items are provided for the items in blue.

Part 1: Poetry

The Poetry question is compulsory.

Text B: more literary non-fiction or prose fiction text

Question number	Marks	AOs targeted	Question type	Possible command words
1	3	AO1	short answer, MCQ	Identify Give Select
2	2	AO2	short answer	Explain
3*	10	AO3	extended answer, marked using level descriptors	Explore Analyse How?

Questions 1 and 2 will be marked using point-based mark schemes. Question 3 will be marked using a level of response mark scheme.

Level descriptors for question 3

Level	Descriptors	Mark
5	• A perceptive analysis of language and structure in conveying the writer's ideas • Well-selected references used as an integral part of the analysis	9-10
4	• A clear analysis of language and structure in conveying the writer's ideas • A wide range of references used to support the analysis	7-8
3	• A generally clear explanation of language and structure in conveying the writer's ideas • Use of textual references to support explanation	5-6
2	• Some straightforward comment on language and/or structure features that show the writer's ideas • Some use of textual detail, beginning to support comments	3-4
1	• Limited evidence of a critical awareness • Limited use of textual detail	1-2
0	Nothing to reward	0

Part 2: Prose

There are optional questions for each set text studied.

Text B: more literary non-fiction or prose fiction text

Question number	Marks	AOs targeted	Question type	Possible command words
4a	2	AO1	evaluation question on characters, themes, settings, with some bullets for support; extended answer, with AO4 dominant, marked holistically using level descriptors	Evaluate
4b	3	AO2		How far?
4c	10	AO4		To what extent?
4d etc – one for each set text.				

The following is a generic Part 2 question on character as an example of the type of question which should be produced:

How far do you think X is an admirable character?

[OR pitiful, unlikable etc.]

In your answer, you should:

- describe aspects of the character you admire
- explain aspects of the character (if there are any) that you dislike
- comment on the ways in which X interacts with other characters.

Use references to the text to support your answer.

Other questions on prose texts might focus on themes or aspects of setting, which would be possible for both fiction and non-fiction set texts.

The example above provides both bullet points for supporting students in developing their response and also a reminder to use textual references for substantiating their argument.

Question 4 will be marked using a level of response mark scheme.

Indicative content

Mark schemes should contain 6 possible points, two for each bullet point in the question. They should be prefaced by:

Students may comment on the following points, though they are not required to do so; any valid point that can be reasonably supported should be accepted.

Level descriptors for question 4

Note that the first and second bullets refer to the dominant AO4 (weighted at 10 out of the 15 marks).

The third bullet refers to both AO1 and AO2 (weighted together at 5 out of the 15 marks).

Level descriptors for question 3

Level	Descriptors	Mark
5	• A sustained convincing personal response to the task • Much well-selected supporting reference • Comprehensive understanding of the text and layers of meaning	13-15
4	• Clear, well-developed personal response to the task • A wide range of supporting references • Clear understanding of the text and its deeper implications	10-12
3	• Reasonably competent personal response • Use of supporting textual references • Understanding of some key ideas	7-9
2	• Some evidence of a personal response, under-developed • Some use of textual detail • Some grasp of key ideas	4-6
1	• Limited evidence of a personal response • Limited use of the text for support • Limited evidence of understanding	1-3
0	Nothing to reward	0

CBSE tests learning ladder – English

This document sets out the learning ladder for the end of year CBSE assessments based on the relevant NCERT curriculum documents and the relevant CBSE Syllabus. The assessment content will set out what content can appear in the assessments.

CEFR levels of IGCSE E2L by skill

Component Level	Reading	Writing	Listening	Speaking 0511 (count-in speaking)			Speaking 0510 (speaking endorsement)
Grade A	B2	B2	B2	C1		Grade 1	C1
Grade B	B2	B2	B2	B2		Grade 2	B2
Grade C	B2	B2	B2	B2		Grade 3	B1
Grade D	B2	B2	B1	B1		Grade 4	A2
Grade E	B1	B1	A2	B1		Grade 5	A2
Grade F	A2	A2	A2	A2			
Grade G	A2	A2	A2	A2			

AO coverage

NCERT Pedagogical process	NCERT Learning outcome / CBSE Syllabus topic	Assessment content	Notes – AOs, question types etc.
Class VI *The learner may be provided opportunities in pairs/groups/ individually and encouraged to –* • become familiar with songs/poems/prose in English through input-rich environment, interaction, classroom activities, discussion etc. • locate sequence of ideas, events and identify main idea of a story/poem through various types of comprehension questions	*The learner –* • reads a variety of texts in English / Braille and identifies main ideas, characters, sequence of ideas and events and relates with his/her personal experiences	Show understanding of explicit meanings	CEFR level A2 Can understand sentences and frequently used expressions related to areas of most immediate relevance (e.g. very basic personal and family information, shopping, local geography, employment). Can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters. Can describe in simple terms aspects of his/her background, immediate environment and matters in areas of immediate need. Text types: letters, recounts, biographies, autobiographies, newspaper and magazine articles, explanations,

			websites, adverts (words rather than graphics) and prose
			AO1 Question focus and types: Locate main ideas Sequence information M/choice Cloze Find and copy
• read different kinds of texts such as prose, poetry, play for understanding and appreciation and write answers for comprehension and inferential questions	• reads to seek information from notice board, newspaper, Internet, tables, charts, diagrams and maps etc.	Show understanding of explicit meanings [in fiction and non-fiction] Show understanding of implicit meanings and perspectives	AO1 AO2 Questions types: Find and copy M/choice Short answer
• raise questions based on their reading • think critically and try to provide suggestion/ solutions to the problems raised		Communicate a personal response to texts [what is read], supported by textual reference	AO4 Question types. Short response M/choice Matching
• read/ discuss the ideas of the text for critical thinking		Communicate a personal response to texts [what is read], supported by textual reference	AO4 Question types. Short response M/choice Matching
• understand the use of antonym (impolite/polite) synonym (big/large) and homonym (tail/tale)	• uses synonyms, antonyms appropriately deduces word meanings from clues in context while reading a variety of texts	Show understanding of explicit meanings	AO1 M/choice Find and copy
• understand the grammatical forms in context/through reading e.g. Noun, pronoun, verb, adverb, determiners, etc.		Not explicitly assessed in a reading exam but understanding of grammatical forms aids understanding of meaning of text so assessed implicitly.	

• use dictionary as a reference book for finding multiple meanings of a word in a variety of contexts • use ICT (Net, mobile, website, Youtube, TED talks etc) to browse for information, for projects/ PPT etc.	• refers to dictionary to check meaning and spelling, and to suggested websites for information.	This is not assessable in a closed book written exam and is best assessed by the teacher through classroom practice.	

Class VII

			CEFR level A2
The learner may be provided opportunities in pairs groups/ individually and encouraged to – • learn vocabulary associated with various professions (e.g. cook, cobbler, farmer, blacksmith, doctor etc)	*The learner –*		Can understand sentences and frequently used expressions related to areas of most immediate relevance (e.g. very basic personal and family information, shopping, local geography, employment). Can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters. Can describe in simple terms aspects of his/her background, immediate environment and matters in areas of immediate need. Text types: letters, recounts, biographies, autobiographies, newspaper and magazine articles, explanations, websites, adverts (words rather than graphics) and prose
• read stories / plays (from books/ other sources in English / Braille) and locate details, sequence of ideas and events and identify main idea	• asks and responds to questions based on texts (from books or other resources) and out of curiosity • reads textual/non-textual materials in English/Braille with comprehension • identifies details, characters, main idea and sequence of ideas and events in textual / non-textual material	Show understanding of explicit meanings	AO1 Question types: M/ choice Matching Sequence information Short answer

• use material from various sources in English and other languages to facilitate comprehension and co-relation	• reads a variety of texts for pleasure e.g. adventure stories and science fiction, fairy tales, biography, autobiography, travelogue etc. (extensive reading) • infers the meaning of unfamiliar words by reading them in context • reads to seek information in print / online, notice board, signboards in public places, newspaper, hoardings etc.	Show understanding of implicit meanings and perspectives	AO2 M/choice Short answer Matching
• think critically on inputs based on reading and interaction and try to provide suggestion/ solutions to the problems raised. (The themes could be social issues, environment problems, appreciation of culture and crafts)	• thinks critically, compares and contrasts characters, events, ideas, themes and relates them to life	Communicate a personal response to texts [what is read], supported by textual reference	AO4
• refer sources such as dictionary, thesaurus and encyclopaedia to facilitate reading • use ICT (Net, mobile, website, Youtube, TED talks etc) to browse for information, for projects/ PPT discussion, debate etc.	• refers dictionary, thesaurus and encyclopaedia to find meanings / spelling of words while reading and writing	This is not assessable in a closed book written exam and is best assessed by the teacher through classroom practice.	

Class VIII	The learner –		CEFR level B1
The learner may be provided opportunities in pairs/groups/ individually and encouraged to –			Can understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure, etc. Can deal with most situations likely to arise whilst travelling in an area where the language is spoken. Can produce simple connected text on topics which are familiar or of personal interest. Can describe experiences and events, dreams, hopes & ambitions and briefly give reasons and explanations for opinions and plans
• use English news (newspaper, TV, Radio) as a resource to develop his/her listening and reading comprehension, note-taking, summarizing etc.			
• watch / listen t English movies, serials, educational channels with sub-titles, audio-video/ multi-media materials, for understanding and comprehension.			
			Text types: letters, recounts, biographies, autobiographies, newspaper and magazine articles, explanations, websites, adverts (words rather than graphics) and prose
	• reads excerpts, dialogues, poems, commentaries of sports and games speeches, news, debates on TV, Radio and expresses opinions about them.	Show understanding of explicit meanings	AO1 Question types: M/ choice Matching Sequence information Short answer
		Communicate a personal response to texts [what is read], supported by textual reference	AO4 M/ choice Short answer Longer answer
• learn vocabulary associated with various professions and use them in different situations.	• infers the meaning of unfamiliar words by reading them in context.	Show understanding of explicit meanings	AO1 Question types: M/ choice Matching Sequence information Short answer

• read stories/plays (from different books/ newspapers in education (NIE)/children's section in magazines in English/ Braille) and narrate them.	• reads textual/non-textual materials in English/Braille with comprehension.	Show understanding of explicit meanings	AO1
• locate main idea, sequence of events and co-relate ideas, themes and issues in a variety of texts in English and other languages.	• identifies details, characters, main idea and sequence of ideas and events while reading.	Show understanding of explicit meanings	AO1
• use various sources from English and other languages to facilitate comprehension, co-relation and critical understanding of issues.	• reads a variety of texts for pleasure e.g. adventure stories and science fiction, fairy tales, also non-fiction articles, narratives, travelogues, biographies, etc. (extensive reading)	Communicate a personal response to texts [what is read], supported by textual reference	AO4 M/ choice Short answer Longer answer
• interpret quotations, sayings and proverbs.	• interprets quotations, sayings and proverbs.	Show understanding of implicit meanings and perspectives Analyse [Comment on] writers' use of language and structure [include understanding /effect of simple literary language – metaphor/ simile]	AO2 AO3 M/ choice Short answer Longer answer
• think critically, compare and contrast characters/ events/ideas/themes and relate them to life and try to give opinions about issues.	• reads, compares, contrasts, thinks critically and relates ideas to life.	Show understanding of implicit meanings and perspectives Communicate a personal response to texts [what is read], supported by textual reference	AO2 AO4 M/ choice Short answer Longer answer
• refer sources such as dictionary, thesaurus and encyclopaedia for meaning in context and understanding texts. • use ICT (Net, mobile, website, Youtube, TED talks etc) to browse for information, for projects/ PPT discussion, debate, class seminar etc.	• refers dictionary, thesaurus and encyclopaedia as reference books for meaning and spelling while reading and writing.	This is not assessable in a closed book written exam and is best assessed by the teacher through classroom practice.	

Class IX

The learners may be provided opportunities individually or in groups and encouraged to —

- refer to dictionary, magazines and periodicals, thesaurus, encyclopaedia, electronic media, visit library and consult various resources for improving English language proficiency.

CEFR level B2

Can understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialisation. Can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Can produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.

Text types: newspaper articles, magazine articles, webpages, advertisements (where words rather than images predominate), brochures, marketing material, speeches, autobiographies, memoirs, travel writing, short stories, novels and poetry.

The learner —		
• understands and elicits meanings of the words in different contexts, and by using dictionary, thesaurus, and digital facilities.	Understanding of explicit meanings in non-fiction and literary texts	AO1
	Reading with comprehension, not merely decoding words	AO1
	Explaining the meaning of words in context	AO2
	Understanding of implicit meanings and perspectives in non-fiction and literary texts	AO1, AO2
	Retrieving information from texts	Multiple-choice, short answer

• ask questions on the texts read in the class and during discussions; be patient and respectful and take turns while listening to others and expressing their views.		Not assessable in a written exam but can be assessed by the teacher in classroom activities.	
• read and narrate stories, describe incidents with fluency and in sequence.	• reads silently with comprehension and interprets layers of meaning.	Understanding of explicit meanings in literary texts	AO1
		Understanding of implicit meanings and perspectives in literary texts	AO2
			AO4
		Communicating a personal response, with supporting references to the text	Multiple choice, short answer, and alongside other AOs in extended answer questions
• to improve their listening and reading skills by taking down notes from passages read aloud, news on TV, during discussions in the class; understand the processes on how to make/take notes after reading a passage/ article, etc., and then summarise.	• reads with comprehension the given text/materials employing strategies like skimming, scanning, predicting, previewing, reviewing, inferring, and summarising.	Understanding of implicit meanings and perspectives	AO2
		Understanding of explicit meanings in non-fiction texts	AO1
		Understanding of implicit meanings and perspectives in non-fiction texts	AO2
		Read and identify main points or significant details of non-fiction texts	Short answer, more extended answer
	• reads literary texts for enjoyment/pleasure and compares, interprets and appreciates characters, themes, plots, and incidents and	Understanding of explicit and implicit meanings and perspectives in literary texts	AO1 & AO2
		Interpreting layers of meaning	AO2, AO4

		Constructing meaning by drawing upon inferences	AO2, AO4
	gives opinion.	Comments on writers' use of language and structure to achieve their effects	AO3
		OR: Comment on how meaning is enhanced through choice of words and phrases	AO4
		Communicates a personal response, supported [informed] by textual reference	Longer answer, targeting all AOs
• connect the issues in the texts they read to the world outside and think on possible solutions.	• reads with understanding information in his environment outside the schools as in hoardings, advertisements, product labels, visiting market place, etc.	Understanding of explicit meanings [and implicit] in more functional-style non-fiction texts	AO1 & AO2 Short answer
• understand and learn to encode and decode texts of different genre through individual, pair, and group reading.		Pair and group reading not assessed in written exam and individual reading subsumed into all aspects of the assessment. Pair and group reading is useful for developing skills and should still be an important pedagogical method.	
• familiarise with a variety of vocabulary associated with various themes using these in different contexts through various inputs like collocations, word webs, thematic vocabulary, and word puzzles.		Specific pedagogical methods not assessable in a written exam but vocabulary appropriate to age and context is assessed in questions targeted at explicit meaning.	

• be acquainted with proverbs, phrases, idioms, and their usage.		Not directly assessed in the written exam but may be included in text sources to allow students to explain explicit and implicit meanings.	
• be exposed to a variety of poems like lyric, ballad, ode, limerick, elegy, etc., and notice onomatopoeic sounds, symbols, simile, metaphors, alliteration, and personification, for appreciation. • identify comparisons, allusions, poet's or writer's point of view, literary devices, etc.	• identifies and appreciates significant literary elements, such as, metaphor, imagery, symbol, simile, personification, onomatopoeia, intention or point of view, rhyme scheme, themes, titles, etc. • explains specific features of different literary genres for interpretation and literary appreciation.	Comments on writers' use of language and structure – in non-fiction texts (such as travel writing, autobiography) as well as literary texts Communicate a personal response, supported by textual reference – this would allow students to go beyond 'explanation'	AO3 AO4 These skills could be targeted separately in shorter answers or via levels descriptors in a longer answer
• follow the concept of directions on a given map of a locality, town, city, country; tactile or raised material for children with special needs. • use map to understand directions, space, and distance; look at graphs, charts, and tables to know how data has been given and interpreted.	• reads poems, stories, texts given in Braille; graphs and maps given in tactile/raised material; interprets, discusses, and writes with the help of a scribe.	Not assessed in the written exam but can be assessed in class activities, particularly in cross curricular teaching activities and project work.	

Class X	The learner —		CEFR level B2
The learners may be provided opportunities individually or in groups and encouraged to — • read literature from different countries, and appreciate the ideas, issues, and themes given there.	• uses language appropriate to purposes and perspectives.		Can understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialisation. Can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Can produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options. Text types: newspaper articles, magazine articles, webpages, advertisements (where words rather than images predominate), brochures, marketing material, speeches, autobiographies, memoirs, travel writing, short stories, novels and poetry
• read texts independently, comprehend, and respond to or ask questions on the text.	• reads, comprehends, and responds to complex texts independently.	This could embrace all the proposed AOs and target literary and non-fiction texts: Explicit meanings Implicit meanings and perspectives Use of language and structure Personal response supported by textual reference ALSO Discrete summarise task on a part / an aspect of a text - Identifying the main points or significant details of a text Construct meaning by drawing inferences	Extended answer question. All AOs assessed holistically using levels descriptors AO1, AO2 Longer answer question AO2 Shorter question

• read stories and literary texts — both fiction and non-fiction with understanding for pleasure and enjoyment; discuss on characters, issues, situations; and if there is a problem, work on the solutions. • use subject, or contexts, and content related vocabulary to express their understanding of the texts and tasks.	• reads stories and literary texts, both fiction and non-fiction, with understanding for pleasure and enjoyment and discusses about these. • collects evidences and discusses in groups for reading tobiographies, history and science based literary texts. • uses the figurative meaning of words and phrases as given in the texts read.	Understanding of explicit and implicit meanings and perspectives in both literary and non-fiction texts Appreciation of plot, themes, characterisation	AO1 & AO2 AO3 Targeted discretely in multiple choice or short answer questions or alongside other AOs in longer answers
• appreciate nuances and shades of literary meanings in a variety of poems like lyric, ballad, ode, limerick, elegy, etc., and the literary devices like onomatopoeic sounds, symbols, metaphors, alliteration, etc., understand comparisons, allusions, poet's or writer's point of view, etc.	• appreciates nuances and shades of literary meanings, talks about literary devices like onomatopoeic sounds, symbols, metaphors, alliterations, comparisons, allusions and the poet's or the writer's point of view. • identifies significant literary elements such as figurative language — metaphor, imagery, symbol, simile, intention or point of view, rhyme scheme, etc.	Understanding of explicit and implicit meanings and perspectives in both literary and non-fiction texts (if the dominant focus is placed on 'appreciates nuances') Comment on writer's use of language and structure in literary and non-fiction texts	AO2 Short answer, though more than 1 or 2 marks AO3 Could be short answer, or slightly longer Both AO 2 and 3 could be combined with AO4 (personal response) for more extended answer questions
	• uses grammatical items as cues for reading comprehension such as tense, reported speech, conjunctions, and punctuation.	Understands explicit meanings in literary and non-fiction texts Understands implicit meanings and perspectives in literary and non-fiction texts	AO1 AO2 Multiple choice, short answer

• use visual aids, and locally developed learning materials to complement and supplement the textbook and supplementary reader.	• draws references from books, newspapers, internet, etc., and interprets using analytical skills.	Focusing on the last strand: Comments on writers' use of language and structure in literary and non-fiction texts	AO3
		Communicates a personal response to literary and non-fiction texts, supported by textual reference	AO4 Extended answer
• understand the concept of directions on a given map of a locality, town, city, country, tactile or raised material for children with special needs.	• reads the poems, stories, texts given in Braille; graphs and maps given in tactile or raised material; interprets, discusses, and writes with the help of a scribe.	Not assessed in the written exam but can be assessed in class activities, particularly in cross curricular teaching activities and project work.	

CBSE example assessment item: English VI

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class
English reading	VI

Item purpose

This question assesses a student's ability to find explicit (AO1) and implied meanings (AO2) within a text and to use information within the text to generate a personal response (AO4).

Source

Text A   Read the letter below and answer the questions that follow.

> Dear Rupa,
>
> Thank you for telling me how you spent your winter. Shall I tell you about mine?
>
> My family decided to take a train to visit our hometown in February and spend time with my grandparents.
>
> 5   My hometown is in Aluva, Kochi. Aluva is a beautiful place because it has many large trees and there are powerful rivers which flow along the outskirts of the town.
>
> The houses looked bright and colourful because they were decorated with rangolis made with flower petals. It was a festival time so people dressed in new clothes and their finest jewellery and we all enjoyed traditional food prepared especially for this occasion.
>
> 10   It was exciting to meet with all my uncles, aunties and cousins after a long time. Most of all, it was wonderful to spend time with my grandparents. I will treasure these moments in Aluva.
>
> Your friend,
>
> Nasreen

Question(s)

1. Who did Nasreen travel with?   (1 mark)

2. How did Nasreen travel?   (1 mark)

3. Give two reasons why Nasreen thinks that Aluva is an attractive place.   (2 marks)

4. What did people do to celebrate the festival? Give two examples.   (2 marks)

5. Find and copy four examples of people Nasreen met in Aluva.   (2 marks)

6. What did Nasreen like best about her visit to Aluva?   (1 mark)

7. *I will treasure these moments in Aluva.*
    What does 'treasure' mean in this sentence?

Select and copy one correct answer from:
enjoy   find   remember   write about   (1 mark)

8. Would you like to visit Aluva? Yes/ No
    Explain your opinion with two reasons from the text.   (2 marks)

                                                        (Total marks 12)

Mark scheme

Point-based

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1. Who did Nasreen travel with?

Answer	Guidance
(my) family	Accept: parents

2. How did Nasreen travel?

Answer	Guidance
(by) train	Accept: rail(way)

3. Give two reasons why Nasreen thinks that Aluva is an attractive place.

Answer	Guidance
(large) trees (powerful) rivers bright/ colourful houses	Award 1 mark for each correct answer to a maximum of two marks.

4. What did people do to celebrate the festival? Give two examples.

Answer	Guidance
• decorated (their) houses • (made) rangolis • (dressed in) new clothes • (wore fine) jewellery • (made/ ate traditional/ special) food	Award 1 mark for each correct answer to a maximum of two marks. Accept paraphrases of correct answers.

5. Find and copy four examples of people Nasreen met in Aluva.

Answer	Guidance
uncles, aunties, cousins, grandparents	Award 2 marks for four correct answers. Award 1 mark for two or three correct answers. No marks for just family

6. What did Nasreen like best about her visit to Aluva?

Answer	Guidance
(meeting her) grandparents	

7. I will treasure these moments in Aluva.
What does 'treasure' mean in this sentence?
Select and copy one correct answer from:
enjoy   find   remember   write about

Answer	Guidance
remember	Accept minor errors in copying word.

8. Would you like to visit Aluva? Yes/ No

   Explain your opinion with two reasons from the text.

Answer	Guidance
Accept answers that offer reasons from the text to support an opinion.	Award 1 mark for each correct answer to a maximum of two marks.
For example:	Student may both agree and disagree and still gain full marks as long as the answers are supported.
Yes:	
• it is beautiful	
• there are rivers and trees	
• the houses are bright and colourful	
• festival time is exciting	
No:	
• the festival may be too busy/crowded	
• I prefer buildings to rivers and trees	

AO coverage

Question	AO1	AO2	AO3	AO4
1	1			
2	1			
3		2		
4	2			
5	2			
6		1		
7		1		
8				2
Total	6	4		2

CBSE example assessment item: English reading VII

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class
English reading	VII

Item purpose

This question assesses a student's ability to find explicit (AO1) and implied meanings (AO2) within a text and to use information within the text to generate a personal response (AO4).

Source

Text B

In this story, two boys talk about some news from their local wildlife reserve. A wildlife reserve is an area where wild animals, such as tigers, are protected by teams of rangers.

The story is located in the Sunderbans (islands near Kolkata).

"Neel," called Viju. "One of the new tiger cubs has escaped!"

Neel gasped. This was big news. The wildlife reserve's hungry, thin female tigers gave birth so rarely nowadays. When three cubs were born ten weeks ago, rangers* visited all fifty or so of the inhabited islands to share the good news.

5 Neel leaned forward in excitement. "How did it get out? Was it a boy or a girl cub? Where do they think it is now?"

"One question at a time!" Viju said. "It clawed a small hole in the fence. It is the girl cub; the boys are still with their mother. And as for where it is? They say it's on our island but they don't know exactly where."

10 "Here?" Neel jumped to his feet as if an enormous man-eating tiger were about to pounce on him.

"Relax," Viju said. "It's still tiny. Ten weeks old. Not much bigger than a small cat."

rangers – people who work in a wildlife reserve to care for the animals

Adapted from *Tiger Boy by Mitali Perkins* published by *Charlesbridge*

Question(s)

1. Find and copy the correct numbers to answer the questions below.
   a) How many tiger cubs are there?
   b) How many weeks old are the tiger cubs?
   c) How many islands did the rangers visit? (3 marks)

2. Find and copy **one** word that tells you how often tiger cubs are born. (1 mark)

3. Find and copy **two** words that suggest that the tigers in the wildlife reserve are not healthy. (1 mark)

4. This was big news.
    What does the word '<u>big</u>' mean in this sentence?
    Copy **two** correct words from the list below.
    difficult   important   pleasing   surprising   unfortunate   (2 marks)

5. Explain how the tiger cub escaped.   (1 mark)

6. "Here?" Neel jumped to his feet as if an enormous man-eating tiger were about to pounce on him.
    Copy **one** word from the list below that correctly completes this sentence:
    Neel jumped to his feet because he was feeling _____.
    brave   excited   happy   nervous   (1 mark)

7. Write **three** things you know about the tiger cub.   (2 marks)

8. Give **two** opinions you have of the character Neel.
    Give a **different** reason for each of your opinions.   (4 marks)

Mark scheme

Point-based

1. Find and copy the correct numbers to answer the questions below.

a) How many tiger cubs are there?

b) How many weeks old are the tiger cubs?

c) How many islands did the rangers visit?

Answer	Guidance
a) 3/ three	
b) 10/ ten	
c) 50/ fifty	

2. Find and copy one word that tells you how often tiger cubs are born.

Answer	Guidance
rarely	Correct answer only

3. Find and copy two words that suggest that the tigers in the wildlife reserve are not healthy.

Answer	Guidance
• thin	Award 1 mark for two correct answers.
• hungry	

4. This was big news.

What does the word 'big' mean in this sentence?

Copy two correct words from the list below.

difficult   important   pleasing   surprising   unfortunate

Answer	Guidance
• important	Award 1 mark for each correct answer.
• surprising	Do not accept answers for which more than two words have selected.

5. Explain how the tiger cub escaped.

Answer	Guidance
(It) clawed a (small) hole in the fence.	Accept answers that paraphrase the correct answer.

6. *"Here?" Neel jumped to his feet as if an enormous man-eating tiger were about to pounce on him.*

Copy one word from the list below that correctly completes this sentence:

Neel jumped to his feet because he was feeling _____.

brave   excited   happy   nervous

Answer	Guidance
nervous	

7. Write three things you know about the tiger cub.

Answer	Guidance
The tiger cub is: • without its mother/ siblings • outside of the (wildlife) reserve/ lost • on the island • tiny/not much bigger than a cat • is female/a girl (cub) • 10 weeks old	Award 1 mark for two correct answers. Award 2 marks for three correct answers. Answers must be founded in the text.

8. Give two opinions you have of the character Neel.

Give a different reason for each of your opinions.

Answer		Guidance
Neel is:		Award 1 mark for each relevant opinion to a maximum of two marks.
Opinion	Reason	
curious/ interested	he asks (lots of) questions	Award 1 mark for each example that supports the opinion given to a maximum of two marks.
excited/excitable	he leans forward/ gasps/ jumps to his feet	Accept other relevant opinions if they are supported by appropriate examples from the text.
scared	he is worried that a tiger may be about	

AO coverage

Question	AO1	AO2	AO3	AO4
1	3			
2	1			
3		1		
4		2		
5	1			
6		1		
7	2			
8				4
Total	**7**	**4**		**4**

CBSE example assessment item: English reading VIII

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class
English reading	VIII

Item purpose

This question assesses a student's ability to find explicit (AO1) and implied meanings (AO2) within a text and to use information within the text to generate a personal response (AO4).

Source

Text A   Read the webpage biography article below about an Indian sailor and answer the questions that follow.

India's first woman to claim a World Cup medal in sailing.

5

It's not every day that you hear of India winning medals in sailing but that's exactly what happened when Nethra Kumanan became the first Indian woman sailor to win a medal in the sport after achieving a bronze in the World Cup Series in Miami, USA on January 25th, 2020.

An engineering student from Chennai, Nethra Kumanan is a more experienced sailor than your average 22-year-old because she has already represented India at both the 2014 and 2018 Asian Games, finishing fourth in the latter event.

10

"Most people don't know sailing exists as a sport in India," Kumanan said after her historic achievement. "Our national sports are cricket, football or hockey and it's usually members of the navy or the army that sail."

Taking sail early on

So how did Kumanan first take to the water?

15

"I discovered sailing in a summer camp and since then I haven't been off the water for more than a year," she explained.

20   While making it to the global stage in sailing is never easy, Nethra Kumanan believes that all the thousands of hours she's invested in sailing are well worth it.

"I am 22 and if someone younger were to come up to me, I'd tell them that this sport takes a lot of time, a lot of hours on the water but it's all worth it. You get to travel the world and meet people from different countries; you experience them trying to do their best …. and you try to do better than them."

Adapted from:
https://www.olympicchannel.com/en/stories/features/detail/nethra-kumanan-sailing/

Question(s)

1. Find and copy the correct numbers to answer the questions below:
   a. How old is Nethra?
   b. Which year did Nethra first compete in the Asian Games?   (2 mark)

2. *It's not every day that you hear of India winning medals in sailing*
   Write down the correct word from the list to complete the sentence below.
   This underlined expression suggests that the information is_____.
   interesting   surprising   unrealistic   usual   (1 mark)

3. What results has Nethra Kumanan achieved:
   a. in the 2018 Asian games?
   b. in the World Cup Series?   (2 marks)

4. "Most people don't know sailing exists as a sport in India," Kumanan said after her historic achievement.
   Explain why the word 'historic' has been used in this sentence.   (1 mark)

5. Give two reasons why it is unusual for Nethra Kumanan to win a World Cup medal for sailing.   (2 marks)

6. Nethra Kumanan believes that thousands of hours she's invested in sailing are well worth it.
   What does the word 'invested' mean in this sentence?
   Write the letter of the correct option on your answer paper.
   A. Nethra has been interested in sailing for a long time.
   B. Nethra has spent much money on sailing.
   C. Nethra learned a lot about sailing.
   D. Nethra put her efforts into sailing.   (1 mark)

7. Select three reasons why Nethra Kumanan enjoys sailing competitions.
   Write the letters of the correct options on your answer paper.
   A. She always knew she would win medals.
   B. She enjoys travel.
   C. She loves swimming.
   D. She meets people from other countries.
   E. She wants to be better than her competitors.
   F. She wants to be rich.   (2 marks)

8. Give two opinions you have of Nethra Kumanan
   Give a different reason for each of your opinions.   (4 marks)

Mark scheme

Point-based

---

1. Find and copy the correct numbers to answer the questions below:

a. How old is Nethra?

b. Which year did Nethra first compete in the Asian Games?

Answer	Guidance
a. 22	Award 1 mark for each correct answer.
b. 2014	

2. It's not every day that you hear of India winning medals in sailing
Write down the correct word from the list to complete the sentence below.
This underlined expression suggests that the information is
Interesting   surprising   unrealistic   usual

Answer	Guidance
surprising	Accept minor slips in spelling the correct answer.

3. What results has Nethra Kumanan achieved:

a. in the 2018 Asian games?

b. in the World Cup Series?

Answer	Guidance
a. fourth	Award 1 mark for each correct answer to a maximum of two marks.
b. bronze/ third/ 3rd	

4. "Most people don't know sailing exists as a sport in India," Kumanan said after her historic achievement.
Explain why the word 'historic' has been used in this sentence.

Answer	Guidance
first/ new/ original/ important	Accept relevant answers that convey the magnitude/ originality of the achievement.

5. Give two reasons why it is unusual for Nethra Kumanan to win World Cup medals for sailing.

Answer	Guidance
• She is very young. • India is not famed for sailing. • It is more usual for members of the navy or army to compete in sailing competitions.	Award 1 mark for each correct answer to a maximum of two marks.

6. Nethra Kumanan believes that thousands of hours she's invested in sailing are well worth it.

What does the word 'invested' mean in this sentence?

Write the letter of the correct option on your answer paper.

A.   Nethra has been interested in sailing for a long time.

B.   Nethra has spent much money on sailing.

C.   Nethra learned a lot about sailing.

D.   Nethra put her efforts into sailing.

Answer	Guidance
D. (Nethra put her efforts into sailing.)	

7. Select three reasons why Nethra Kumanan enjoys sailing competitions.

Write the letters of the correct options on your answer paper.

A. **She always knew she would win medals.**

B. **She enjoys travel.**

C. **She loves swimming.**

D. **She meets people from other countries.**

E. **She wants to be better than her competitors.**

She wants to be rich.

Answer	Guidance
B, D, E	Award 1 mark for correct answers. Award 2 marks for three correct answers.

8. Give two opinions you have of Nethra Kumanan

Give a different reason for each of your opinions.

Answer	Guidance
Nethra Kumanan is: • determined …..she spends hours on the water • competitive….. she wants to be better than her opponents • persevering….. she has practised since she was much younger • curious …. she enjoys travel and meeting people	Award 1 mark for each relevant opinion to a maximum of two marks. Award 1 mark for each example that supports the opinion given to a maximum of two marks. Accept other relevant opinions if they are supported by appropriate examples from the text.

AO coverage

Question	AO1	AO2	AO3	AO4
1	2			
2		1		
3	2			
4		1		
5		2		
6		1		
7		2		
8				4
Total	**4**	**7**		**4**

CBSE example assessment item: Class IX - Reading - Q1

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
English	IX	Reading Text A

Item purpose

This question assesses the ability of the student to show understanding of explicit meanings (AO1) in an informative text on a global issue.

Text A

Plastic Pollution

This is from a 2017 magazine article by the television naturalist David Attenborough.

We must act now to protect our oceans from the deadly threat of plastic.

For me, there was no scene in the Blue Planet II series more heart-rending than one in this week's programme. In it, as snowflakes settle on the ground, a baby albatross* lies dead, its stomach pierced by a plastic toothpick fed to it by its own mother, having mistaken it for healthy food. Nearby lies plastic litter that other hungry chicks have regurgitated.   5

Being fed lethal plastic debris is a risk that every young albatross now faces. This one scene symbolises a major problem that today threatens all sea creatures worldwide. Plastic is now found everywhere in the ocean, from its surface to its greatest depths.   10

There are fragments of nets so big they entangle the heads of fish, birds and turtles, and slowly strangle them. Other pieces of plastic are so small that they are mistaken for food and eaten, accumulating in fishes' stomachs, leaving them undernourished. And while in the sea, this debris may combine with other toxic chemicals that we have dumped in the ocean adding, some suspect, to the chemical contamination* that we're already seeing in a variety of sea creatures.   15

Every year, we dump around eight million tonnes of plastic into the sea. When ingenious chemists invented plastics over a century ago, the manufacturers proudly announced that this new material was, most wonderfully and valuably, indestructible. It would never wear out.   20

No one at the time, apparently, asked the question of what happened to this extraordinary new kind of marvellous material after we have finished with it. Now we know. It kills.

Yet all is not yet lost. We can, right now, reduce the amount of plastic that we use in our everyday lives. Already many companies have realised the danger and have taken measures to reduce the amount of plastic bags and packaging they use. And we ourselves can simply stop using plastic unnecessarily.   25

albatross – a type of seabird
contamination - pollution

324 words

Source: **Taken from:** https://www.radiotimes.com/news/tv/documentaries/2018-03-16/david-attenborough-blue-planet-ii-we-must-act-now-to-protect-our-oceans-from-the-deadly-threat-of-plastic/

Question

1 (a) From lines 2-5, identify one word which shows the impact on the writer of seeing the baby albatross.

(1 mark)

1 (b) Explain what the writer means by 'lethal plastic debris'.

(2 marks)

Mark scheme

Point-based

1 (a) From lines 2-5, identify one word which shows the impact on the writer of seeing the baby albatross.

(1 mark)

Answer	Guidance
'heart-rending'.	Award 1 mark for this word.

1 (b) Explain what the writer means by 'lethal plastic debris'.

(2 marks)

Answer	Guidance
• *lethal:* deadly / life-threatening • *debris:* rubbish / litter / waste / something discarded	Award **2 marks** for full explanation of the two strands ('lethal' and 'debris'). Award **1 mark** for partial explanation. Accept alternative valid synonyms.

CBSE example assessment item: Class IX - Reading - Q3

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
English	IX	Reading Text A

Item purpose

This short answer question assesses the ability of the student to comment on how the writer uses language to achieve an effect (AO3).

Text A

Plastic Pollution

This is from a 2017 magazine article by the television naturalist David Attenborough.

We must act now to protect our oceans from the deadly threat of plastic.

For me, there was no scene in the Blue Planet II series more heart-rending than one in this week's programme. In it, as snowflakes settle on the ground, a baby albatross* lies dead, its stomach pierced by a plastic toothpick fed to it by its own mother, having mistaken it for healthy food. Nearby lies plastic litter that other hungry chicks have regurgitated.   5

Being fed lethal plastic debris is a risk that every young albatross now faces. This one scene symbolises a major problem that today threatens all sea creatures worldwide. Plastic is now found everywhere in the ocean, from its surface to its greatest depths.   10

There are fragments of nets so big they entangle the heads of fish, birds and turtles, and slowly strangle them. Other pieces of plastic are so small that they are mistaken for food and eaten, accumulating in fishes' stomachs, leaving them undernourished. And while in the sea, this debris may combine with other toxic chemicals that we have dumped in the ocean adding, some suspect, to the chemical contamination* that we're already seeing in a variety of sea creatures.   15

Every year, we dump around eight million tonnes of plastic into the sea. When ingenious chemists invented plastics over a century ago, the manufacturers proudly announced that this new material was, most wonderfully and valuably, indestructible. It would never wear out.   20

No one at the time, apparently, asked the question of what happened to this extraordinary new kind of marvellous material after we have finished with it. Now we know. It kills.

Yet all is not yet lost. We can, right now, reduce the amount of plastic that we use in our everyday lives. Already many companies have realised the danger and have taken measures to reduce the amount of plastic bags and packaging they use. And we ourselves can simply stop using plastic unnecessarily.   25

albatross – a type of seabird *contamination* - pollution	**324 words**

Source: **Taken from:** https://www.radiotimes.com/news/tv/documentaries/2018-03-16/david-attenborough-blue-planet-ii-we-must-act-now-to-protect-our-oceans-from-the-deadly-threat-of-plastic/

Question

3 '…a baby albatross lies dead, its stomach pierced by a plastic toothpick fed to it by its own mother' (lines 3-5)
Give two ways in which the writer uses language to create such a disturbing picture of the baby albatross.

(2 marks)

Mark scheme

Point-based

'…a baby albatross lies dead, its stomach pierced by a plastic toothpick fed to it by its own mother' (lines 3-5)

Give two ways in which the writer uses language to create such a disturbing picture of the baby albatross.

(2 marks

Answer	Guidance
• the word 'baby' suggests its powerlessness / innocence • the pain suggested by the stomach being 'pierced' (by a toothpick) • the (upsetting) detail that the mother caused the baby's death.	Award **1 marks** for each point, up to a maximum of **2 marks**.

CBSE example assessment item: Class IX - Reading - Q4

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
English	IX	Reading Text A

Item purpose

This extended answer question targets understanding of explicit (AO1) and implicit (AO2) meanings by requiring students to select relevant information from a specified section of the text: a non-fiction text on a global issue. Understanding is evident in an ability to express ideas in own words as far as possible, up to a specified word limit.

Text A

Plastic Pollution

This is from a 2017 magazine article by the television naturalist David Attenborough.

We must act now to protect our oceans from the deadly threat of plastic.

For me, there was no scene in the Blue Planet II series more heart-rending than one in this week's programme. In it, as snowflakes settle on the ground, a baby albatross* lies dead, its stomach pierced by a plastic toothpick fed to it by its own mother, having mistaken it for healthy food. Nearby lies plastic litter that other hungry chicks have regurgitated. — 5

Being fed lethal plastic debris is a risk that every young albatross now faces. This one scene symbolises a major problem that today threatens all sea creatures worldwide. Plastic is now found everywhere in the ocean, from its surface to its greatest depths. — 10

There are fragments of nets so big they entangle the heads of fish, birds and turtles, and slowly strangle them. Other pieces of plastic are so small that they are mistaken for food and eaten, accumulating in fishes' stomachs, leaving them undernourished. And while in the sea, this debris may combine with other toxic chemicals that we have dumped in the ocean adding, some suspect, to the chemical contamination* that we're already seeing in a variety of sea creatures. — 15

Every year, we dump around eight million tonnes of plastic into the sea. When ingenious chemists invented plastics over a century ago, the manufacturers proudly announced that this new material was, most wonderfully and valuably, indestructible. It would never wear out. — 20

No one at the time, apparently, asked the question of what happened to this extraordinary new kind of marvellous material after we have finished with it. Now we know. It kills.

Yet all is not yet lost. We can, right now, reduce the amount of plastic that we use in our everyday lives. Already many companies have realised the danger and have taken measures to reduce the

Source

Taken from: https://www.radiotimes.com/news/tv/documentaries/2018-03-16/david-attenborough-blue-planet-ii-we-must-act-now-to-protect-our-oceans-from-the-deadly-threat-of-plastic/

| amount of plastic bags and packaging they use. And we ourselves can simply stop using plastic unnecessarily. | 25 |
| *albatross* – a type of seabird
contamination - pollution | **324 words** |

Question

4 Re-read the text from paragraph three (beginning 'Being fed lethal plastic debris…') to the end of the text.

Using your own words as far as possible, summarise what you learn about the threats created by plastic pollution.

Write no more than 120 words.   (8 marks)

Mark scheme

Level of response

Students should draw upon the following points:

1. Plastic is deadly / it causes death

2. A danger to young albatrosses

3. …and all animal life in the oceans

4. It represents a significant / global issue

5. Animals get trapped in piece of netting

6. Tiny bits of plastic confuse animals into thinking they have been fed

7. The plastic mixes with other poisons

8. Vast amounts of plastic are discarded in the oceans

9. Plastic is not biodegradable / cannot be broken down

10. Problems caused by excess use of plastic (bags/ packaging).

Levels of response

The answer is marked holistically, using the following levels descriptors. The need for students to express their understanding concisely is reflected in the second part of Bullet 1. Excessively long responses are unlikely to go higher than 5 marks because of the loss of focus on the task (even where a range of points are generally expressed in own words).

Level descriptors

Level	Descriptors	Mark
4	• Clear understanding of text, with mostly clear focus	7-8
	• A wide range of points, expressed in own words for the most part	
3	• Text generally understood, and task generally addressed	5-6
	• A range of points, generally expressed in own words	
2	• Evidence of some understanding, with some focus on the task	3-4
	• A grasp of some relevant points, with occasional use of own words	
1	• Little understanding of text and/or task	1-2
	• Simple points, lifted from the text	
0	Nothing to reward	0

CBSE example assessment item: Class X - Literature - Q2

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
English	X	Literature: Poetry section

Item purpose

This short answer question assesses the ability of the student to draw inferences (AO2).

Poetry

A Tiger in the Zoo

He stalks in his vivid stripes
The few steps of his cage,
On pads of velvet quiet,
In his quiet rage.   5

He should be lurking in shadow,
Sliding through long grass
Near the water hole
Where plump deer pass.

He should be snarling around houses   10
At the jungle's edge,
Bearing his white fangs, his claws,
Terrorising the village!

But he's locked in a concrete cell,
His strength behind bars,   15
Stalking the length of his cage,
Ignoring visitors.

He hears the last voice at night,
The patrolling cars,   20
And stares with his brilliant eyes
At the brilliant stars.

Leslie Norris

Source: Class X set poetry text: Leslie Norris, 'A Tiger in the Zoo'

Question

2 Explain why Norris says the tiger 'should be lurking in shadow' (line 5).   (2 marks)

Mark scheme

Point-based

2 Explain why Norris says the tiger 'should be lurking in shadow' (line 5).	(2 marks)
Answer	**Guidance**
Award 1 mark for each point, up to a **maximum of 2 marks**. • Tigers are dangerous • Tigers deliberately hide in the darkness / to pounce • This is the normal / instinctive behaviour of tigers • The tiger is being kept from its natural environment / a criticism of the zoo	Award **1 mark** for each point, up to a maximum of **2 marks**.

CBSE example assessment item: Class X - Literature - Q3

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
English	X	Literature: Poetry section

Item purpose

This extended answer question assesses the ability of the student analyse the ways in which the poet uses language and structure to convey ideas (AO3). The higher levels descriptors require an ability to analyse the effects the poet achieves, a skill of a higher order than describing or merely logging poetic devices.

Class X set poetry text: Leslie Norris, 'A Tiger in the Zoo'

Poetry: A Tiger in the Zoo

He stalks in his vivid stripes
The few steps of his cage,
On pads of velvet quiet,
In his quiet rage.

He should be lurking in shadow,
Sliding through long grass
Near the water hole
Where plump deer pass.

He should be snarling around houses
At the jungle's edge,
Bearing his white fangs, his claws,
Terrorising the village!

But he's locked in a concrete cell,
His strength behind bars,
Stalking the length of his cage,
Ignoring visitors.

He hears the last voice at night,
The patrolling cars,
And stares with his brilliant eyes
At the brilliant stars.

Leslie Norris

Source: Class X set poetry text: Leslie Norris, 'A Tiger in the Zoo'

Question

3 Explore how Norris uses language and structure to convey his thoughts about the tiger in the poem.

In your answer, you should:

- comment on the language the poet uses
- consider the contrast made between tigers in the wild and tigers in captivity
- the structure of the poem.

Refer to details in the poem to support your response.   (10 marks)

Mark scheme

Indicative content

Students may comment on the following:

Language points:

- personification of the tiger: e.g. 'lurking', 'rage'
- the adjective 'plump' used to describe potential prey
- the onomatopoeia of 'snarling'
- the reference to 'fangs', 'claws' and 'terrorising'

Structure points:

- the use of rhyme: e.g. 'cage…rage'
- the contrast between the tiger at large and the tiger in captivity
- the contrast between the tiger's actual plight and what he 'should' be doing
- the impact of the final stanza: e.g. the repetition of 'brilliant'.

The content points here are indicative and not intended to be exhaustive. All valid and supported points should be taken into account when arriving at the final mark.

For the higher levels, answers should:

- go beyond the simple logging of features and straightforward explanation of points
- analyse closely the ways in which Norris achieves his effects in conveying his thoughts about the tiger.

Levels of response

The descriptors relate to AO3.

An even balance between language and structure points is not expected. For the highest two levels, there should be at least some comment on each of language and structure.

Level descriptors

Level	Descriptors	Mark
5	• A perceptive analysis of language and structure in conveying the writer's ideas • Well-selected references used as an integral part of the analysis	9-10
4	• A clear analysis of language and structure in conveying the writer's ideas • A wide range of references used to support the analysis	7-8
3	• A generally clear explanation of language and structure in conveying the writer's ideas • Use of textual references to support explanation	5-6
2	• Some straightforward comment on language and/or structure features that show the writer's ideas • Some use of textual detail, beginning to support comments	3-4
1	• Limited evidence of a critical awareness • Limited use of textual detail	1-2
0	Nothing to reward	0

CBSE example assessment item: Class X - Reading - Q7

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
English	X	Reading Text B

Item purpose

This extended answer question assesses holistically both AO3 and AO4, which are weighted equally. Students are tested on the ability to give a supported personal response (AO4) to the ways in which the writer uses language and structure to achieve her effects (AO3).

In the first sentence of the question, context is provided for students. The next sentence is the question stem, beginning with the command word 'Explore…'

Bullet points are provided for support, and the final sentence reminds students to use textual reference to support the points they make.

Source

Taken from Anita Desai, 'Studies in the Park', Games at Twilight, Penguin 1978 (pages-).

Text B: Studying for exams

In this extract from Anita Desai's short story 'Studies in the Park', the narrator describes the pressure of studying for his examinations in the park and at home.

The exams grew nearer. Not three, not two, but only one month to go. I had to stop daydreaming and set myself tasks for every day and remind myself constantly to complete them. It grew so hot I had to give up strolling on the paths and staked out a private place for myself under a tree. I noticed the tension tightening the eyes and mouths of other students – they applied themselves more diligently to their books, talked less, slept less. Everyone looked a little demented from lack of sleep. Our books seemed attached to our hands as though by roots, they were part of us, they lived because we fed them. They were parasites and, like parasites, were sucking us dry. We mumbled to ourselves, not always consciously. Chipmunks jumped over our feet, mocking us. The gram seller* down at the gate whistled softly 'I'm glad I never went to school, I am a bul-bul*, I live in Paradise…'

5

10

My brains began to jam up. I could feel it happening, slowly. As if the oil were used up. As if everything was getting locked together, rusted. The white cells, the grey matter, the springs and nuts and bolts. I yelled at my mother – I think it was my mother – 'What do you think I am? What do you want of me?' and crushed a glass of milk between my hands. It was sticky. She had put sugar in my milk. As if I were a baby. I wanted to cry. They wouldn't let me sleep, they wanted to see my light on all night, they made sure I never stopped studying. Then they brought me milk and sugar and made clicking sounds with their tongues. I raced out to the park. I think I sobbed as I paced up and down, up and down…

15

gram seller - seller of small items

bul-bul - nightingale, 'bird of a thousand songs'

Question

4 In the text, the writer portrays the pressure the narrator feels as he studies for his examinations.

Explore how effectively she does this.

In your answer, you should comment on:

- the words and images the writer uses
- the way she organises her material.

Refer to details in the extract to support your answer.   (10 marks)

Mark scheme

Indicative content

Students **may** comment on the following:

- How the narrator counts down to the exams at the start of the extract
- Constant pressure of setting task 'every day'
- The need to find a private spot in the park
- Narrator's acknowledgement of the pressure on others
- Extended metaphor of 'roots', 'parasites', and 'sucking us dry'
- The hint of delirium: '…mumbled to ourselves, not always consciously'
- The second paragraph's exaggeration in description of the physical impact of studying: 'brains…jam up', 'oil…used up', 'rusted'
- Use of direct speech showing his frustration
- His feeling that he is being infantilised
- The indications of distress: 'I wanted to cry', 'sobbed'

The content points here are indicative and not intended to be exhaustive. All valid and supported points should be taken into account when arriving at the final mark.

For the higher levels, answers should:

- go beyond the simple logging of features and straightforward explanation of points
- evaluate how effectively Desai portrays the tension the narrator feels as he studies for his exams.

Levels of response

The descriptors relate to AO3 (the first bullet) and AO4 (the second bullet). The AOs are evenly weighted, and responses marked holistically using the levels descriptors.

Level descriptors

The descriptors relate to AO3 (the first bullet) and AO4 (the second bullet). The AOs are evenly weighted, and responses marked holistically using the levels descriptors.

Level	Descriptors	Mark
5	• A sustained critical analysis of the ways in which the writer achieves her effects • A sustained, convincing personal response to the task	9-10
4	• A well-developed and clear analysis of the ways in which the writer achieves her effects • Clear, well-developed personal response to the task	7-8
3	• A generally reasonably developed explanation of some effects • Reasonably competent personal response to the task	5-6
2	• Some straightforward comment on some features of the writing • Some evidence of a personal response, under-developed	3-4
1	• Limited evidence of a critical awareness • Limited awareness of the task	1-2
0	Nothing to reward	0

Mathematics

Assessment objectives – Mathematics

This document sets out the assessment objectives for CBSE mathematics and their percentage weighting for the CBSE end of year tests for the different classes from VI to X.

No.	Description of Assessment Objective	Class				
		VI	VII	VIII	IX	X
AO1	Demonstrate knowledge and understanding of mathematical ideas, techniques and procedures.	50 - 65	50 - 65	50 - 65	40 – 55	40 – 55
AO2	Apply knowledge and understanding of mathematical ideas, techniques and procedures to classroom and real-world situations	35 - 50	35 - 50	35 - 50	45 - 60	45 - 60

Demonstrate knowledge and understanding of mathematical ideas, techniques and procedures.

Students should be able to recall and apply mathematical knowledge, terminology and definitions to carry out routine procedures or straightforward tasks requiring single or multi-step solutions in mathematical or every-day situations. At appropriate class levels this would include:

- working accurately with information presented in words, tables, graphs and diagrams

- using and interpreting mathematical notation correctly

- using a calculator to perform calculations where appropriate

- understanding and using systems of measurement in everyday use

- estimating, approximating and working to appropriate levels of accuracy, and converting between equivalent numerical forms

- using geometrical instruments to measure and to draw to appropriate levels of accuracy

- recognising and using spatial relationships in two and three dimensions

Apply knowledge and understanding of mathematical ideas, techniques and procedures to classroom and real-world situations.

Students should be able to reason, interpret and communicate mathematically when solving problems. They should be able to analyse a problem, select a suitable strategy and apply appropriate techniques. At appropriate class levels this would include:

- presenting arguments and chains of reasoning in a logical and structured way

- assessing the validity of an argument
- interpreting and communicating information accurately, and changing from one form of presentation to another
- solving unstructured problems by putting them into a structured form
- recognising patterns in a variety of situations and forming generalisations
- applying combinations of mathematical skills and techniques using connections between different areas of mathematics
- making logical deductions, making inferences and drawing conclusions from given mathematical information, including statistical data
- interpreting results in the context of a given problem

Note: proportions for these AOs are presented as ranges. We suggest that the initial balance might use the high end of AO1 with the low end of AO2, moving over time towards increasing the proportion of AO2 over time as the new pedagogical approach is embedded.

CBSE end of year test assessment specification - Class VI

This document sets out the approach to the assessment for the following subject and class:

Subject	Class
Mathematics	VI

Assessment title	Non-calculator	Calculator
Duration	1 hour	1 hour
Total number of marks	40	40
Percentage AO1	50 -65% (20 – 26 marks)	50 -65% (20 – 26 marks)
Percentage AO2	35 – 50% (14 – 20 marks)	35 – 50% (14 – 20 marks)
High level content coverage	Number systems (15 - 17 marks) Algebra (3 – 5 marks) Geometry (7 - 9 marks) Mensuration (7 - 9 marks) Statistics and probability (3 – 5 marks)	Number systems (13 - 15marks) Algebra (3 - 5 marks) Geometry (9 - 11marks) Mensuration (7 - 9 marks) Statistics and probability (3 - 5 marks)

Assessment Objectives:

No.	Description of Assessment Objective
AO1	**Demonstrate knowledge and understanding of mathematical ideas, techniques and procedures.**

Students should be able to recall and apply mathematical knowledge, terminology and definitions to carry out routine procedures or straightforward tasks requiring single or multi-step solutions in mathematical or everyday situations. At appropriate class levels this would include:

- working accurately with information presented in words, tables, graphs and diagrams

- using and interpreting mathematical notation correctly

- using a calculator to perform calculations where appropriate

- understanding and using systems of measurement in everyday use

- estimating, approximating and working to appropriate levels of accuracy, and converting between equivalent numerical forms

- using geometrical instruments to measure and to draw to appropriate levels of accuracy

- recognising and using spatial relationships in two and three dimensions

No.	Description of Assessment Objective
AO2	**Apply knowledge and understanding of mathematical ideas, techniques and procedures to classroom and real-world situations.**

Students should be able to reason, interpret and communicate mathematically when solving problems. They should be able to analyse a problem, select a suitable strategy and apply appropriate techniques. At appropriate class levels this would include:

- presenting arguments and chains of reasoning in a logical and structured way

- assessing the validity of an argument

- interpreting and communicating information accurately, and changing from one form of presentation to another

- solving unstructured problems by putting them into a structured form

- recognising patterns in a variety of situations and forming generalisations

- applying combinations of mathematical skills and techniques using connections between different areas of mathematics

- making logical deductions, making inferences and drawing conclusions from given mathematical information, including statistical data

- interpreting results in the context of a given problem

Overall assessment structure:

There are 2 assessments of 1 hour each with 40 marks each.

This will allow a reasonable coverage of both the content of the CBSE syllabus and the NCERT curriculum but ensures that the assessment remains manageable for schools to administer and students to sit without being overly burdensome. Questions will sample content within each broad area of mathematics i.e. number, algebra etc.

Mathematics Class VI

Both papers will be 1 hour and worth 40 marks. Reading time is not specified.

There can be one or two parts per question and the number of marks for a question can be 1, 2, 3 or 4.

Part questions need to stand independently and not use an answer from another part or question, even though they may use the same stimulus, context or diagram.

Question parts will be a and b and numbered as follows:

1 (a)

1 (b)

Each part can be either 1 or 2 marks.

If 1 mark, the mark will be for answer only.

If 2 marks then

• both marks should relate to one and only one assessment content bullet point.

• both marks should relate to one and only one AO

• 1 mark may be allocated to a part answer or method and the second to correct answer only

Question types:

• Multiple choice, single answer from 4 options

• Answer only questions

• Short answer questions with method expected to be shown

The level difficulty is expected to rise through the paper.

The distribution of marks will meet quotas as described above, for Assessment objectives and high level content coverage.

It is expected that, over the two papers:

• marks will be distributed as evenly as possible between content headings and content bullet points (see content structure below)

• a spread of arithmetic operations should be required.

Paper 1

The first paper is for 40 marks and is a non-calculator paper. It will contain some questions that require calculations on real numbers using the four arithmetical operations. All questions testing mental arithmetic should be in this paper. The paper will also contain questions where a calculator is not useful.

The paper will start with 15 multiple choice questions of one mark each. These will have 4 options with one correct answer. A correct answer may be just the letter or an unambiguous version of the text.

These questions will be presented as follows:

For questions 1 to 15, choose the one correct option.

1 This is the question followed by 4 possible answers

    (A) option 1

    (B) option 2

    (C) option 3

    (D) option 4

                                            (1 mark)

2 etc

The remaining 25 marks will be provided by a range of questions.

Paper 2

The second paper, also for 40 marks, will allow the use of a calculator. For some questions a calculator may be required or provide a distinct advantage.

Candidate requirements

- Ruler (in cm), protractor, compass, pencil, eraser and pen

- Formulae are NOT provided

- Calculators are NOT allowed in paper 1

- Calculators are required for some questions in paper 2

Content Structure

Number systems

6N1 Integer properties and operations

- 6N1a Compare integers up to 8 digits using greater than, equal to or less than in words or symbols

- 6N1b Add and subtract positive integers or decimal up to 4 digits

- 6N1c Multiply positive integers up to 3 digits

- 6N1d Divide positive integers up to 3 digits divided by up to 2 digits with an exact answer

- 6N1e Add and subtract negative numbers

- A1a Identify factors and multiples of constant, linear, quadratic and cubic polynomials

6N2 Factors

- 6N2a Number patterns: odd, even, multiples and prime numbers

- 6N2b Highest common factor and lowest common multiple

- 6N2c Prime factors and co-prime numbers

6N3 Fractions, decimals and percentages

- 6N3a Compare decimals up to 4 decimal places and 5 significant digits

- 6N3b Add and subtract positive decimals up to 4 digits

- 6N3c Multiply decimals up to 3 significant figures by positive integers or decimals up to 2 significant digits

- 6N3d Divide decimals up to 3 significant figures by positive integers up to 2 digits
- 6N3e Convert between fractions and decimals
- 6N3f Simplify fractions and identify equivalent fractions
- 6N3g Add and subtract fractions and mixed numbers

6N4 Ratio and proportion

- 6N4a Express two quantities as a ratio in its simplest form
- 6N4b Divide a quantity in a given ratio
- 6N4c Use the unitary method and direct proportion

Algebra

6A1 Expressions

- 6A1a Form and use algebraic expressions (up to 2 variables, including use of brackets)

Geometry

6G1 Shapes

- 6G1a Identify properties of 2D shapes: polygons up to 8 sides, circle, open and closed, regular and irregular
- 6G1b Identify triangles and their properties using given angles or sides: scalene, isosceles, equilateral
- 6G1c Identify quadrilaterals and their properties: square, rectangle, rhombus, trapezium, parallelogram, regular and irregular
- 6G1d Name properties of 3D shapes: angles, edges, vertices and faces
- 6G1e Identify 3D shapes and their properties: sphere, cube, cuboid, cylinder, cone, triangular prism, triangular and square based pyramids

6G2 Angles and lines

- 6G2a Classify angles (acute, right angled, obtuse, reflex)
- 6G2b Estimate angles up to 360^0.
- 6G2c Identify properties of parallel lines

6G3 Symmetry

- 6G3a Identify lines of symmetry of 2D shapes
- 6G3b Construct the mirror image of a shape in a line of reflection

6G4 Construction

- 6G4a Draw and use nets: cube, cuboid, cylinder, cone and tetrahedron
- 6G4b Construct angles up to 36^0 using a protractor
- 6G4c Bisect angles and create angles of 30^0, 45^0, 60^0, 90^0 and 120^0 using ruler and compass

Mensuration

6M1 Perimeter

- M1a Find the perimeter of rectilinear shapes: including faces of 3D shapes

6M2 Area

- M2a Find the area of rectilinear shapes: including faces of 3D shapes

Statistics and probability

6S1 Data collection and organisation

- S1a Organise data: frequency table and tally marks

6S2 Data representation

- S2a Draw and interpret pictographs and bar charts for discrete data

CBSE end of year test assessment specification - Class VII

This document sets out the approach to the assessment for the following subject and class:

Subject	Class
Mathematics	VII

Assessment title	Non-calculator	Calculator
Duration	1 hour	1 hour
Total number of marks	40	40
Percentage AO1	50 -65% (20 – 26 marks)	50 -65% (20 – 26 marks)
Percentage AO2	35 – 50% (14 – 20 marks)	35 – 50% (14 – 20 marks)
High level content coverage	Number systems (15 - 17 marks) Algebra (3 - 5 marks) Geometry (7 - 9 marks) Mensuration (5 - 7 marks) Statistics and probability (5 - 7 marks)	Number systems (15 - 17 marks) Algebra (3 - 5 marks) Geometry (7 - 9 marks) Mensuration (5 - 7 marks) Statistics and probability (5 - 7 marks)

Assessment Objectives:

No.	Description of Assessment Objective
AO1	**Demonstrate knowledge and understanding of mathematical ideas, techniques and procedures.**
	Students should be able to recall and apply mathematical knowledge, terminology and definitions to carry out routine procedures or straightforward tasks requiring single or multi-step solutions in mathematical or everyday situations. At appropriate class levels this would include:
	• working accurately with information presented in words, tables, graphs and diagrams
	• using and interpreting mathematical notation correctly
	• using a calculator to perform calculations where appropriate
	• understanding and using systems of measurement in everyday use
	• estimating, approximating and working to appropriate levels of accuracy, and converting between equivalent numerical forms
	• using geometrical instruments to measure and to draw to appropriate levels of accuracy
	• recognising and using spatial relationships in two and three dimensions
AO2	**Apply knowledge and understanding of mathematical ideas, techniques and procedures to classroom and real-world situations.**
	Students should be able to reason, interpret and communicate mathematically when solving problems. They should be able to analyse a problem, select a suitable strategy and apply appropriate techniques. At appropriate class levels this would include:
	• presenting arguments and chains of reasoning in a logical and structured way
	• assessing the validity of an argument
	• interpreting and communicating information accurately, and changing from one form of presentation to another
	• solving unstructured problems by putting them into a structured form
	• recognising patterns in a variety of situations and forming generalisations
	• applying combinations of mathematical skills and techniques using connections between different areas of mathematics
	• making logical deductions, making inferences and drawing conclusions from given mathematical information, including statistical data
	• interpreting results in the context of a given problem

Overall assessment structure:

There are 2 assessments of 1 hour each with 40 marks each.

This will allow a reasonable coverage of both the content of the CBSE syllabus and the NCERT curriculum but ensures that the assessment remains manageable for schools to administer and students to sit without being overly burdensome. Questions will sample content within each broad area of mathematics i.e. number, algebra etc.

Mathematics Class VII

Both papers will be 1 hour and worth 40 marks. Reading time is not specified.

There can be one or two parts per question and the number of marks for a question can be 1, 2, 3 or 4.

Part questions need to stand independently and not use an answer from another part or question, even though they may use the same stimulus, context or diagram.

Question parts will be a and b and numbered as follows:

1 (a)

1 (b)

Each part can be either 1 or 2 marks.

If 1 mark, the mark will be for answer only.

If 2 marks then

- both marks should relate to one and only one assessment content bullet point.
- both marks should relate to one and only one AO
- 1 mark may be allocated to a part answer or method and the second to correct answer only

Question types:

- Multiple choice, single answer from 4 options
- Answer only questions
- Short answer questions with method expected to be shown

The level difficulty is expected to rise through the paper.

The distribution of marks will meet quotas as described above, for Assessment objectives and high level content coverage.

It is expected that, over the two papers:

- a maximum of 15% of content may be derived from Class VI
- marks will be distributed as evenly as possible between content headings and content bullet points (see content structure below)
- a spread of arithmetic operations should be required.

Paper 1

The first paper is for 40 marks and is a non-calculator paper. It will contain some questions that require calculations on real numbers using the four arithmetical operations. All questions testing mental arithmetic should be in this paper. The paper will also contain questions where a calculator is not useful.

The paper will start with 15 multiple choice questions of one mark each. These will have 4 options with one correct answer.

These questions will be presented as follows:

For questions 1 to 15, choose the one correct option.

1 This is the question followed by 4 possible answers

    (A) option 1

    (B) option 2

    (C) option 3

    (D) option 4

                               (1 mark)

2 etc

The remaining 25 marks will be provided by a range of questions.

Paper 2

The second paper, also for 40 marks, will allow the use of a calculator. For some questions a calculator may be required or provide a distinct advantage.

Candidate requirements

- Ruler (in cm), protractor, compass, pencil, eraser and pen
- Formulae are NOT provided
- Calculators are NOT allowed in paper 1
- Calculators are required for some questions in paper 2

Content Structure

Number systems

7N1 Integer properties and operations

- 7N1a Multiply integers up to 3 digits
- 7N1b Divide integers up to 3 digits divided by up to 2 digits with rational results

7N2 Factors

- 7N2a Express and use numbers with positive integer indices
- 7N2b Apply laws of exponents to positive integers: multiply, divide and powers

7N3 Fractions, decimals and percentages

- 7N3a Multiply rational numbers, including interpreting "of" as multiply
- 7N3b Divide rational numbers
- 7N3c Convert between percentages, fractions and decimals
- 7N3d Calculate a number as a percentage of another, including percentage profit or loss in a single transaction
- 7N3e Calculate using percentages including simple interest: time period in complete years

7N4 Ratio and proportion

- 7N4a Simplify ratios and identify equal ratios or pairs of quantities in the same proportion

Algebra

7A1 Expressions

- 7A1a Simplify, add and subtract algebraic expressions: up to 2 variables, including use of brackets

7A2 Equations

- 7A2a Solve simple linear equations in 1 variable with two operations

Geometry

7G1 Shapes

- 7G1a Identify and use properties of congruent triangles: SSS, SAS, ASA, RHS
- 7G1a Use properties of 3D shapes: angles, edges, vertices, faces and nets: cubes cuboids, cylinders, cones

7G2 Angles and lines

- 7G2a Identify supplementary and complementary angles: adjacent angles, parallel lines with a transversal
- 7G2b Apply the sum of the angles in a triangle and exterior angle properties

7G3 Symmetry

- 7G3a Identify rotational symmetry and line symmetry

7G4 Construction

- 7G4a Construct a parallel line through a point using ruler and compass
- 7G4b Construct a triangle using protractor, ruler and compass
- 7G4c Represent 3-D figures in 2-D showing hidden faces

Mensuration

7M1 Perimeter

- 7M1a Find the perimeter of rectilinear shapes (including faces of 3D shapes)

7M2 Area

- 7M2a Find the area of combinations of rectilinear shapes
- 7M2b Estimate areas of closed, irregular shapes using a grid

7M3 Units

- 7M3a Convert units of length and mass.

Statistics and probability

7S1 Data collection and organisation

- 7S1a Calculate the mean of a set of numbers
- 7S1b Find the median of a set of numbers
- 7S1c Find the mode of a set of numbers, frequency table or graph

7S2 Data representation

- 7S2a Draw and interpret charts for discrete data

7S3 Probability

- 7S3a Estimate likelihood or chance for events in words or as a fraction, decimal or percentage

CBSE end of year test assessment specification - Class VIII

This document sets out the approach to the assessment for the following subject and class:

Subject	Class
Mathematics	VIII

Assessment title	Non-calculator	Calculator
Duration	1 hour	1 hour
Total number of marks	40	40
Percentage AO1	50 -65% (20 – 26 marks)	50 -65% (20 – 26 marks)
Percentage AO2	35 – 50% (14 – 20 marks)	35 – 50% (14 – 20 marks)
High level content coverage	Number systems (13 - 15 marks)	Number systems (13 - 15 marks)
	Algebra (3 - 5 marks)	Algebra (3 - 5 marks)
	Coordinate geometry (3 - 5 marks)	Coordinate geometry (3 - 5 marks)
	Geometry (5 - 7 marks)	Geometry (5 - 7 marks)
	Mensuration (5 - 7 marks)	Mensuration (5 - 7 marks)
	Statistics and probability (5 - 7 marks)	Statistics and probability (5 - 7 marks)

Assessment Objectives:

No.	Description of Assessment Objective
AO1	**Demonstrate knowledge and understanding of mathematical ideas, techniques and procedures.**

Students should be able to recall and apply mathematical knowledge, terminology and definitions to carry out routine procedures or straightforward tasks requiring single or multi-step solutions in mathematical or everyday situations. At appropriate class levels this would include:

- working accurately with information presented in words, tables, graphs and diagrams
- using and interpreting mathematical notation correctly
- using a calculator to perform calculations where appropriate
- understanding and using systems of measurement in everyday use
- estimating, approximating and working to appropriate levels of accuracy, and converting between equivalent numerical forms
- using geometrical instruments to measure and to draw to appropriate levels of accuracy
- recognising and using spatial relationships in two and three dimensions

AO2	**Apply knowledge and understanding of mathematical ideas, techniques and procedures to classroom and real-world situations.**

Students should be able to reason, interpret and communicate mathematically when solving problems. They should be able to analyse a problem, select a suitable strategy and apply appropriate techniques. At appropriate class levels this would include:

- presenting arguments and chains of reasoning in a logical and structured way
- assessing the validity of an argument
- interpreting and communicating information accurately, and changing from one form of presentation to another
- solving unstructured problems by putting them into a structured form
- recognising patterns in a variety of situations and forming generalisations
- applying combinations of mathematical skills and techniques using connections between different areas of mathematics
- making logical deductions, making inferences and drawing conclusions from given mathematical information, including statistical data
- interpreting results in the context of a given problem

Overall assessment structure:

There are 2 assessments of 1 hour each with 40 marks each.

This will allow a reasonable coverage of both the content of the CBSE syllabus and the NCERT curriculum but ensures that the assessment remains manageable for schools to administer and students to sit without being overly burdensome. Questions will sample content within each broad area of mathematics i.e. number, algebra etc.

Assessment details

Mathematics Class VIII

Both papers will be 1 hour and worth 40 marks. Reading time is not specified.

There can be one or two parts per question and the number of marks for a question can be 1, 2, 3 or 4.

Part questions need to stand independently and not use an answer from another part or question, even though they may use the same stimulus, context or diagram.

Question parts will be a and b and numbered as follows:

1 (a)

1 (b)

Each part can be either 1 or 2 marks.

If 1 mark, the mark will be for answer only.

If 2 marks then

- both marks should relate to one and only one assessment content bullet point.
- both marks should relate to one and only one AO
- 1 mark may be allocated to a part answer or method and the second to correct answer only

A small proportion of extended questions involving more than one step may be awarded 3 or 4 marks. In this case:

- marks may relate to more than one assessment content bullet point
- all marks should relate to one and only one AO
- one mark should be allocated to the answer and other marks awarded individually to a part answer or method

Question types:

- Multiple choice, single answer from 4 options
- Answer only questions
- Short answer questions with method expected to be shown

The level difficulty is expected to rise through the paper.

The distribution of marks will meet quotas as described above, for Assessment objectives and high level content coverage.

It is expected that, over the two papers:

- a maximum of 20% of content may be derived from Classes VI and VII
- marks will be distributed as evenly as possible between content headings and content bullet points (see content structure below)
- a spread of arithmetic operations should be required.

Paper 1

The first paper is for 40 marks and is a non-calculator paper. It will contain some questions that require calculations on real numbers using the four arithmetical operations. All questions testing mental arithmetic should be in this paper. The paper will also contain questions where a calculator is not useful.

The paper will start with 15 multiple choice questions of one mark each. These will have 4 options with one correct answer.

These questions will be presented as follows:

For questions 1 to 15, choose the one correct option.

1 This is the question followed by 4 possible answers

   (A) option 1

   (B) option 2

   (C) option 3

   (D) option 4

(1 mark)

2 etc

The remaining 25 marks will be provided by a range of questions.

Paper 2

The second paper, also for 40 marks, will allow the use of a calculator. For some questions a calculator may be required or provide a distinct advantage.

Candidate requirements

- Ruler (in cm), protractor, compass, pencil, eraser and pen
- Formulae are NOT provided
- Calculators are NOT allowed in paper 1
- Calculators are required for some questions in paper 2

Content Structure

Number systems

8N2 Factors

- 8N2a Identify multiples of simple numbers: divisibility by 2, 3, 4, 5, 6, 9 and 10
- 8N2b Find integral powers and roots of positive whole numbers (squares, cubes and square roots and cube roots)

8N3 Fractions, decimals and percentages

- 8N3a Use operations on rational numbers and note patterns
- 8N3b Represent and order rational numbers on a number line
- 8N3c Calculate using percentages, including profit, discount and sales tax
- 8N3d Calculate compound interest using an annual or semi-annual rate and up to 3 time periods

8N4 Ratio and proportion

- 8N4a Use direct and inverse proportion in simple word problems, including time and work contexts.

Algebra

8A1 Expressions

- 8A1a Multiply and divide algebraic expressions (including 2 brackets and up to 2 variables)
- 8A1b Factorise algebraic expressions (including into 2 brackets and up to 2 variables)
- 8A1c Use identities of the types (a±b)(a±b)

8A2 Equations

- 8A2a Form and solve linear equations in one variable

Coordinate geometry

8C1 Graphs

- 8C1a Plot points on a graph using coordinates
- 8C1b Interpret line graphs

Geometry

8G1 Shapes

- 8G1a Identify and use properties of quadrilaterals (square, rectangle, parallelogram, trapezium)
- 8G1b Draw and interpret 2D representations of 3D shapes
- 8G1c Draw and interpret nets (cuboids, cubes, pyramids, prisms)
- 8G1d Apply Euler's relation for polyhedra (Faces+Vertices-Edges=2)

8G2 Angles and lines

- 8G2a Apply the sum of the angles in a quadrilateral
- 8G2b Identify angle properties of parallelograms

8G4 Construction

- 8G4a Construct a quadrilateral using ruler and compass

Mensuration

8M1 Perimeter

- 8M1a Find the circumference of a circle

8M2 Area

- 8M2a Find the area of a trapezium
- 8M2b Find the area of polygons
- 8M2c Find the area of a circle

8M3 Units

- 8M3a Convert between units of volume

8M4 3D shapes, surface area and volume

- 8M4a Find the surface area of cuboids and cylinders
- 8M4b Find the volume of cuboids and cylinders

Statistics and probability

8S1 Data collection and organisation

- 8S1a Represent data in grouped intervals

8S2 Data representation

- 8S2a Draw and interpret bar charts, and pie charts for simple data

8S3 Probability

- 8S3a Estimate probability of an event based on outcomes of equally likely events.

CBSE end of year test assessment specification - Class IX

This document sets out the approach to the assessment for the following subject and class:

Subject	Class
Mathematics	IX

	Paper 1 Non-calculator	Paper 2 Calculator
Duration	30 minutes	1 hour 30 minutes
Total number of marks	20	60
Percentage AO1	40% - 55%	40%-55%
Percentage AO2	45% - 60%	45%-60%
High level content coverage	Number systems (7 - 9 marks)	
	Algebra (16 - 18 marks)	
	Coordinate geometry (3 - 5 marks)	
	Geometry (27 - 29 marks)	
	Mensuration (12 - 14 marks)	
	Statistics and probability (9 - 11 marks)	

Assessment Objectives:

No.	Description of Assessment Objective
AO1	**Demonstrate knowledge and understanding of mathematical ideas, techniques and procedures.**
	Students should be able to recall and apply mathematical knowledge, terminology and definitions to carry out routine procedures or straightforward tasks requiring single or multi-step solutions in mathematical or everyday situations. At appropriate class levels this would include:
	• working accurately with information presented in words, tables, graphs and diagrams
	• using and interpreting mathematical notation correctly
	• using a calculator to perform calculations where appropriate
	• understanding and using systems of measurement in everyday use
	• estimating, approximating and working to appropriate levels of accuracy, and converting between equivalent numerical forms
	• using geometrical instruments to measure and to draw to appropriate levels of accuracy
	• recognising and using spatial relationships in two and three dimensions
AO2	**Apply knowledge and understanding of mathematical ideas, techniques and procedures to classroom and real-world situations.**
	Students should be able to reason, interpret and communicate mathematically when solving problems. They should be able to analyse a problem, select a suitable strategy and apply appropriate techniques. At appropriate class levels this would include:
	• presenting arguments and chains of reasoning in a logical and structured way
	• assessing the validity of an argument
	• interpreting and communicating information accurately, and changing from one form of presentation to another
	• solving unstructured problems by putting them into a structured form
	• recognising patterns in a variety of situations and forming generalisations
	• applying combinations of mathematical skills and techniques using connections between different areas of mathematics
	• making logical deductions, making inferences and drawing conclusions from given mathematical information, including statistical data
	• interpreting results in the context of a given problem

Overall assessment structure:

There will be two assessments to cover the class IX content which will last 2 hours and have 80 marks altogether:

This will allow a reasonable coverage of both the content of the CBSE syllabus and the NCERT curriculum but ensures that the assessment remains manageable for schools to administer and students to sit without being overly burdensome. Questions will sample content within each broad area of mathematics i.e. number, algebra etc.

Assessment details

Question parts will be numbered as follows:

1 (a)

1 (b)

Question types:

- Multiple choice, single answer from 4 options
- Answer only questions
- Short answer questions with method expected to be shown

The level difficulty is expected to rise through the paper.

The distribution of marks will meet quotas as described above, for Assessment objectives and high level content coverage.

It is expected that, over the two papers:

- marks will be distributed as evenly as possible between content headings and content bullet points (see content structure below)
- a spread of arithmetic operations should be required.

Class IX Paper 1

30 minutes, 20 marks, **no calculator allowed**.

Equipment: pen, pencil, rubber, ruler, protractor, compasses, and graph paper.

The paper will consist of approximately 8-10 1 mark questions assessing a single step calculation or recall of mathematical facts, and some longer questions of up to 4 marks. There will be one section in the paper, and questions will be graduated in difficulty with the demand increasing through the paper.

Class IX Paper 2

1 hour 30 minutes, 60 marks, **calculator allowed**.

Equipment: calculator, pen, pencil, rubber, ruler, protractor, compasses, and graph paper.

The paper will consist of approximately 8-10 1 mark questions assessing a single step calculation, and 15-20 longer questions of up to 6 marks. There will be one section in the paper, and questions will be graduated in difficulty with the demand increasing through the paper. A number of questions may be linked together around a common theme of source. Part questions need to stand independently and not use an answer from another part or question, even though they may use the same stimulus, context or diagram.

Content Structure

Some items, in blue, are not required in the period of the Covid-reduced curriculum

Number systems

9N1 Real Numbers

- 9N1a Representation of natural numbers, integers, rational numbers (both terminating and non-terminating recurring decimals) on the number line.

- 9N1b Know that a rational number is a terminating decimal if the only prime factors of the denominator are 2 and / or 5, otherwise it is a recurring decimal.

- 9N1c Know that some numbers such as are not rational

- 9N1d Definition of nth root of a real number: if nth root of x is y then yn= x.

- 9N1e Rationalization (with precise meaning, i.e. that the denominator is an integer) of real numbers of the type   where x and y are natural numbers and a and b are integers.

- 9N1f Laws of exponents to include rational exponents with positive real bases.

Algebra

9A1 Polynomials

- 9A1a Identify factors and multiples of constant, linear, quadratic and cubic polynomials

- 9A1b Use the Remainder and Factor Theorems, including to factorise a cubic polynomial, and to identify zeroes of a polynomial.

- 9A1c Recall of algebraic expressions and identities. Verification of identities:

$$(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$$
$$(x \pm y)^3 = x^3 \pm y^3 \pm 3xy(x \pm y)$$
$$x^3 \pm y^3 = (x \pm y)(x^2 \mp xy + y^2)$$
$$x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$$

and their use in factorization of polynomials.

9A2 Linear equations in two variables

- 9A2a Identify the solutions of a linear equation in two variables (x, y) as a straight line, including where x or y is a constant i.e. the equation has only one variable.

- 9A2b Solve problems from real life, including problems on Ratio and Proportion, using both algebraic and graphical methods.

Coordinate geometry

9C1 The Cartesian plane

- 9C1a Use standard notations and plot points in the plane.

Geometry   - note the introduction to Euclid's Geometry is not for assessment.

9G2 Lines and angles

- 9G2a Identify and calculate with vertically opposite angles when two lines intersect, and corresponding, alternate and interior angles when a transversal intersects two parallel lines.

- 9G2b Be able to prove, and use, the fact that the sum of the angles in a triangle is 1800.

- 9G2c Know and use that if a side of a triangle is produced, the exterior angle so formed is equal to the sum of the two interior opposite angles.

9G3 Triangles

- 9G3a Use the fact that: Two triangles are congruent if any two sides and the included angle of one triangle is equal to any two sides and the included angle of the other triangle (S9S Congruence).

- 9G3b Be able to prove, and to use the fact that: Two triangles are congruent if any two angles and the included side of one triangle is equal to any two angles and the included side of the other triangle (ASA Congruence).

- 9G3c Use the fact that: Two triangles are congruent if the three sides of one triangle are equal to three sides of the other triangle (SSS Congruence).

- 9G3d Use the fact that: Two right triangles are congruent if the hypotenuse and a side of one triangle are equal (respectively) to the hypotenuse and a side of the other triangle. (RHS Congruence)

- 9G3e Be able to prove, and to use the fact that: The angles opposite to equal sides of a triangle are equal.

- 9G3f Use the fact that: The sides opposite to equal angles of a triangle are equal.

- 9G3g Use triangle inequalities and relation between 'angle and facing side' inequalities in triangles.

9G4 Quadrilaterals

- 9G4a Be able to prove, and use the fact that: The diagonal divides a parallelogram into two congruent triangles.

- 9G4b Use the fact that: In a parallelogram opposite sides are equal, and conversely.

- 9G4c Use the fact that: In a parallelogram opposite angles are equal, and conversely.

- 9G4d Use the fact that: A quadrilateral is a parallelogram if a pair of its opposite sides is parallel and equal.

- 9G4e Use the fact that: In a parallelogram, the diagonals bisect each other and conversely.

- 9G4f Use the fact that: In a triangle, the line segment joining the mid points of any two sides is parallel to the third side and in half of it and (motivate) its converse.

9G5 Area

- 9G5a Be able to prove, and use the fact that: Parallelograms on the same base and between the same parallels have equal area.

- 9G5b Use the fact that: Triangles on the same base (or equal bases) and between the same parallels are equal in area.

9G6 Circles

- 9G6a Be able to prove, and use the fact that: Equal chords of a circle subtend equal angles at the center, and be able to use its converse.

- 9G6b Be able to use the fact that: The perpendicular from the center of a circle to a chord bisects the chord and conversely, the line drawn through the center of a circle to bisect a chord is perpendicular to the chord.

- 9G6c Be able to use the fact that: There is one and only one circle passing through three given non-collinear points.

- 9G6d Be able to use the fact that: Equal chords of a circle (or of congruent circles) are equidistant from the center (or their respective centers) and conversely.

- 9G6e Be able to prove, and use the fact that: The angle subtended by an arc at the center is double the angle subtended by it at any point on the remaining part of the circle.

- 9G6f Be able to use the fact that: Angles in the same segment of a circle are equal.

- 9G6g Be able to use the fact that: If a line segment joining two points subtends equal angle at two other points lying on the same side of the line containing the segment, the four points lie on a circle.

- 9G6h (Be able to use the fact that: The sum of either of the pair of the opposite angles of a cyclic quadrilateral is 180° and its converse.

9G7 Constructions

- 9G7a Construction of bisectors of line segments and angles of measure 60o, 90o, 45o etc., equilateral triangles.

- 9G7b Construction of a triangle given its base, sum/difference of the other two sides and one base angle.

- 9G7c Construction of a triangle of given perimeter and base angles.

Mensuration

9M1 Areas

- 9M1a Calculate the area of a triangle using Heron's formula (without proof) and its application in finding the area of a quadrilateral.

9M2 Surface areas and volumes

- 9M2a Calculate the surface areas and volumes of cubes, cuboids, spheres (including hemispheres) and right circular cylinders/cones.

Statistics and probability

9S1 Statistics

- 9S1a Collection of data

- 9S1b Presentation of data — construct and interpret bar graphs, histograms (with varying base lengths), frequency polygons for data given in various forms: ungrouped / grouped data in list or tables.

- 9S1c Calculate mean, median and mode of ungrouped data.

S2 Probability

- 9S2a Calculate estimates of probabilities based on observed frequency of outcomes.

CBSE end of year test assessment specification - Class X

This document sets out the approach to the assessment for the following subject and class:

Subject	Class
Mathematics	X

Assessment title	Paper 1 Non-calculator	Paper 2 Calculator
Duration	30 minutes	1 hour 30 minutes
Total number of marks	20	60
Percentage AO1	40% - 55%	40% - 55%
Percentage AO2	40% - 55%	40% - 55%
High level content coverage	Number systems (5 - 7 marks)	
	Algebra (19 - 21 marks)	
	Coordinate geometry (5 - 7 marks)	
	Geometry (14 - 16 marks)	
	Trigonometry (11 – 13 marks)	
	Mensuration (9 - 11 marks)	
	Statistics and probability (10 - 12 marks)	

Assessment Objectives:

No.	Description of Assessment Objective
AO1	**Demonstrate knowledge and understanding of mathematical ideas, techniques and procedures.**

Students should be able to recall and apply mathematical knowledge, terminology and definitions to carry out routine procedures or straightforward tasks requiring single or multi-step solutions in mathematical or everyday situations. At appropriate class levels this would include:

- working accurately with information presented in words, tables, graphs and diagrams
- using and interpreting mathematical notation correctly
- using a calculator to perform calculations where appropriate
- understanding and using systems of measurement in everyday use
- estimating, approximating and working to appropriate levels of accuracy, and converting between equivalent numerical forms
- using geometrical instruments to measure and to draw to appropriate levels of accuracy
- recognising and using spatial relationships in two and three dimensions

AO2	**Apply knowledge and understanding of mathematical ideas, techniques and procedures to classroom and real-world situations.**

Students should be able to reason, interpret and communicate mathematically when solving problems. They should be able to analyse a problem, select a suitable strategy and apply appropriate techniques. At appropriate class levels this would include:

- presenting arguments and chains of reasoning in a logical and structured way
- assessing the validity of an argument
- interpreting and communicating information accurately, and changing from one form of presentation to another
- solving unstructured problems by putting them into a structured form
- recognising patterns in a variety of situations and forming generalisations
- applying combinations of mathematical skills and techniques using connections between different areas of mathematics
- making logical deductions, making inferences and drawing conclusions from given mathematical information, including statistical data
- interpreting results in the context of a given problem

Overall assessment structure:

There will be two assessments to cover the class IX content which will last 2 hours and have 80 marks altogether:

This will allow a reasonable coverage of both the content of the CBSE syllabus and the NCERT curriculum but ensures that the assessment remains manageable for schools to administer and students to sit without being overly burdensome. The separate assessment content structure document for year IX lists detailed content assessment statements within each of the topics listed above. Questions will sample content within each broad area of mathematics i.e. number, algebra etc.

Assessment details

Question parts will be numbered as follows:

1 (a)

1 (b)

Question types:

- Multiple choice, single answer from 4 options
- Answer only questions
- Short answer questions with method expected to be shown

The level difficulty is expected to rise through the paper.

The distribution of marks will meet quotas as described above, for Assessment objectives and high level content coverage.

It is expected that, over the two papers:

- marks will be distributed as evenly as possible between content headings and content bullet points (see content structure below)
- a spread of arithmetic operations should be required.

Year X Paper 1

30 minutes, 20 marks, **no calculator allowed**.

Equipment: pen, pencil, rubber, ruler, protractor, compasses, and graph paper.

The paper will consist of approximately 8-10 1 mark questions assessing a single step calculation or recall of mathematical facts, and some longer questions of up to 4 marks. There will be one section in the paper, and questions will be graduated in difficulty with the demand increasing through the paper.

Year X Paper 2

1 hour 30 minutes, 60 marks, calculator allowed.

Equipment: calculator, pen, pencil, rubber, ruler, protractor, compasses, and graph paper.

The paper will consist of approximately 8-10 1 mark questions assessing a single step calculation, and 15-20 longer questions of up to 6 marks. There will be one section in the paper, and questions will be graduated in difficulty with the demand increasing through the paper. A number of questions may be linked together around a common theme of source. Part questions need to stand independently and not use an answer from another part or question, even though they may use the same stimulus, context or diagram.

Content Structure

Some items, in yellow, are not required in the period of the Covid-reduced curriculum

Number systems

10N1 Real Numbers

- 10N1a Use the Fundamental theorem of Arithmetic to find the (unique) prime factorisation of numbers
- 10N1b Use Euclid's division lemma (for $a = bq + r$) to find q and r given a and b.
- 10N1c   Apply 10N1a and 10N1b to solve problems related to real life contexts.
- 10N1d Prove that a decimal which is not recurring or terminating can not be a rational number.

Algebra

10A1 Polynomials

- 10A1a Use the relationship between zeros and coefficients of quadratic polynomials.
- 10A1b Use the division algorithm for polynomials with real coefficients, with the divisor no more than quadratic and the polynomial to be divided no higher than quartic (order 4)

10A2 Linear equations in two variables

- 10A2a Identify graphically the solutions of a pair of linear equations in two variables, including where the equations are inconsistent (parallel lines).
- 10A2b Solve a pair of linear equations in two variables using algebraic methods: by substitution, by elimination and by cross multiplication.
- 10A2c Solve problems from real life where a pair of linear equations occur.
- 10A2d Solve simple problems on equations which are reducible to linear equations.

10A3 Quadratic equations

- 10A3a Solve quadratic equations by factorisation and by using the quadratic formula (where roots are real).
- 10A3b Know and use the relationship between the discriminant and the nature of the roots.
- 10A3c Solve problems from real life where a quadratic equation occurs.

10A4 Arithmetic progressions

- 10A4a Be able to calculate the nth term and the sum of the first n terms of an Arithmetic Progression

- 10A4b Be able to identify and use Arithmetic Progressions in solving daily life problems.

Geometry

10G1 Triangles

- 10G1a Be able to prove, and to use the fact that: If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

- 10G1b Use the fact that: If a line divides two sides of a triangle in the same ratio, the line is parallel to the third side.

- 10G1 c Use the fact that: If in two triangles, the corresponding angles are equal, their corresponding sides are proportional and the triangles are similar.

- 10G1 d Use the fact that: If the corresponding sides of two triangles are proportional, their corresponding angles are equal and the two triangles are similar.

- 10G1 e Use the fact that: If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional, the two triangles are similar.

- 10G1 f Use the fact that: If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, the triangles on each side of the perpendicular are similar to the whole triangle and to each other.

- 10G1 g Be able to prove, and to use the fact that: The ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides.

- 10G1 h Be able to prove, and to use the fact that: In a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.

- 10G1 i Be able to prove, and to use the fact that: In a triangle, if the square on one side is equal to sum of the squares on the other two sides, the angles opposite to the first side is a right angle.

10G2 Circles

- 10G2a Be able to prove, and use the fact that: The tangent at any point of a circle is perpendicular to the radius through the point of contact.

- 10G2b Be able to prove, and use the fact that: The lengths of tangents drawn from an external point to a circle are equal.

10G3 Constructions

- 10G3a Construct the division of a line segment in a given ratio (internally).

- 10G3b Construct the tangents to a circle from a point outside it.

- 10G3c Construction of a triangle similar to a given triangle.

Trigonometry

10T1 Introduction to trigonometry

- 10T1a Calculate and use the trigonometric ratios of an acute angle of a right angled triangle.

- 10T1b Know and use the values of the trigonometric ratios of 300, 450 and 600, and of 00 and 900 where they are defined.

- 10T1c Know and use the relationships between the ratios.

10T2 Trigonometric identities

- 10T2a Be able to prove, and to use the identity $\sin^2 A + \cos^2 A = 1$

- 10T2b Know and use trigonometric ratios of complementary angles.

10T3 Heights and distances, angles of elevation and depression

- 10T3a Simple problems on heights and distances. Problems should not involve more than two right triangles. Angles of elevation or depression should be only 30°, 45°, 60°.

Mensuration

10M1 Areas related to circles

- 10M1a Calculate the area of sectors and segments of circles (in calculating segments, problems should be restricted to central angle of 60^0, 90^0 and 120^0 only).
- 10M1b Solve problems based on areas and perimeter / circumference of plane figures involving triangles, simple quadrilaterals and circles.

10M2 Surface areas and volumes

- 10M2a Calculate the surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres and right circular cylinders/cones, and the frustrum of a cone.
- 10M2b Problems involving converting one type of metallic solid into another and other mixed problems. (Problems with combination of not more than two different solids).

Statistics and probability

10S1 Statistics

- 10S1a Calculate mean, median and mode of grouped data (bimodal situation to be avoided).
- 10S1b Presentation of data — cumulative frequency graphs.

10S2 Probability

- 10S2a Calculate probabilities based on scenarios involving equally likely outcomes.
- 10S2b Calculate probabilities of an event in simple problems.

CBSE tests learning ladder – Maths

This document sets out the learning ladder for the end of year CBSE assessments based on the relevant NCERT curriculum documents and the relevant CBSE Syllabus. The assessment content will set out what content can appear in the assessments.

Some items, in yellow in class IX and X, are not required in the period of the Covid-reduced curriculum

AO coverage

NCERT Pedagogical process	NCERT Learning outcome / CBSE Syllabus topic	Assessment content	Notes
Class VI *The learner may be provided opportunities in pairs/groups/ individually and encouraged to —* • encounter situations having numbers up to 8 digits, e.g., cost of property, total population of different towns, etc. • compare numbers through situations like cost of two houses, number of spectators, money transactions, etc.	*The learner —* • solves problems involving large numbers by applying appropriate operations (addition, subtraction, multiplication and division)	6N1a Compare integers up to 8 digits using greater than, equal to or less than in words or symbols 6N1b Add and subtract positive integers or decimals up to 4 digits 6N1c Multiply positive integers up to 3 digits 6N1d Divide positive integers up to 3 digits divided by up to 2 digits with an exact answer 6N3a Compare decimals up to 4 decimal places and 5 significant digits 6N3b Add and subtract positive decimals up to 4 digits 6N3c Multiply decimals up to 3 significant figures by positive integers or decimals up to 2 significant digits 6N3d Divide decimals up to 3 significant figures by positive integers up to 2 digits	

• classify numbers on the basis of their properties like even, odd, etc. • observe patterns that lead to divisibility by 2,3,4,5,6,8,10 and 11.	• recognises and appreciates (through patterns) the broad classification of numbers as even, odd, prime, co-prime, etc.	6N2a Number patterns: odd, even, multiples and prime numbers 6N2c Prime factors and co-prime numbers
• create number patterns through which HCF and LCM can be discussed • explore daily life situations to involve the use of HCF and LCM0	• applies HCF or LCM in a particular situation	6N2b Highest common factor and lowest common multiple
• create and discuss daily life situations involving the use of negative numbers	• solves problem involving addition and subtraction of integers.	6N1e Addition and subtraction of negative numbers
• observe situations that require the representation by fractions and decimals	• uses fractions and decimals in different situations which involve money, length, temperature etc. For example, 7½ metres of cloth. distance between two places is 112.5 km etc. • solves problems on daily life situations involving addition and subtraction of fractions / decimals	6N3e Convert between fractions and decimals 6N3f Simplify fractions and identify equivalent fractions 6N3g Add and subtract fractions and mixed numbers
• use different contexts in mathematics to appreciate the necessity of representing unknowns by variables (alphabet) • explore and generalise the need of using variables alphabets	• uses variable with different operations to generalise a given situation. e.g., Perimeter of a rectangle with sides x units and 3 units is 2(x+3) units	6A1a Form and use algebraic expressions up to 2 variables, including use of brackets
• describe situations involving the need for comparing quantities by taking ratio • discuss and solves word problems that use ratios and unitary method	• compares quantities using ratios in different situations. e.g., the ratio of girls to boys in a particular class in 3:2 • uses unitary method in solving various word problems. For example, if the cost of a dozen notebooks is given, she finds the cost of 7 notebooks by first finding the cost of 1 notebook	6N4a Express two quantities as a ratio in its simplest form 6N4b Divide a quantity in a given ratio 6N4c Use the unitary method and direct proportion

• share the concept of angles through some examples like opening the door, opening the pencil box, etc. Students can be asked to give more such examples from the surroundings • classify angles based on the amount of rotation	• demonstrates an understanding of angles by–identifying examples of angles in the surroundings–classifying angles according to their measure–estimating the measure of angles using 45°, 90°, and 180° as reference angles	6G2a Classify angles: acute, right angled, obtuse, reflex 6G2b Estimate angles up to 360°.
• explore various shapes through concrete models and pictures of different geometrical shapes like triangles and quadrilaterals, etc. • identify various geometrical figures and observe their characteristics in and outside the classroom environment either individually or in groups • make different shapes with the help of available materials like sticks, paper cutting, etc.	• describes geometrical ideas like line, line segment, open and closed figures, angle, triangle, quadrilateral, circle, etc., with the help of examples in surroundings • demonstrates an understanding of line symmetry by–identifying symmetrical 2-Dimensional (2-D) shapes which are symmetrical along one or more lines–creating symmetrical 2-D shapes • classifies triangles into different groups/types on the basis of their angles and sides. For example- scalene, isosceles or equilateral on the basis of sides, etc. • classifies quadrilaterals into different groups/ types on the basis of their sides/angles	6G1a Identify properties of 2D shapes: polygons up to 8 sides, circle, open and closed, regular and irregular 6G1b Identify triangles and their properties using given angles or sides.: scalene, isosceles, equilateral 6G1c Identify quadrilaterals and their properties: square, rectangle, rhombus, trapezium, parallelogram, regular and irregular 6G2c Identify properties of parallel lines 6G3a Identify lines of symmetry of 2D shapes 6G3b Construct the mirror image of a shape in a line of reflection

• observe various models and nets of 3-Dimensional (3-D) shapes like cuboid, cylinder, etc. and discuss about the elements of 3-D figures such as faces, edges and vertices	• identifies various (3-D) objects like sphere, cube, cuboid, cylinder, cone from the surroundings • describes and provides examples of edges, vertices and faces of 3-D objects • finds out the perimeter and area of rectangular objects in the surroundings like floor of the classroom, surfaces of a chalk box etc	6G1d Name properties of 3D shapes: angles, edges, vertices and faces 6G1e Identify 3D shapes and their properties: sphere, cube, cuboid, cylinder, cone, triangular prism, triangular and square based pyramids 6G4a Draw and use nets: cube, cuboid, cylinder, cone and tetrahedron
	• finds out the perimeter and area of rectangular objects in the surroundings like floor of the classroom, surfaces of a chalk box etc	6M1a Find the perimeter of rectilinear shapes: including faces of 3D shapes 6M2a Find the area of rectilinear shapes: including faces of 3D shapes
	• arranges given/ collected information such as expenditure on different items in a family in the last six months, in the form of table, pictograph and bar graph and interprets them.	6S1a Organise data: frequency table and tally marks 6S2a Draw and interpret pictographs and bar charts for discrete data
		6G4b Construct angles up to 360 using a protractor 6G4c Bisect angles and create angles of 30°, 45°, 60°, 90° and 120° using ruler and compass

Class VII

The learner may be provided opportunities in pairs/groups/ individually and encouraged to—

- provide contexts for exploring the rules of multiplication and division of integers. This can be done through number line or number patterns. For example: a positive integer multiplied by a negative integer gives a negative integer.

- explore the multiplication/ division of fractions/decimals through pictures/paper folding activities /daily life examples
  For example: (a) ¼ x ½ is ¼ of ½ and

number of ¼ in ½ are two

(b) ½ ÷ ¼
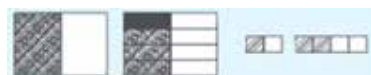
- discuss the situations that require the use of numbers in opposite direction, such as moving 1102 m to the right of a tree and 2153m to its left etc.

- involve children in exploring how repeated multiplication of numbers can be expressed in short form. For example 2×2×2×2×2×2= can be expressed as 2^6

The learner—

- multiplies/divides two integers

- interprets the division and multiplication of fractions.

- for example interprets x as of
  Also ½ ÷ ¼ is interpreted as how many ¼ make ½?

- uses algorithms to multiply and divide fractions/decimals.

- solves problems related to daily life situations involving rational numbers

- uses exponential form of numbers to simplify problems involving multiplication and division of large numbers.

7N1a Multiply integers up to 3 digits

7N1d Divide integers up to 3 digits divided by up to 2 digits with rational results

7N3a Multiply proper fractions, including interpreting "of" as multiply

7N3b Divide proper fractions

7N2a Express and use numbers with positive integer indices

7N2b Apply laws of exponents to positive integers: multiply, divide and powers

• provide situations from daily life that lead to setting up of equations and choosing the appropriate value of the variable that equate both sides • explore the possible combinations of variables and constants using different operations to form algebraic expressions in various contexts • conduct activity of adding /subtracting number of objects of same category from daily life. For example number of notebooks obtained when 3 notebooks are added to a group of 5 notebooks	• represents daily life situations in the form of a simple equation and solves it • adds/subtracts algebraic expressions	7A1a Simplify, add and subtract algebraic expressions: up to 2 variables, including use of brackets 7A2a Solve simple linear equations in 1 variable with up to two operations
• evolve the understanding of the concepts of ratios and percentage (equality of ratio.) • provide daily life situations based on profit/loss and simple interest that show the use of percentage	• solves problems related to conversion of percentage to fraction and decimal and vice versa • calculates profit/loss percent and rate percent in simple interest • distinguishes quantities that are in proportion. For example, tells that 15, 45 and 40, 120 are in the same proportion	7N3c Convert between percentages, fractions and decimals 7N3d Calculate a number as a percentage of another, including percentage profit or loss in a single transaction 7N3e Calculate using percentages including simple interest: time period in complete years 7N4a Simplify ratios and identify equal ratios or pairs of quantities in the same proportion

• explore different examples from daily life in which pair of angles are involved with a common vertex, e.g., Scissors, Road Junction, Letter X, T, etc. • verify the properties of various pairs of angles by drawing diagram (One group can give measure of one angle, the other group needs to give the measure of other angle.) • visualise the relationship between various pairs of angles when a transversal cuts two lines (parallel and non-parallel), angles of triangle and relationship among its sides through diagrams and upper primary mathematics kit (developed by NCERT)	• classifies pairs of angles based on their properties as linear, supplementary, complementary, adjacent and vertically opposite and finds value of the one when the other is given. • verifies the properties of various pairs of angles formed when a transversal cuts two lines	7G2a Identify supplementary and complementary angles: adjacent angles, parallel lines with a transversal
• draw different types of triangles, ask them to measure angles of all triangles, and verify • explore exterior angle property of triangles; and Pythagoras theorem • sum of two sides of a triangle is greater than the third side.	• finds unknown angle of a triangle when its two angles are known	7G2b Apply the sum of the angles in a triangle and exterior angle properties
• identify symmetrical figures from their environment and which shows rotational symmetry • visualise the symmetry through paper folding activities		7G3a Identify rotational symmetry and line symmetry
• establish congruence criterion and later on verify the property by superimposing one above the other	• explains congruency of triangles on the basis of the information given about them like (SSS, SAS, ASA, RHS)	7G1a Identify and use properties of congruent triangles: SSS, SAS, ASA, RHS

• demonstrate the construction of a line parallel to the given line from a point outside it through student's active participation • construct the simple triangle by using ruler and compasses	• using ruler and a pair of compasses constructs, a line parallel to a given line from a point outside it and triangles	7G1a Use properties of 3D shapes: angles, edges, vertices, faces and nets: cubes cuboids, cylinders, cones 7G4c Represent 3-D figures in 2-D showing hidden faces
• cut out different closed figures drawn on hard boards/ thick papers. Trace the figures in the given graph sheets • count the exact number of square units occupied by the traced figure (Complete, Half, etc.), and find out the approximate area of these figures	• finds out approximate area of closed shapes by using unit square grid/ graph sheet	7M2b Estimate areas of a closed, irregular shape using a grid
• through discussion motivate them to arrive at the formula for area of a rectangle/square	• calculates areas of the regions enclosed in a rectangle and a square	7M2a Find the area of combinations of rectilinear shapes
• find a representative value of data i.e. mean, mode or median of ungrouped data. Encourage them to arrange it in a tabular form and represent it by bar graphs	• finds various representative values for simple data from her/his daily life contexts like mean, median and mode	7M4a Convert units of length and mass.
		7S1a Calculate the mean of a set of numbers 7S1b Find the median of a set of numbers 7S1c Find the mode of a set of numbers, frequency table or graph
• draw inferences for future events from the existing data	• interprets data using bar graph such as consumption of electricity is more in winters than summer, runs scored by a team in first 10 overs etc.	7S2a Draw and interpret charts for discrete data

• discuss the situations where the term 'chance' can be used, for example, what are the chances of winning today as chances of getting 6 while rolling a dice	• recognises variability in real life situations, such as, variations in the height of students in her class and uncertainty in happening of events like throwing a coin	7S3a Estimate likelihood or chance for events in words or as a fraction, decimal or percentage

Class VIII

The learner may be provided opportunities in pairs/groups/ individually and encouraged to — • explore examples of rational numbers with all the operations and explore patterns in these operations	*The learner —* • generalises properties of addition, subtraction, multiplication and division of rational numbers through patterns • finds out as many rational numbers as possible between two given rational numbers.	8N3a Use operations on rational numbers and note patterns 8N3b Represent rational numbers on a number line
• use generalised form of numbers up to 3 digits and uses her understanding of algebra to derive the divisibility rules for 2, 3, 4 …. done earlier by observing patterns on them	• proves divisibility rules of 2, 3,4, 5, 6, 9 and 11	8N2a Identify multiples of simple numbers: divisibility by 2, 3, 4, 5, 6, 9 and 10
• explore patterns in square numbers, square roots, cubes and cube roots of numbers and form rules for exponents as integer	• finds squares, cubes and square roots and cube roots of numbers using different methods. • solves problems with integral exponents.	8N2b Find integral powers and roots of positive whole numbers (squares, cubes and square roots and cube roots)
• observe situations that lead to simple equations and solve them using suitable processes	• solves puzzles and daily life problems using variables.	8A2a Form and solve linear equations in one variable
• multiply two algebraic expressions and different polynomials based on previous knowledge of distributive property of numbers and generalise various algebraic identities using concrete examples	• multiplies algebraic expressions. • e.g. expand	8A1a Multiply and divide algebraic expressions including 2 brackets and up to 2 variables 8A1c Use identities of the types

• factorise algebraic expressions using relevant activities based on previous knowledge of factorising two numbers	• uses various algebraic identities in solving problems of daily life	8A1b Factorise algebraic expressions, including into 2 brackets and up to 2 variables
• observe contexts that involve the use of percentages like discount, profit & loss, VAT, simple and compound interest, etc. • generalise the formula of compound interests through repeated use of simple interest	• applies the concept of per cent in profit and loss situation in finding discount, VAT and compound interest. E.g., calculates discount per cent when marked price and actual discount are given or finds profit per cent when cost price and profit in a transaction are given.	8N3c Calculate using percentages, including profit, discount and sales tax 8N3d Calculate compound interest using an annual or semi-annual rate and up to 3 time periods
• observe situations where one quantity depends on the other. The quantities increase together, or in which while one increases the other decreases. For example, as the speed of a vehicle increases the time taken by it to cover the distance decreases.	• Solves problems based on direct and inverse proportions	8N4a Use direct and inverse proportion
• measure the angles and sides of different quadrilaterals and identify patterns in the relationship among them, make hypothesis on the basis of generalisation of the patterns and later on verify through examples	• Solves problems related to angles of a quadrilateral using angle sum property	8G1a Identify and use properties of quadrilaterals: square, rectangle, parallelogram, trapezium 8G2a Apply the sum of the angles in a quadrilateral

• verify the properties of parallelograms and apply reasoning by doing activities such as constructing parallelograms, drawing their diagonals and measuring their sides and angles • express/represent a 3-D shape into its 2-D form from their daily life like, drawing a box on a plane surface, showing bottles on paper, board or wall etc. • make nets of various shapes like cuboids, cubes, pyramids, prisms, etc. and from nets make the shapes and establish relationship among vertices, edges and surfaces	• verifies properties of parallelograms and establishes the relationship between them through reasoning. • represents 3D shapes on a plane surface such as sheet of paper, black board etc.	8G2b Identify angle properties of parallelograms 8G1b Draw and interpret 2D representations of 3D shapes 8G1c Draw and interpret nets (cuboids, cubes, pyramids, prisms	
	• verifies Euler's relation through pattern	8G1d Apply Euler's relation for polyhedra ()	Should the 5 Platonic solids be mentioned specifically?
• demonstrate the construction of various quadrilaterals using geometric kit	• constructs different quadrilaterals using compasses and straight edge.	8G4a Construct a quadrilateral using ruler and compass	
• sketch the figure of trapezium and other polygons in the given graph paper and asked student to estimate their areas using counting of unit square • derive the formula for calculating area of trapezium using the areas of triangle and rectangle (square)	• estimates the area of shapes like trapezium and other polygons by using square grid/graph sheet and verifies using formulas.	8M2a Find the area of a trapezium	

• identify that surfaces of various 3-D objects like cubes, cuboids and cylinder • derive formulae for surface area of cubes and cuboids using the formulae for areas of rectangles, squares and circles	• finds the area of a polygon.	8M1a Find the circumference of a circle 8M2b Find the area of polygons
• demonstrate to find volume of a given cube and cuboid using unit cubes	• finds surface area and volume of cuboidal and cylindrical object.	8M2c Find the area of a circle 8M3a Find the surface area of cuboids and cylinders 8M3b Find the volume of cuboids and cylinders
• collect data, organise it into groups and represent it into bar graphs/ pie chart	• draws and interprets bar charts and pie charts.	8S1a Represent data in grouped intervals 8S2a Draw and interpret bar charts and pie charts for discrete data
• conduct activities related to throwing a large number of identical dice/coins together and aggregating the result of the throws to get a large number of individual events and make assumptions for future events on the basis of the above data.	• makes hypotheses on chances of future events on the basis of its earlier occurrences or available data like, after repeated throws of dice and coins	8S3a Estimate probability of an event based on outcomes of equally likely events
		8C1a Plot points on a graph using coordinates 8C1b Interpret line graphs

Some items, in yellow, are not required in the period of the Covid-reduced curriculum

NCERT Pedagogical process	NCERT Learning outcome / CBSE Syllabus topic	Assessment content	Notes – AOs, question types etc.
Class IX *The learners may be provided with opportunities individually or in groups and encouraged to —* • work with real numbers and consolidate the concepts of numbers learnt in earlier classes. Some such opportunities could be: to observe and discuss real numbers. to recall and observe the processes involved in different mathematical concepts studied earlier and find situations in which they come across irrational numbers. For example, finding the length of the diagonal of a square with side, say, 2 units or area of a circle with a given radius, etc. • To observe the properties of different types of numbers, such as, the denseness of the numbers, by devising different methods based on the knowledge of numbers gained in earlier classes. One of them could be by representing them on the number line. • To facilitate in making mental estimations in different situations, such as, arranging numbers like 2, $2^{1/2}$, $2^{3/2}$, $2^{5/2}$, etc., in ascending (or descending) order (in a given time frame for mental mathematics) or telling between which two integers the numbers like, $\sqrt{17}$, $\sqrt{23}$, $\sqrt{59}$, $-\sqrt{2}$, etc., lie.	*The learner —* • applies logical reasoning in classifying real numbers, proving their properties and using them in different situations.	Number systems 9N1 Real Numbers • 9N1a Representation of natural numbers, integers, rational numbers (both terminating and non-terminating recurring decimals) on the number line. • 9N1b Know that a rational number is a terminating decimal if the only prime factors of the denominator are 2 and / or 5, otherwise it is a recurring decimal. • 9N1c Know that some numbers such as $\sqrt{2}$, $\sqrt{3}$ are not rational • 9N1d Definition of nth root of a real number: if nth root of x is y then $y^n = x$. • 9N1e Rationalization (with precise meaning, i.e. that the denominator is an integer) of real numbers of the type • $\frac{1}{a + b - \sqrt{x}}$ and $\frac{1}{\sqrt{x} + \sqrt{y}}$ where x and y are natural numbers and a and b are integers. • 9N1f Laws of exponents to include rational exponents with positive real bases.	

• apply relevant results to factorise the polynomials.	• identifies/classifies polynomials among algebraic expressions and factorises them by applying appropriate algebraic identities.	**Algebra** **9A1 Polynomials** • 9A1a Identify factors and multiples of constant, linear, quadratic and cubic polynomials • 9A1b Use the Remainder and Factor Theorems, including to factorise a cubic polynomial, and to identify zeroes of a polynomial. • 9A1c Recall of algebraic expressions and identities. Verification of identities: $(x+y+z)2 = x2 + y2 + z2$ $2xy+2yz+2zx$ $(x\pm y)3 = x3 \pm y3 \pm 3xy\,(x \pm y)$ $x2 \pm y2 = (x \pm y)\,(x2 \pm xy + y2)$ $x3 + y3 + z3 -3xyz = (x+y+z)(x2 + y2 + z2-xy-yz-zx)$ and their use in factorization of polynomials.	Note that the last of these identities is not required in the Covid curriculum
• draw and compare the graphs of linear equations in one or two variables.	• relates the algebraic and graphical representations of a linear equation in one or two variables and applies the concept to daily life situations.	**9A2 Linear equations in two variables** • 9A2a Identify the solutions of a linear equation in two variables (x, y) as a straight line, including where x or y is a constant i.e. the equation has only one variable. • 9A2b Solve problems from real life, including problems on Ratio and Proportion, using both algebraic and graphical methods.	

- discuss the proofs of mathematical statements using axioms and postulates.

- derives proofs of mathematical statements particularly related to geometrical concepts, like parallel lines, triangles, quadrilaterals, circles, etc., by applying axiomatic approach and solves problems using them.

Geometry - note the introduction to Euclid's Geometry is not for assessment.

9G2 Lines and angles

- 9G2a Identify and calculate with vertically opposite angles when two lines intersect, and corresponding, alternate and interior angles when a transversal intersects two parallel lines.

- 9G2b Be able to prove, and use the fact that the sum of the angles in a triangle is 180^0.

- 9G2c Know and use that if a side of a triangle is produced, the exterior angle so formed is equal to the sum of the two interior opposite angles.

9G3 Triangles

- 9G3a Use the fact that: Two triangles are congruent if any two sides and the included angle of one triangle is equal to any two sides and the included angle of the other triangle (SAS Congruence).

- play the following games related to geometry

  for Euclid's axioms, if one group says, if equals are added to equals, then the results are equal. The other group may be encouraged to provide example such as, if a = b, then a + 3 = b + 3, another group may extend it further as a + 3 + 5 = b + 3 + 5, and so on.

  By observing different objects in the surroundings one group may find the similarities and the other group may find the differences with reference to different geometrical shapes — lines, rays, angles, parallel lines, perpendicular lines, congruent shapes, non-congruent shapes, etc., and justify their findings logically.

- identifies similarities and differences among different geometrical shapes.

- 9G3b Be able to prove, and to use the fact that: Two triangles are congruent if any two angles and the included side of one triangle is equal to any two angles and the included side of the other triangle (ASA Congruence).

- 9G3c Use the fact that: Two triangles are congruent if the three sides of one triangle are equal to three sides of the other triangle (SSS Congruence).

- 9G3d Use the fact that: Two right triangles are congruent if the hypotenuse and a side of one triangle are equal (respectively) to the hypotenuse and a side of the other triangle. (RHS Congruence)

- 9G3e Be able to prove, and to use the fact that: The angles opposite to equal sides of a triangle are equal.

- 9G3f Use the fact that: The sides opposite to equal angles of a triangle are equal.

- 9G3g Use triangle inequalities and relation between 'angle and facing side' inequalities in triangles.

9G4 Quadrilaterals

- 9G4a Be able to prove, and use the fact that: The diagonal divides a parallelogram into two congruent triangles.

- 9G4b Use the fact that: In a parallelogram opposite sides are equal, and conversely.

- 9G4c Use the fact that: In a parallelogram opposite angles are equal, and conversely.

- 9G4d Use the fact that: A quadrilateral is a parallelogram if a pair of its opposite sides is parallel and equal.

- 9G4e Use the fact that: In a parallelogram, the diagonals bisect each other and conversely.

- 9G4f Use the fact that: In a triangle, the line segment joining the mid points of any two sides is parallel to the third side and in half of it and (motivate) its converse.

9G6 Circles

- 9G6a Be able to prove, and use the fact that: Equal chords of a circle subtend equal angles at the centre, and be able to use its converse.

- 9G6b Be able to use the fact that: The perpendicular from the centre of a circle to a chord bisects the chord and conversely, the line drawn through the centre of a circle to bisect a chord is perpendicular to the chord.

- 9G6c Be able to use the fact that: There is one and only one circle passing through three given non-collinear points.

- 9G6d Be able to use the fact that: Equal chords of a circle (or of congruent circles) are equidistant from the centre (or their respective centres) and conversely.

- 9G6e Be able to prove, and use the fact that: The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle.

- 9G6f Be able to use the fact that: Angles in the same segment of a circle are equal.

- 9G6g Be able to use the fact that: If a line segment joining two points subtends equal angle at two other points lying on the same side of the line containing the segment, the four points lie on a circle.

- 9G6h Be able to use the fact that: The sum of either of the pair of the opposite angles of a cyclic quadrilateral is 180° and its converse.

- work with algebraic identities using models and explore the use of algebraic identities in familiar contexts.

Algebra

- 9A1c Recall of algebraic expressions and identities. Verification of identities:
  $(x+y+z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$
  $(x \pm y)^3 = x^3 \pm y^3 \pm 3xy(x+y)$
  $x^3 \pm y^3 = (x \pm y)(x^2 \pm xy + y^2)$
  $x^3 + y^3 + z^3 - 3xyz = (x + y +z)(x^2+y^2 + z^2 - xy - yz - zx)$
  and their use in factorization of polynomials.

• discuss in groups about the properties of triangles and construction of geometrical shapes such as, triangles, line segment and its bisector, angle and its bisector under different conditions	• finds areas of all types of triangles by using appropriate formulae and apply them in real life situations. • constructs different geometrical shapes like bisectors of line segments, angles and triangles under given conditions and provides reasons for the processes of such constructions.	**9G5 Area** • 9G5a Be able to prove, and use the fact that: Parallelograms on the same base and between the same parallels have equal area. • 9G5b Use the fact that: Triangles on the same base (or equal bases) and between the same parallels are equal in area. **9G7 Constructions** • 9G7a Construction of bisectors of line segments and angles of measure 60º, 90º, 45º etc., equilateral triangles. • 9G7b Construction of a triangle given its base, sum/difference of the other two sides and one base angle. • 9G7c Construction of a triangle of given perimeter and base angles.
• find and discuss ways to fix position of a point in a plane and different properties related to it.	• develops strategies to locate points in a Cartesian plane.	Coordinate geometry 9C1 The Cartesian plane • 9C1a Use standard notations and plot points in the plane.
• collect data from their surroundings and calculate central tendencies such as, mean, mode or median.	• identifies and classifies the daily life situations in which mean, median and mode can be used.	Statistics and probability 9S1 Statistics • 9S1a Collection of data • 9S1c Calculate mean, median and mode of ungrouped data.
• engage in a survey and discuss about different ways to represent data pictorially such as, bar graphs, histograms (with varying base lengths) and frequency polygons.	• analyses data by representing it in different forms like, tabular form (grouped or ungrouped), bar graph, histogram (with equal and varying width and length), and frequency polygon.	• 9S1b Presentation of data — construct and interpret bar graphs, histograms (with varying base lengths), frequency polygons for data given in various forms: ungrouped / grouped data in list or tables.

• explore the features of solid objects from daily life situations to identify them as cubes, cuboids, cylinders, etc.	• derives formulae for surface areas and volumes of different solid objects like, cubes, cuboids, right circular cylinders/ cones, spheres and hemispheres and applies them to objects found in the surroundings.	**Mensuration** 9M1 Areas • 9M1a Calculate the area of a triangle using Heron's formula (without proof) and its application in finding the area of a quadrilateral. 9M2 Surface areas and volumes • 9M2a Calculate the surface areas and volumes of cubes, cuboids, spheres (including hemispheres) and right circular cylinders/cones.
• play games involving throwing a dice, tossing a coin, etc., and find their chance of happening. • do a project of collecting situations corresponding to different numbers representing probabilities.	• calculates empirical probability through experiments and describes its use in words. • solves problems that are not in the familiar context of the child using above learning. These problems should include the situations to which the child is not exposed earlier.	**9S2 Probability** • 9S2a Calculate estimates of probabilities based on observed frequency of outcomes.
• visualise the concepts using GeoGebra and other ICT tools.		No explicit assessment for this

NCERT Pedagogical process	NCERT Learning outcome / CBSE Syllabus topic	Assessment content	Notes – AOs, question types etc.
Class X			
The learners may be provided with opportunities individually or in groups and encouraged to — • extend the methods of finding LCM and HCF of large numbers learnt earlier to general form.	*The learner —*		
	• generalises properties of numbers and relations among them studied earlier to evolve results, such as, Euclid's division algorithm, Fundamental Theorem of Arithmetic and applies them to solve problems related to real life contexts.	**Number systems** 10N1 Real Numbers • 10N1a Use the Fundamental theorem of Arithmetic to find the (unique) prime factorisation of numbers • 10N1b Use Euclid's division lemma (for $a = bq + r$) to find q and r given a and b. • 10N1c Apply 10N1a and 10N1b to solve problems related to real life contexts. • 10N1d Prove that a decimal which is not recurring or terminating can not be a rational number.	
• discuss different aspects of polynomials, such as — their degree, type (linear, quadratic, cubic), zeroes, etc., relationship between their visual representation and their zeroes.	• develops a relationship between algebraic and graphical methods of finding the zeroes of a polynomial.	**Algebra** 10A1 Polynomials • 10A1a Use the relationship between zeros and coefficients of quadratic polynomials. • 10A1b Use the division algorithm for polynomials with real coefficients, with the divisor no more than quadratic and the polynomial to be divided no higher than quartic (order 4)	

• play a game which may involve a series of acts of factorising a polynomial and using one of its factors to form a new one. For example, one group factorising say, $(x^3 - 2x^2 - x - 2)$ and using one of its factors $x-1$ to construct another polynomial, which is further factorised by another group to continue the process.		This is not assessable in a written test as it is a description of a pedagogical approach. The actual maths content is covered elsewhere.
	• finds solutions of pairs of linear equations in two variables using graphical and different algebraic methods.	**10A2 Linear equations in two variables** • 10A2a Identify graphically the solutions of a pair of linear equations in two variables, including where the equations are inconsistent (parallel lines). • 10A2b Solve a pair of linear equations in two variables using algebraic methods: by substitution, by elimination and by cross multiplication. • 10A2c Solve problems from real life where a pair of linear equations occur. • 10A2d Solve simple problems on equations which are reducible to linear equations.
• use quadratic equations to solve real life problems through different strategies, such as, quadratic formula, etc.		**10A3 Quadratic equations** • 10A3a Solve quadratic equations by factorisation and by using the quadratic formula (where roots are real). • 10A3b Know and use the relationship between the discriminant and the nature of the roots. • 10A3c Solve problems from real life where a quadratic equation occurs.

• use graphical ways to visualise different aspects of linear equations, such as, visualising linear equations in two variables or to find their solution.		• 10A2a Identify graphically the solutions of a pair of linear equations in two variables, including where the equations are inconsistent (parallel lines).
• observe and analyse patterns in their daily life situations to check if they form an Arithmetic Progression and, if so, find rule for getting their nth term and sum of n terms. The situations could be — our savings or pocket money, games such as, playing cards and snakes and ladders, etc.	• develops strategies to apply the concept of A.P. to daily life situations.	**10A4 Arithmetic progressions** • 10A4a Be able to calculate the nth term and the sum of the first n terms of an Arithmetic Progression • 10A4b Be able to identify and use Arithmetic Progressions in solving daily life problems.
• analyse and compare different geometrical shapes, charts, and models made using paper folding and tell about their similarity and congruence.	• establishes properties for similarity of two triangles logically using different geometric criteria established earlier such as, Basic Proportionality Theorem, etc.	**Geometry** 10G1 Triangles • 10G1a Be able to prove, and to use the fact that: If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio. • 10G1b Use the fact that: If a line divides two sides of a triangle in the same ratio, the line is parallel to the third side. • 10G1c Use the fact that: If in two triangles, the corresponding angles are equal, their corresponding sides are proportional and the triangles are similar. • 10G1d Use the fact that: If the corresponding sides of two triangles are proportional, their corresponding angles are equal and the two triangles are similar. • 10G1e Use the fact that: If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional, the two triangles are similar.

- 10G1f Use the fact that: If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, the triangles on each side of the perpendicular are similar to the whole triangle and to each other.

- 10G1g Be able to prove, and to use the fact that: The ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides.

- 10G1h Be able to prove, and to use the fact that: In a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.

- 10G1i Be able to prove, and to use the fact that: In a triangle, if the square on one side is equal to sum of the squares on the other two sides, the angles opposite to the first side is a right angle.

• discuss in groups different situations, such as, constructing maps, etc., in which the concepts of trigonometry are used.	• This is not assessable in a written test as it is a description of a pedagogical approach. The actual maths content is covered elsewhere.

- work in projects related to heights and distances, that may include situations in which methods have to be devised for measuring the angle of inclination of the top of a building and their own distance from the building.

Trigonometry

- 10T3 Heights and distances, angles of elevation and depression

- 10T3a Simple problems on heights and distances. Problems should not involve more than two right triangles. Angles of elevation or depression should be only 30°, 45°, 60°.

• devise ways to find the values of different trigonometric ratios for a given value of a trigonometric ratio.	• determines all trigonometric ratios with respect to a given acute angle (of a right triangle) and uses them in solving problems in daily life contexts like finding heights of different structures or distance from them. Know and use basic trigonometric identities.	**Trigonometry** 10T1 Introduction to trigonometry • 10T1a Calculate and use the trigonometric ratios of an acute angle of a right angled triangle. • 10T1b Know and use the values of the trigonometric ratios of 30^0, 45^0 and 60^0, and of 0^0 and 90^0 where they are defined. • 10T1c Know and use the relationships between the ratios. 10T2 Trigonometric identities • 10T2a Be able to prove, and to use the identity $sin^2 A + cos^2 A = 1$ • 10T2b Know and use trigonometric ratios of complementary angles.
	• demonstrates strategies of finding roots and determining the nature of roots of a quadratic equation.	**10A3 Quadratic equations** • 10A3a Solve quadratic equations by factorisation and by using the quadratic formula (where roots are real). • 10A3b Know and use the relationship between the discriminant and the nature of the roots. • 10A3c Solve problems from real life where a quadratic equation occurs.
	• works out ways to differentiate between congruent and similar figures.	**Geometry** 10G1 Triangles Applications of the ideas in this

- observe shapes in the surroundings that are a combination of shapes studied so far, such as, cone, cylinder, cube, cuboid, sphere, hemisphere, etc. They may work in groups and may provide formulas for different aspects of these combined shapes.

- derives formulae to establish relations for geometrical shapes in the context of a coordinate plane, such as, finding the distance between two given points, to determine the coordinates of a point between any two given points, to find the area of a triangle, etc.

- examines the steps of geometrical constructions and reason out each step

10M2 Surface areas and volumes

- 10M2a Calculate the surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres and right circular cylinders/cones, and the frustrum of a cone.

- 10M2b Problems involving converting one type of metallic solid into another and other mixed problems. (Problems with combination of not more than two different solids).

- determine areas of various materials, objects, and designs around them for example design on a handkerchief, design of tiles on the floor, geometry box, etc.

Mensuration

10M1 Areas related to circles

- 10M1a Calculate the area of sectors and segments of circles (in calculating segments, problems should be restricted to central angle of 60^0, 90^0 and 120^0 only).

- 10M1b Solve problems based on areas and perimeter / circumference of plane figures involving triangles, simple quadrilaterals and circles.

- discuss and analyse situations related to surface areas and volumes of different objects, such as, (a) given two boxes of a certain shape with different dimensions, if one box is to be changed exactly like another box, which attribute will change, its surface area or volume? (b) By what percent will each of the dimensions of one box have to be changed to make it exactly of same size as the other box?

- finds surface areas and volumes of objects in the surroundings by visualising them as a combination of different solids like cylinder and a cone, cylinder and a hemisphere, combination of different cubes, etc.

10M2 Surface areas and volumes

- 10M2a Calculate the surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres and right circular cylinders/cones, and the frustrum of a cone.

- 10M2b Problems involving converting one type of metallic solid into another and other mixed problems. (Problems with combination of not more than two different solids).

• discuss and analyse the chance of happening of different events through simple activities like tossing a coin, throwing two dice simultaneously, picking up a card from a deck of 52 playing cards, etc.	• determines the probability of an event and applies the concept in solving daily life problems	**Statistics and probability** 10S2 Probability **10S2a Calculate probabilities based on scenarios involving equally likely outcomes.** **10S2b Calculate probabilities of an event in simple problems.**
• generalise the formulas of mean, median and mode read in the earlier classes by providing situations for these central tendencies. • collect data from their surroundings and calculate the central tendencies.	• calculates mean, median and mode for different sets of data related with real life contexts.	**10S1 Statistics** • 10S1a Calculate mean, median and mode of grouped data (bimodal situation to be avoided). • 10S1b Presentation of data — cumulative frequency graphs
• to draw tangents to a circle from a point which lies outside and a point which lies inside the circle. They may be motivated to evolve different ways to verify the properties of such tangents	• derives proofs of theorems related to the tangents of circles • constructs — a triangle similar to a given triangle as per a given scale factor. a pair of tangents from an external point to a circle and justify the procedures.	**10G2 Circles** • 10G2a Be able to prove, and use the fact that: The tangent at any point of a circle is perpendicular to the radius through the point of contact. • 10G2b Be able to prove, and use the fact that: The lengths of tangents drawn from an external point to a circle are equal. 10G3 Constructions • 10G3a Construct the division of a line segment in a given ratio (internally). • 10G3b Construct the tangents to a circle from a point outside it. • 10G3c Construction of a triangle similar to a given triangle.

CBSE example assessment item – Maths, Class VI, Paper 1: Prime factors

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
Maths	VI	Paper1 (Non-calculator)

Item purpose

An example of a multiple choice question. To be used in a non-calculator paper.

Question(s)

1 The prime factors of 350 are

(A) 5, 7 and 10

(B) 2, 5 and 35

(C) 2, 5 and 7

(D) 3 and 5   (1 mark)

Mark scheme

Point-based

1

Answer	Guidance
(C)	Correct answer only

AO coverage

Question	AO1	AO2
1	1	
Total	1	

Content coverage

Question	Content areas covered
1	6N2c Prime factors and co-prime numbers

CBSE example assessment item: Maths, Class VI, Paper 1: Construction

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
Maths	VI	Paper 1 (Non-calculator)

Item purpose

An example of a construction question.

To be used in either a non-calculator paper or calculator paper.

Question(s)

1 Use a protractor to construct an angle of 135^0

Use a ruler and compass to draw a line that bisects the angle.

You must show your construction marks.

(3 marks)

(Total marks 3)

Mark scheme

1

Answer	Guidance
An angle of 135^0 with an angle bisector	A1 Construct an angle of 132 to 138°
	M1 Arcs intersecting both lines of the angle AND additional arcs with centres that are those intersections
	A1 The angle bisector drawn using the construction marks. The two angles created by the bisector should be within 2° of each other.
	For a bisector created using a protractor only award the first A1 if the angle constructed is in the range allowed.

Brackets indicate optional information for awarding marks

AO coverage

Question	AO1	AO2
1	3	
Total	3	

Content coverage

Question	Content areas covered
1	6G4c Bisect angles and create angles of 30°, 45°, 60°, 90° and 120° using ruler and compass
	Note that *6G4b* Construct angles up to 360° using a protractor is involved but is not the main purpose of the question.

CBSE example assessment item – Maths, Class7, Paper 1: Percentage loss and ratio

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
Maths	VII	Paper1 (Non-calculator)

Item purpose

An example of a two-part question with method marks and a content reference from a previous class.

To be used in either a non-calculator paper or calculator paper.

Question(s)

1. (a) Seema bought a book for Rs 200 and sold it for Rs 170.
    Calculate the percentage loss.   (2 marks)

2. (b) Last year Seema bought 36 books. 15 were fiction books and the rest were non-fiction.
    Express the number of fiction books to non-fiction books as a ratio in its simplest form.
                                                                                      (2 marks)
                                                                         (Total marks 4)

Mark scheme

1 (a)

Answer	Guidance
15%	M1 100 x (200 – 170)/200 OR equivalent
	Allow 100 x 30/200
	A1 15 (%)
	Allow 2 marks for correct answer only

1 (b)

Answer	Guidance
5 : 7	M1 non-fiction = 36 – 15 = 21
	15 : their 21
	A1 (fiction : non-fiction) = 5 : 7
	Allow non-fiction : fiction = 7 : 5
	Allow 2 marks for correct answer only
	Allow to in place of :

Brackets indicate optional information for awarding marks

AO coverage

Question	AO1	AO2
1 (a)		2
1 (b)		2
Total		4

Content coverage

Question	Content areas covered
1 (a)	7N3d Calculate a number as a percentage of another, including percentage profit or loss in a single transaction
1 (b)	6N4a Express two quantities as a ratio in its simplest form

CBSE example assessment item – Maths, Class VII, Paper 1: Algebra

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
Maths	VII	Paper 1 (Non-calculator)

Item purpose

An example of a two-part question with method marks.

To be used in either a non-calculator paper or calculator paper.

Question(s)

1 (a) Simplify $2(x+3x^3)+x(3-4x^2)$ (2 marks)

1 (b) $2x/3 = 5$

Solve the equation for x.   (2 marks)

(Total marks 4)

Mark scheme

1 (a)

Answer	Guidance
$5x+2x^3$	M1 $2x+6x^3+3x-4x^3$ A1 $5x+2x^3$ Allow $x(5+2x^2)$ Allow 2 marks for correct answer only

1 (b)

Answer	Guidance
7.5	M1 $2x=3×5$ OR 15 AND x=their 15÷2 OR equivalent method A1 x=7.5 OR 7½ Allow correct value without x= Allow 2 marks for correct answer only

Brackets indicate optional information for awarding marks

AO coverage

Question	AO1	AO2
1 (a)	2	
1 (b)	2	
Total	4	

Content coverage

Question	Content areas covered
1 (a)	7A1a Simplify, add and subtract algebraic expressions: up to 2 variables, including use of brackets
1 (b)	7A2a Solve simple linear equations in 1 variable with two operations

CBSE example assessment item – Maths, Class VIII, Paper 2: Area of a circle

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
Maths	VIII	Paper 2 (Calculator)

Item purpose

An example of an extended question.

To be used in a calculator paper. It rewards students for showing the method they use.

Question(s)
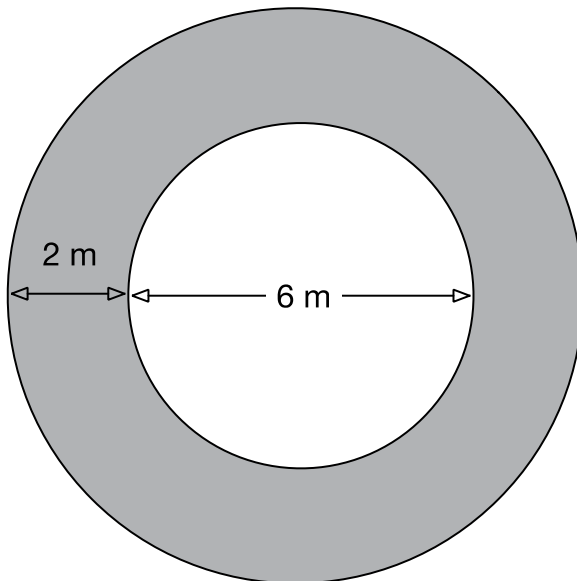
The diagram above shows the plan of a garden path (shaded) around a circular flower bed.

Find the area of the path in square metres correct to 1 decimal place. Show your working.

(3 marks)

(Total marks 3)

Mark scheme

1	
Answer	**Guidance**
50.3 m^2	M1 Evidence of use of area of a circle formula
	$\pi \times n^2$ where n is 3 OR 5 (NOT 1) and Pi is given as a symbol, word or a number
	M1 Area of path is difference between areas of circles of radius 5 and 3
	(for $\pi(5^2-3^2)$ or equivalent award M2)
	A1 50.3 (m^2) Allow 50.26..
	If correct answer only award 2 marks

Brackets indicate optional information for awarding marks

AO coverage

Question	AO1	AO2
1		3
Total		3

Content coverage

Question	Content areas covered
1	8M2c Find the area of a circle

CBSE example assessment item – Maths, Class IX, Paper 1: Identify irrational number

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
Mathematics	IX	Paper1 (Non-calculator)

Item purpose

This question assesses the ability of the student to identify irrational numbers.

An example of a multiple-choice question. To be used in a non-calculator paper.

Question(s)

1 Which of these is an irrational number?

(A) $(\sqrt{12})/12$

(B) 0.8

(C) $\sqrt{16}$

(D) 3/7

(1 mark)
(Total marks 1)

Mark scheme

Point-based

1   Which of these is an irrational number?

(A) $(\sqrt{12})/12$

(B) 0.8

(C) $\sqrt{16}$

(D) 3/7

Answer	Guidance
A	Correct answer only
	B = 4/5, C = 4 and D = 3/7 are all fractions or integers.

AO coverage

Question	AO1	AO2
1 (a)	1	
Total	1	

Content coverage

Question	Content areas covered
1	9N1c Know that some numbers such as $\sqrt{2}$, $\sqrt{3}$ are not rational

CBSE example assessment item: Maths, Class IX, Paper 2: Estimating probability

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
Mathematics	IX	Paper 2

Item purpose

This question assesses the ability of the student to estimate probability from observations.

Question(s)

1   A group of 4 friends found a biased dice, and each threw it 50 times. The outcomes they observed are listed in the table below.

Calculate the best estimate of the probability that the dice shows a one or a two when it is thrown.

	1	2	3	4	5	6	All
Mehar	13	11	8	8	4	6	**50**
Dasyn	14	11	8	7	5	5	**50**
Raunak	9	13	6	8	6	8	**50**
Adhira	12	10	5	11	5	7	**50**

(3 marks)

(Total marks 3)

Mark scheme

Point-based

1 A group of 4 friends find a biased dice, and each throw it 50 times. The outcomes they observe are listed in the table below.

Calculate the best estimate of the probability that the dice shows a one or a two when it is thrown.

Answer	Guidance
93/200 or 0.465 There are 200 observations altogether, with 48 ones and 45 twos. The best estimate is found by taking all of the observations together.	M1 combining the observations from the 4 friends into a single sample M1 combining the observations for scores one and two together. A1 giving an answer as a fraction or decimal. 93/200 or 0.465 (or 46.5%) on its own gets 3 marks. 46% or 47% on its own gets 2 marks, but 3 marks if 93/200 or 0.465 is seen. Special cases – if they choose one of the people and give the estimate from them (24/50, 25/50, 22/50, 22/50) scores 2 of the 3 marks [including if they work out all 4 and choose 22/50 because it occurs twice] 48/200 or 45/200 (or equivalent) gets two marks (the first M1 and the A1, but not the second M1 i.e. gives the estimate for getting a one, or the estimate of getting a two) 93 on its own – scores 1 of the 3 marks: evidence of taking total of ones and twos, but not fully deserving both of the method marks

AO coverage

Question	AO1	AO2
1		3
Total		3

Content coverage

Question	Content areas covered
1	9S2a Calculate estimates of probabilities based on observed frequency of outcomes.

CBSE example assessment item – maths, Class X, Paper 1: Find sum of an AP

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
Mathematics	X	Paper 1 (Non-calculator)

Item purpose

This question assesses the ability of the student to find the sum of an arithmetic progression.

To be used in a non-calculator paper.

Question(s)

1   Find the sum of the first one hundred terms of the arithmetic progression 1 , 6 , 11 ….

(3 marks)

(Total marks 3)

Mark scheme

Point-based

1   Find the sum of the first one hundred terms of the arithmetic progression 1 , 6 , 11 ….

Answer	Guidance
24850 $a = 1, n = 100, d = 5$ $l = 1 + 99 \times 5 = 496$ $S_{100} = 50 \times (1 + 496) = 24850$	1 mark for correctly identifying values of a, n, d 1 mark for correctly calculating the value of l 1 mark for correctly identifying the sum of the AP (alternatively, if $S_{100} = \frac{1}{2} n \{2a + (n-1)d\}$ is used second mark is for quoting it accurately Note – if they calculate l as 501 then they will get answer of 25100 on follow through – will get 2 marks (first and third of the marks listed)

AO coverage

Question	AO1	AO2
1 (a)	3	
Total	3	

Content coverage

Question	Content areas covered
1	• 10A4a Be able to calculate the nth term and the sum of the first n terms of an Arithmetic Progression

CBSE example assessment item – maths, Class X, Paper 2: Use trigonometric ratios

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
Mathematics	X	Paper 2

Item purpose

This question assesses the ability of the student to use a trigonometric ratio in a simple context.

Question(s)

1   A rectangle measures 8 cm by 3 cm.

Calculate the smaller angle that a diagonal makes with the sides of the rectangle. Give your answer correct to 1 decimal place.

(3 marks)

(Total marks 3)

Mark scheme

Point-based

1 A rectangle measures 8 cm by 3 cm.

Calculate the smaller angle that a diagonal makes with the sides of the rectangle. Give your answer correct to 1 decimal place.

Answer	Guidance
20.60 $\tan \alpha = 3/8 \rightarrow \alpha = 20.556..^{0} = 20.6^{0}$ to 1 dp.	M1 to identify use of trigonometry or draw diagram to show rectangle plus diagonal with angle marked between diagonal and side (either side) M1 to identify tan as the trigonometric ratio required A1 correct solution (2 marks if larger angle i.e. 69.4 is given). Don't penalise if answer not rounded correctly. Don't penalise if degree symbol is omitted.

AO coverage

Question	AO1	AO2
1		3
Total		3

Content coverage

Question	Content areas covered
1	• 10T1a Calculate and use the trigonometric ratios of an acute angle of a right-angled triangle.

CBSE example assessment item – Maths, Class X, Paper 2: Find volume of compound shape

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
Mathematics	X	Paper 2

Item purpose

This question assesses the ability of the student to understand how to break a problem into component parts and calculate volume of a compound shape, and use proportion in a real-world context.

Source
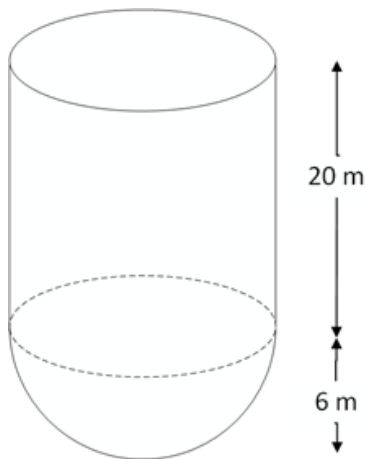
Tank diagram

Question(s)

1(a) A petrol storage tank consists of a hemisphere of radius 6 metres with a cylinder with height 20 metres above it. Find the capacity of the tank in millions of litres, correct to 1 decimal place.   (4 marks)

1(b) Research shows that motorists put 42.7 litres of petrol into their car on average when they visit a garage. How many visits, to put petrol into a car, would you expect this storage tank be able to supply? Give your answer in thousands.   (2 marks)

(Total marks 6)

Mark scheme

Point-based

1(a) A petrol storage tank consists of a hemisphere of radius 6 metres with a cylinder with height 20 metres above it. Find the capacity of the tank in millions of litres, correct to 1 decimal place.

Answer	Guidance
1(a) 2.7 million litres (to 1 d.p.) Cylinder = $\pi \times 6^2 \times 20 = 720\pi$ m³ Hemisphere = $2/3 \times \pi \times 6^3 = 144\pi$ m³ Total volume = 864 π m³ = 2,714.3... m³ = 2.7 million litres	M1 – to find volume of cylinder M1 – to find volume of hemisphere A1 – any correct value for the volume (864 π m³ ; 2,714.3... m³; 2.714... million litres A1 – answer rounded and in correct units (FT from their value for the volume) Total part (a) = 4 marks

1(b) Research shows that motorists put 42.7 litres of petrol into their car on average when they visit a garage. . How many visits, to put petrol into a car, would you expect this storage tank be able to supply? Give your answer in thousands of motorists, correct to the nearest thousand.

1(b) 64 thousand Volume ÷ 42.7 = 63.56.... thousands = 64 thousand to the nearest thousand	M1 for correct ratio calculation (i.e. their volume / 42.7) A1 accept correct answer with FT, don't penalise use of rounded value from part a, nor failure to give answer in specified format (this has been penalised in part a if not done correctly). Total part (b) = 2 marks

Answer	Guidance
A	Correct answer only B = 4/5, C = 4 and D = 3/7 are all fractions or integers.

AO coverage

Question	AO1	AO2
1(a)	2	2
1(b)		2
Total	2	4

Content coverage

Question	Content areas covered
1 (a)	• 10M2a Calculate the surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres and right circular cylinders/cones, and the frustrum of a cone.
1 (b)	• 9A2b Solve problems from real life, including problems on Ratio and Proportion, using both algebraic and graphical methods.

Science

Assessment objectives – Science

This document sets out the assessment objectives for CBSE science and their percentage weighting for the CBSE end of year tests for the different classes from VI to X.

No.	Description of Assessment Objective	Class				
		VI	VII	VIII	IX	X
AO1	Demonstrate knowledge and understanding of scientific ideas, techniques and procedures.	40	40	40	30	30
AO2	Apply knowledge and understanding of scientific ideas, techniques and procedures to classroom and real-world situations.	40	40	40	30	30
AO3	Analyse scientific information and ideas to present data and interpret patterns and relationships.	10	10	10	20	20
AO4	Evaluate scientific information to: • make judgments and draw conclusions • develop and improve experimental procedure	10	10	10	20	20

CBSE end of year test assessment specification: Class VI

This document sets out the approach to the assessment for the following subject and class:

Subject	Class
Science	VI

Duration	1 hour 15 minutes
Total number of marks	50
Percentage AO1	40%
Percentage AO2	40%
Percentage AO3	10%
Percentage AO4	10%
High level content coverage	Botany (20-30%)
	Food (20-30%)
	Light (10-15%)
	Solubility and water (20-30%)
	Magnets (10-15%)

Assessment objectives

No.	Description of Assessment Objective
AO1	Demonstrate knowledge and understanding of scientific ideas, techniques and procedures.
AO2	Apply knowledge and understanding of scientific ideas, techniques and procedures to classroom and real-world situations.
AO3	Analyse scientific information and ideas to present data and interpret patterns and relationships.
AO4	Evaluate scientific information to: • make judgments and draw conclusions • develop and improve experimental procedure

Overall assessment structure

There will be a single assessment to cover the class VI content which will last 1 hour 15 minutes and have 50 marks. This will allow a reasonable coverage of both the content of the CBSE syllabus and the NCERT curriculum but ensures that the assessment remains manageable for schools to administer and students to sit without being overly burdensome.

The AO weighting is the primary driver for the design of the assessment and the questions it contains as this will govern the skills that the students are expected to exhibit and is related to a competency based curriculum where students can do more than recall facts but are able to apply these facts to different contexts and analyse and evaluate scientific data. Given the competing demands of meeting the requirements for the AOs and the content set out in the CBSE syllabus and the NCERT curriculum aspects the weighting of the content coverage and the NCERT curriculum aspects have been allocated a range to allow assessments to be created which will

meet both requirements. The weighting of the content coverage is related to the overall teaching time allocated to it in the syllabus and the weighting of the NCERT curriculum aspects is related to the types of AOs covered and nature of the content allocated.

The assessment will be formed from structured short answer and objective questions based on a common source or stem which will build in difficulty through their sub-parts to allow all students to be able to access at least some questions throughout the assessment yet challenge the more able.

There will be between 6 and 9 structured questions in the assessment which will be worth between 3 and 9 marks each.

There will also be a small number of stand-alone single mark objective and short answer questions at the start of the assessment (3-6) to allow a balance of content coverage to be easily achieved and manage the weightings of AOs appropriately.

Assessment details

There are six major aspects of the NCERT curriculum which will be assessed in the end of year VI test and each aspect will need to be sampled in every assessment.

The table below shows the range of marks that will be covered by each of the different aspects of the curriculum. A range is necessary to accommodate the different AO weightings and cover the different content areas.

Section	Title	Marks
6.1	Scientific classification	7-11
6.2	Scientific investigation and causal effects – processes and phenomena	11-15
6.3	Measurement of physical properties	3-6
6.4	Drawing, presenting, analysing and interpreting data	7-11
6.5	Scientific models and creativity	3-6
6.6	Application of scientific information to real life	8-12

The number of marks available for each aspect will vary as the nature of the aspect and volume of content is different. These aspects are related to both the assessment objectives and the high level content themes so it means that each lends itself more or less readily to different types of question. For example 6.1 Scientific classification is mostly about recall of knowledge or application of this knowledge to a context so it focuses on AO1 and AO2 whereas 6.4 Drawing, presenting, analysing and interpreting data is mostly about applying knowledge and analysing data so it focuses on AO3 and AO2.

The assessment of the practical skills in 6.3 Measurement of physical properties and 6.5 Scientific models and creativity will be through questions which test the student's knowledge of how to carry out practical tasks and achieve fair and valid results. Questions may approximate a student's ability to measure, for example by presenting a clear image of a thermometer and asking students to record the temperature shown. Beyond this, there will be no direct assessment of these practical skills but the questions will be written such that those students who have done the practical work will be able to answer them more easily.

Structured questions will have a theme which run through them but can link across different aspects and also between different content areas where appropriate. For example a question may describe an investigation of plant growth and ask questions about the biotic factors that impact growth, the passage of light through the leaf, the practical investigation of the effect of light on growth and the disadvantages of using electric lamps. This links across 6.1, 6.2, 6.3, 6.4 and 6.6 and covers parts of Botany and Light.

All objective questions will require students to select from a list of possible options. The number of options will be at least three (so not True or False questions will be used) and will be dependent on the number of reasonable choices which a student can make. For example there are three different elements which may be magnetic, but more choices of food sources of nutrients so the latter may require a selection to be made from 4 or 5 choices.

Gap fill questions can be used but they need to be structured in a way which allows the candidates to write the answer on plain paper.

Assessment rubrics

There will be no optional questions in the assessments and students will be expected to attempt all questions. This is because it is very hard to ensure that optional questions are of the same demand and students are actually quite poor at selecting the question which they would be better placed to answer.

Students will be allowed to use a calculator and will need access to a pen, pencil, ruler and graph paper.

CBSE end of year test assessment specification: Class VII

This document sets out the approach to the assessment for the following subject and class:

Subject	Class
Science	VII

Duration	1 hour 20 minutes
Total number of marks	60
Percentage AO1	40%
Percentage AO2	40%
Percentage AO3	10%
Percentage AO4	10%
High level content coverage	Acidity and Soils (20-30%)
	Organs and Systems (20-30%)
	Colour and Lenses (10-15%)
	Electric Circuits (20-30%)
	Heat (5-10%)

Assessment objectives

No.	Description of Assessment Objective
AO1	Demonstrate knowledge and understanding of scientific ideas, techniques and procedures.
AO2	Apply knowledge and understanding of scientific ideas, techniques and procedures to classroom and real-world situations.
AO3	Analyse scientific information and ideas to present data and interpret patterns and relationships.
AO4	Evaluate scientific information to: • make judgments and draw conclusions • develop and improve experimental procedure

Overall assessment structure

There will be a single assessment to cover the class VI content which will last 1 hour 30 minutes and have 60 marks. This will allow a reasonable coverage of both the content of the CBSE syllabus and the NCERT curriculum but ensures that the assessment remains manageable for schools to administer and students to sit without being overly burdensome.

The AO weighting is the primary driver for the design of the assessment and the questions it contains as this will govern the skills that the students are expected to exhibit and is related to a competency-based curriculum where students can do more than recall facts but are able to apply these facts to different contexts and analyse and evaluate scientific data. Given the competing demands of meeting the requirements for the AOs and the content set out in the CBSE syllabus and the NCERT curriculum aspects the weighting of the content coverage and the NCERT curriculum aspects have been allocated a range to allow assessments to be created which will

meet both requirements. The weighting of the content coverage is related to the overall teaching time allocated to it in the syllabus and the weighting of the NCERT curriculum aspects is related to the types of AOs covered and nature of the content allocated.

The assessment will be formed from structured short answer and objective questions based on a common source or stem which will build in difficulty through their sub-parts to allow all students to be able to access at least some questions throughout the assessment yet challenge the more able.

There will be between 8 and 11 structured questions in the assessment which will be worth between 3 and 9 marks each.

There will also be a small number of stand-alone single mark objective and short answer questions at the start of the assessment (3-6) to allow a balance of content coverage to be easily achieved and manage the weightings of AOs appropriately.

Assessment details

There are six major aspects of the NCERT curriculum which will be assessed in the end of year VI test and each aspect will need to be sampled in every assessment.

The table below shows the range of marks that will be covered by each of the different aspects of the curriculum. A range is necessary to accommodate the different AO weightings and cover the different content areas.

Section	Title	Marks
7.1	Scientific classification	8-12
7.2	Scientific investigation and causal effects – processes and phenomena	12-16
7.3	Measurement of physical properties	3-6
7.4	Drawing, presenting, analysing and interpreting data	8-12
7.5	Scientific models and creativity	5-7
7.6	Application of scientific information to real life	10-16

The number of marks available for each aspect will vary as the nature of the aspect and volume of content is different. These aspects are related to both the assessment objectives and the high level content themes so it means that each lends itself more or less readily to different types of question. For example 7.1 Scientific classification is mostly about recall of knowledge or application of this knowledge to a context so it focuses on AO1 and AO2 whereas 7.4 Drawing, presenting, analysing and interpreting data is mostly about applying knowledge and analysing data so it focuses on AO3 and AO2.

The assessment of the practical skills in 7.3 Measurement of physical properties and 7.5 Scientific models and creativity will be through questions which test the student's knowledge of how to carry out practical tasks and achieve fair and valid results. Questions may approximate a student's ability to measure, for example by describing how to place ammeters and voltmeters in a circuit for valid measurement of values, or reading data off a photograph of a voltmeter or ammeter. . Beyond this, there will be no direct assessment of these practical skills but the questions will be written such that those students who have done the practical work will be able to answer them more easily.

Structured questions will have a theme which run through them but can link across different aspects and also between different content areas where appropriate. For example, a question may describe a cold home and ask about methods of insulation, the

effect on breathing of a person jogging on the spot to warm up and match data on heart rates to the different levels of activity. This links across 7.2, 7.3 and 7.6 and covers parts of *Organs and Systems, Electric Circuits and Heat.*

All objective questions will require students to select from a list of possible options. The number of options will be at least three (so not True or False questions will be used) and will be dependent on the number of reasonable choices which a student can make. For example, a substance can only be one of three options – acid, base of salt – but there are more choices of products of the reaction of a metal and acid, so the latter may require a selection to be made from 4 or 5 choices.

Gap fill questions can be used but they need to be structured in a way which allows the candidates to write the answer on plain paper.

Assessment rubrics

There will be no optional questions in the assessments and students will be expected to attempt all questions. This is because it is very hard to ensure that optional questions are of the same demand and students are actually quite poor at selecting the question which they would be better placed to answer.

Students will be allowed to use a calculator and will need access to a pen, pencil, ruler and graph paper.

CBSE end of year test assessment specification: Class VIII

This document sets out the approach to the assessment for the following subject and class:

Subject	Class
Science	VIII

Duration	1 hour 30 minutes
Total number of marks	60
Percentage AO1	40%
Percentage AO2	40%
Percentage AO3	10%
Percentage AO4	10%
High level content coverage	Cells and Reproduction (20-30%)
	Metals and Combustion (20-30%)
	Agricultural Methods (10-15%)
	Forces (20-30%)
	Sound and Sight (10-15%)

Assessment objectives

No.	Description of Assessment Objective
AO1	Demonstrate knowledge and understanding of scientific ideas, techniques and procedures.
AO2	Apply knowledge and understanding of scientific ideas, techniques and procedures to classroom and real-world situations.
AO3	Analyse scientific information and ideas to present data and interpret patterns and relationships.
AO4	Evaluate scientific information to: • make judgments and draw conclusions • develop and improve experimental procedure

Overall assessment structure

There will be a single assessment to cover the class VI content which will last 1 hour 30 minutes and have 60 marks. This will allow a reasonable coverage of both the content of the CBSE syllabus and the NCERT curriculum but ensures that the assessment remains manageable for schools to administer and students to sit without being overly burdensome.

The AO weighting is the primary driver for the design of the assessment and the questions it contains as this will govern the skills that the students are expected to exhibit and is related to a competency-based curriculum where students can do more than recall facts but are able to apply these facts to different contexts and analyse and evaluate scientific data. Given the competing demands of meeting the requirements for the AOs and the content set out in the CBSE syllabus and the NCERT curriculum aspects the weighting of the content coverage and the NCERT curriculum aspects have been allocated a range to allow assessments to be created which will

meet both requirements. The weighting of the content coverage is related to the overall teaching time allocated to it in the syllabus and the weighting of the NCERT curriculum aspects is related to the types of AOs covered and nature of the content allocated.

The assessment will be formed from structured short answer and objective questions based on a common source or stem which will build in difficulty through their sub-parts to allow all students to be able to access at least some questions throughout the assessment yet challenge the more able.

There will be between 7 and 11 structured questions in the assessment which will be worth between 3 and 9 marks each.

There will also be a small number of stand-alone single mark objective and short answer questions at the start of the assessment (3-6) to allow a balance of content coverage to be easily achieved and manage the weightings of AOs appropriately.

Assessment details

There are six major aspects of the NCERT curriculum which will be assessed in the end of year VI test and each aspect will need to be sampled in every assessment.

The table below shows the range of marks that will be covered by each of the different aspects of the curriculum. A range is necessary to accommodate the different AO weightings and cover the different content areas.

Section	Title	Marks
8.1	Scientific classification	8-12
8.2	Scientific investigation and causal effects – processes and phenomena	12-16
8.3	Measurement of physical properties	3-6
8.4	Drawing, presenting, analysing and interpreting data	8-12
8.5	Scientific models and creativity	5-7
8.6	Application of scientific information to real life	10-16

The number of marks available for each aspect will vary as the nature of the aspect and volume of content is different. These aspects are related to both the assessment objectives and the high level content themes so it means that each lends itself more or less readily to different types of question. For example 8.1 Scientific classification is mostly about recall of knowledge or application of this knowledge to a context so it focuses on AO1 and AO2 whereas 8.4 Drawing, presenting, analysing and interpreting data is mostly about applying knowledge and analysing data so it focuses on AO3 and AO2.

The assessment of the practical skills in 8.3 Measurement of physical properties and 8.5 Scientific models and creativity will be through questions which test the student's knowledge of how to carry out practical tasks and achieve fair and valid results. Questions may approximate a student's ability to measure, for example by measuring the length of an image and using it to calculate the actual size of a microscopic object. . Beyond this, there will be no direct assessment of these practical skills but the questions will be written such that those students who have done the practical work will be able to answer them more easily.

Structured questions will have a theme which run through them but can link across different aspects and also between different content areas where appropriate. For example, a question may describe the use of a tractor and ask about combustion of fuels, the impact of the exhaust gases on the carbon cycle and the forces involved in moving the tractor forward. . This links

across 8.2, 8.4 and 8.6 and covers parts of Metals and Combustion, Agricultural Methods and Forces. All objective questions will require students to select from a list of possible options. The number of options will be at least three (so not True or False questions will be used) and will be dependent on the number of reasonable choices which a student can make. For example, a cell may only be one of three options – animal, plant, or fungus – but there are more choices of forces that act upon an object, so the latter may require a selection to be made from 4 or 5 choices.

Gap fill questions can be used but they need to be structured in a way which allows the candidates to write the answer on plain paper.

Assessment rubrics

There will be no optional questions in the assessments and students will be expected to attempt all questions. This is because it is very hard to ensure that optional questions are of the same demand and students are actually quite poor at selecting the question which they would be better placed to answer.

Students will be allowed to use a calculator and will need access to a pen, pencil, ruler and graph paper.

CBSE end of year test assessment specification: Class IX

This document sets out the approach to the assessment for the following subject and class:

Subject	Class
Science	IX

Duration	2 hours
Percentage AO1	30%
Percentage AO2	30%
Percentage AO3	20%
Percentage AO4	20%
High level content coverage	Nature of matter (20-30%)
	The living world (20-30%)
	Movement and force (20-30%)
	Environment (10-15%)
	Food (10-15%)

Assessment objectives

No.	Description of Assessment Objective
AO1	Demonstrate knowledge and understanding of scientific ideas, techniques and procedures.
AO2	Apply knowledge and understanding of scientific ideas, techniques and procedures to classroom and real-world situations.
AO3	Analyse scientific information and ideas to present data and interpret patterns and relationships.
AO4	Evaluate scientific information to: • make judgments and draw conclusions • develop and improve experimental procedure

The assessment objectives are broadly based on levels of Bloom's taxonomy and are of similar style and demand to those used in other international qualifications such as GCSE and iGCSE.

Overall assessment structure

There will be a single assessment to cover the class IX content which will last 2 hours and have 80 marks. This will allow a reasonable coverage of both the content of the CBSE syllabus and the NCERT curriculum but ensures that the assessment remains manageable for schools to administer and students to sit without being overly burdensome. The number of marks will allow students to understand how well they have done on each of the 5 high level content areas and each of the assessment objectives and this will help teachers identify areas of weakness for individual students and also for whole classes so they can focus their teaching appropriately.

The AO weighting is the primary driver for the design of the assessment and the questions it contains as this will govern the skills that the students are expected to exhibit and is related to a competency based curriculum where students can do more than recall facts but are able to apply these facts to different contexts and analyse and evaluate scientific data. Given the competing demands of meeting the requirements for the AOs and the content set out in the CBSE syllabus and the NCERT curriculum aspects the weighting of the content coverage and the NCERT curriculum aspects have been allocated a range to allow assessments to be created which will

meet both requirements. The weighting of the content coverage is related to the overall teaching time allocated to it in the syllabus and the weighting of the NCERT curriculum aspects is related to the types of AOs covered and nature of the content allocated.

The assessment will predominantly be formed from structured short answer and objective questions based on a common source or stem which will build in difficulty through their sub-parts to allow all students to be able to access at least some questions throughout the assessment yet challenge the more able. There will also be one extended response item in the assessment to test students abilities to be able to produce coherent explanations.

There will be between 9 and 12 structured questions in the assessment which will be worth between 4 and 14 marks each.

There will also be a small number of stand-alone single mark objective and short answer questions at the start of the assessment (3-6) to allow a balance of content coverage to be easily achieved and manage the weightings of AOs appropriately.

Assessment details

Curriculum coverage

There are thirteen major aspects of the NCERT curriculum which will be assessed in the end of year IX test and each aspect will need to be sampled in every assessment.

The table below shows the range of marks that will be covered by each of the different aspects of the curriculum. A range is necessary to accommodate the different AO weightings and cover the different content areas The number of marks is proportional to the amount of content which can be assessed, the link between the aspect and the AO(s) covered and the relative importance of the area of study.

Section	Title	Marks
9.1	Scientific classification	3-4
9.2	Scientific investigation	6-8
9.3	Application of scientific investigation to daily life	5-7
9.4	Causal effects – processes and phenomena	5-7
9.5	Using data and calculating answers	7-9
9.6a	Draw and present information	5-7
9.6b	Analyse and interpret data	8-10
9.7	Understanding scientific theory and convention	5-7
9.8	Measure physical properties	1-2
9.9	Application of scientific theories and concepts	8-10
9.10	Draws conclusions	7-9
9.11	Describes scientific discoveries	2-3
9.12	Evaluates evidence	6-8

The number of marks available for each aspect will vary as the nature of the aspect and volume of content is different. These aspects are related to both the assessment objectives and the high level content themes so it means that each lends itself more or less readily to different types of question. For example 9.1 Scientific classification is mostly about recall of knowledge or application of this knowledge to a context so it focuses on AO1 and AO2 whereas 9.5 Using data and calculating answers is mostly about analysing data and applying knowledge so it focuses on AO3 and AO2.

The assessment of the practical skills in 9.2 Scientific investigation and 9.8 measures physical properties will be through questions which test the student's knowledge of how to carry out practical tasks and achieve fair and valid results. There will be no direct assessment of these practical skills but the questions will be written such that those students who have done the practical work will be able to answer them more easily. Teachers could be asked to assess these practical skills separately through the set list of experiments which appear in the CBSE syllabus. This could take the form of a laboratory book detailing a write up of the experiments carried out with teacher annotation about how well they actually did the practical tasks.

The questions designed to assess 9.12 Evaluate evidence will cover whether students understand the evidence they are presented with and its potential limitations but it is not possible to design an assessment of whether they believe this evidence to be correct in an assessment of this nature. This is because the student can respond with what they think the teacher will want rather than their actual belief.

The only aspects of the NCERT curriculum which will not be covered is observing technological devices and designing models as these focus on students making things and this is not possible to assess in a written assessment format. Again this could be covered in a teacher assessment with a portfolio of evidence produced containing photographs of what they have made and notes about the devices they have studied with teacher annotation explaining how well they have completed the work.

Question styles

Structured questions will have a theme which run through them but can link across different aspects and also between different content areas where appropriate. For example a question may present a velocity time graph for a car and ask questions about the car's speed, the amount of energy it uses and then the impact of the burning of petrol on the environment. This links across 9.5, 9.6b and 9.9 and covers parts of Movement and force and The environment.

All objective questions will require students to select from a list of possible options. The number of options will be at least three (so not True or False questions will be used) and will be dependent on the number of reasonable choices which a student can make. For example there are three different choices as whether a substance is an element a compound or a mixture but there are a larger number of choices which could be made in relation to internal cell structures so this may require a selection to be made from 4 or 5 choices.

Gap fill questions can be used but they need to be structured in a way which allows the candidates to write the answer on plain paper.

Extended response questions will be worth 4 marks and will always require students to explain theories, processes and phenomena or how these relate to every day life and scientific convention. They will be level of response marked as per the mark scheme below and indicative content will be provided to show the sort of content which could be covered by the student.

Section	Title	Marks
4	Clear well structured explanation linking effects to causes or underpinning theory	4
3	Clear description of relevant facts with some explanation relating effects to causes or underpinning theory.	3
2	Description of the basic facts but no link of effects to causes or underpinning theory	2
1	Limited isolated descriptive points relevant to the topic	1
0	Nothing worthy of credit	0

Assessment details

There will be no optional questions in the assessments and students will be expected to attempt all questions. This is because it is very hard to ensure that optional questions are of the same demand and students are actually quite poor at selecting the question which they would be better placed to answer.

Students will be allowed to use a calculator and will need access to a pen, pencil, ruler and graph paper.

CBSE end of year test assessment specification: X

This document sets out the approach to the assessment for the following subject and class:

Subject	Class
Science	X

Duration	2 hour
Total number of marks	80
Percentage AO1	30%
Percentage AO2	30%
Percentage AO3	20%
Percentage AO4	20%
High level content coverage	Chemical substances (25-35%)
	The living world (25-35%)
	Natural phenomena (10-15%)
	Effects of current (10-15%)
	Natural resources (10-15%)

Assessment objectives

No.	Description of Assessment Objective
AO1	Demonstrate knowledge and understanding of scientific ideas, techniques and procedures.
AO2	Apply knowledge and understanding of scientific ideas, techniques and procedures to classroom and real-world situations.
AO3	Analyse scientific information and ideas to present data and interpret patterns and relationships.
AO4	Evaluate scientific information to: • make judgments and draw conclusions • develop and improve experimental procedure

The assessment objectives are broadly based on levels of Bloom's taxonomy and are of similar style and demand to those used in other international qualifications such as GCSE and iGCSE.

Overall assessment structure

There will be a single assessment to cover the class X content which will last 2 hours and have 80 marks. This will allow a reasonable coverage of both the content of the CBSE syllabus and the NCERT curriculum but ensures that the assessment remains manageable for schools to administer and students to sit without being overly burdensome. The number of marks will allow students to understand how well they have done on each of the 5 high level content areas and each of the assessment objectives and this will help teachers identify areas of weakness for individual students and also for whole classes so they can focus their teaching appropriately.

The AO weighting is the primary driver for the design of the assessment and the questions it contains as this will govern the skills that the students are

expected to exhibit and is related to a competency based curriculum where students can do more than recall facts but are able to apply these facts to different contexts and analyse and evaluate scientific data. Given the competing demands of meeting the requirements for the AOs and the content set out in the CBSE syllabus and the NCERT curriculum aspects the weighting of the content coverage and the NCERT curriculum aspects have been allocated a range to allow assessments to be created which will meet both requirements. The weighting of the content coverage is related to the overall teaching time allocated to it in the syllabus and the weighting of the NCERT curriculum aspects is related to the types of AOs covered and nature of the content allocated.

The assessment will predominantly be formed from structured short answer and objective questions based on a common source or stem which will build in difficulty through their sub-parts to allow all students to be able to access at least some questions throughout the assessment yet challenge the more able. There will also be two extended response item in the assessment to test students abilities to be able to produce coherent explanations.

There will be between 9 and 12 structured questions in the assessment which will be worth between 4 and 14 marks each.

There will also be a small number of stand-alone single mark objective and short answer questions at the start of the assessment (3-8) to allow a balance of content coverage to be easily achieved and manage the weightings of AOs appropriately.

Assessment details

Curriculum coverage

There are thirteen major aspects of the NCERT curriculum which will be assessed in the end of year IX test and each aspect will need to be sampled in every assessment.

The table below shows the range of marks that will be covered by each of the different aspects of the curriculum. A range is necessary to accommodate the different AO weightings and cover the different content areas The number of marks is proportional to the amount of content which can be assessed, the link between the aspect and the AO(s) covered and the relative importance of the area of study.

Section	Title	Marks
10.1	Scientific classification	3-4
10.2	Scientific investigation	6-8
10.3	Causal effects – processes and phenomena	10-12
10.4	Using data and calculating answers	7-9
10.5a	Draw and present information	5-7
10.5b	Analyse and interpret data	8-10
10.6	Understanding scientific theory and convention	5-7
10.7	Measures physical properties	1-2
10.8	Application of scientific theories and concepts	8-10
10.9	Draws conclusions	7-9
10.10	Describes scientific discoveries	2-3
10.11	Evaluates evidence	6-8
10.12	Uses science to change behaviour	2-3

The number of marks available for each aspect will vary as the nature of the aspect and volume of content is different. These aspects are related to both the assessment objectives and the high level content themes so it means that each lends itself more or less readily to different types of question. For example *10.1 Scientific classification* is mostly about recall of knowledge or application of this knowledge to a context so it focuses on AO1 and AO2 whereas *10.4 Using data and calculating answers* is mostly about analysing data and applying knowledge so it focuses on AO3 and AO2.

The assessment of the practical skills in *10.2 Scientific investigation* and *10.7 measures physical properties* will be through questions which test the student's knowledge of how to carry out practical tasks and achieve fair and valid results. There will be no direct assessment of these practical skills but the questions will be written such that those students who have done the practical work will be able to answer them more easily. Teachers could be asked to assess these practical skills separately through the set list of experiments which appear in the CBSE syllabus. This could take the form of a laboratory book detailing a write up of the experiments carried out with teacher annotation about how well they actually did the practical tasks.

The questions designed to assess *10.11 Evaluate evidence* will cover whether students understand the evidence they are presented with and its potential limitations but it is not possible to design an assessment of whether they believe this evidence to be correct in an assessment of this nature. This is because the student can respond with what they think the teacher will want rather than their actual belief. Similarly it is not possible to assess whether a student actually changes their behaviour in 10.12 Uses science to change behaviour but the student will be expected to show they understand what they should do differently.

The aspect of the NCERT curriculum related to communication is implicitly assessed in all other areas. Clear written communication will be needed in order for the teacher to be able to understand the answer and award the marks. Other forms of communication such as verbal

The only aspects of the NCERT curriculum which will not be covered is observing technological devices and designing models as these focus on students making things and this is not possible to assess in a written assessment format. Again this could be covered in a teacher assessment with a portfolio of evidence produced containing photographs of what they have made and notes about the devices they have studied with teacher annotation explaining how well they have completed the work.

Question styles

Structured questions will have a theme which run through them but can link across different aspects and also between different content areas where appropriate. For example a question may ask a student to explore the process for extraction of a metal from its ore and then link this to the underlying chemical reaction and the impact of the process at an industrial scale on the local environment. This links across 10.1, 10.3, 10.5a, and 10.11 and covers parts of *Chemical substances* and *Natural resources*.

All objective questions will require students to select from a list of possible options. The number of options will be at least three (so not True or False questions will be used) and will be dependent on the number of reasonable choices which a student can make. For example there are three different choices as whether bonding in a substance is ionic, covalent or metalic but there are a larger number of choices which could be made in relation to types of chemical reaction so this may require a selection to b e made from 4 or 5 choices.

Gap fill questions can be used but they need to be structured in a way which allows the candidates to write the answer on plain paper.

Extended response questions will be worth 4 marks and will always require students to explain theories, processes and phenomena or how these relate to every day life and scientific

convention. They will be level of response marked as per the mark scheme below and indicative content will be provided to show the sort of content which could be covered by the student.

Section	Title	Marks
4	Clear well structured explanation linking effects to causes or underpinning theory	4
3	Clear description of relevant facts with some explanation relating effects to causes or underpinning theory.	3
2	Description of the basic facts but no link of effects to causes or underpinning theory	2
1	Limited isolated descriptive points relevant to the topic	1
0	Nothing worthy of credit	0

Assessment rubrics

There will be no optional questions in the assessments and students will be expected to attempt all questions. This is because it is very hard to ensure that optional questions are of the same demand and students are actually quite poor at selecting the question which they would be better placed to answer.

Students will be allowed to use a calculator and will need access to a pen, pencil, ruler and graph paper.

CBSE tests learning ladder – Science

This document sets out the learning ladder for the end of year CBSE assessments based on the relevant NCERT curriculum documents and the relevant CBSE Syllabus. The assessment content will set out what content can appear in the assessments.

NCERT Pedagogical process	NCERT Learning outcome / CBSE Syllabus topic	Assessment content	Notes – AOs, question types etc.
Class VI *The learner is to be provided with opportunities in pairs/groups/ individually in an inclusive setup and encouraged to—* **6.1 Scientific Classification** • explore surroundings, natural processes, phenomena using senses viz. seeing, touching, tasting, smelling, hearing.	*The learner—* • identifies materials and organisms, such as, plant fibres, flowers, on the basis of observable features, i.e., appearance, texture, function, aroma, etc. • differentiates materials and organisms, such as, fibre and yarn; tap and fibrous roots; electrical conductors and insulators; on the basis of their properties, structure and functions. • classifies materials, organisms and processes based on observable properties, e.g., materials as soluble, insoluble, transparent, translucent and opaque; changes as can be reversed and cannot be reversed; plants as herbs, shrubs, trees, creeper, climbers; components of habitat as biotic and abiotic; motion as rectilinear, circular, periodic etc.	**Botany** 6.1.1 Distinguish a variety of plant types based on externally observable characteristics: • Herbs as non-woody plants that die down to the ground after flowering • Shrubs as woody plants with several main stems arising at or near the ground • Trees as relatively tall woody perennial plants with a single stem, branches. • Creepers as plants that grow along the ground or up surfaces by means or spreading stems. 6.1.2 Identify fabrics which have plant sources: • Cotton • Jute 6.1.3 Identify fabrics which have non-plant sources: • Wool • Silk • Polyester • Nylon 6.1.4 Identify plant organs and describe key features of: • Leaves • Flowers	AO1 Identify a plant type from an image AO1 AO1 AO1 Annotate a diagram of a plant

	• Roots	
	• Stems	
	6.1.5 Identify components of a habitat as either biotic or abiotic.	AO1 Match sides with lines or numbers/ letters
	Food	
	6.1.6 Classify foods as sources of particular nutritional requirements:	
	• Rice and other grains and sugars for carbohydrates	
	• Pulses, eggs and meat for proteins	
	• Oils and fats and dairy products for lipids	
	• Various drinks for water	
	• Fruits and vegetables or vitamins and minerals	
	• Vegetables for fibre	
	Light	AO1, AO2 Fill in blanks
	6.1.7 Distinguish between materials that are:	
	• Transparent	
	• Translucent	
	• Opaque	
	• Reflective	
	6.1.8 Distinguish conductors and insulators of electricity.	AO1 Tick columns in table
	Solubility and water	
	6.1.9 Distinguish between melting and dissolving and dispel the misconception of disappearing.	AO1 AO2 Short answer
	6.1.10 Distinguish between soluble and insoluble substances, both domestic and laboratory.	AO1 AO2 Complete table
	6.1.11 Distinguish between reversible and non-reversible changes, both domestic and laboratory:	AO1 AO2 'Do you agree' style application
	• Changes of state (reversible)	
	• Expansion and contraction (reversible)	
	• Chemical reactions (variable)	
	• Burning and combustion (non-reversible)	

		• Developmental changes in organisms (non-reversible)	
		6.1.12 Identify solute, solvent and solution for given substances.	AO1 AO2 Annotate diagram
		Magnets	
		6.1.13 Recognise that some materials can become magnetic: • Iron • Nickel • Cobalt	AO1 Tick boxes, short answer
6.2 Scientific investigations and causal effects – processes and phenomena • pose questions and find answers through reflection, discussion, designing and performing appropriate activities, role plays, debates, use of ICT, etc.	• conducts simple investigations to seek answers to queries, e.g., What are the food nutrients present in animal fodder? Can all physical changes be reversed? Does a freely suspended magnet align in a particular direction? • relates processes and phenomenon with causes, e.g., deficiency diseases with diet; adaptations of animals and plants with their habitats; quality of air with pollutants, etc. • explains processes and phenomenon, e.g., processing of plant fibres; movements in plants and animals; formation of shadows; reflection of light from plane mirror; variations in composition of air; preparation of vermicompost, etc.	**Botany** 6.2.1 Explain how plants both occupy and create habitats, and describe what a habitat is.	AO1 Short answer question
		6.2.2 Explain adaptations of plants to different environmental conditions: • Structural adaptations - xerophytes • Behavioural adaptations - phototropism • Physiological adaptations - the production of leaf toxins	AO1 AO2 Reading comprehension
		6.2.3 Design investigations of plant growth under various conditions: - light level and the impacts of over and under watering and interpret the results of these experiments.	AO2 Series of short answer questions
		Diet 6.2.4 Design investigations and interpret the results of food tests: • Benedict's reagent (reducing sugar) • Iodine solution (starch) • Biuret reagent (protein) • Emulsions test (lipid)	AO1 Complete table
		6.2.5 Explain the causes and effects of deficiency diseases: • Vitamin A deficiency (night blindness)	AO2, AO4 Short answer

- Protein deficiency (kwashiorkor)
- Iron-deficient anaemia
- Scurvy
- Rickets
- Goitre

Light

6.2.6 Explain how to construct a simple torch:

AO1, AO2
Drawing

- Cells and other components connected in an unbroken loop.
- All components must be electrical conductors.

6.2.7 Conduct investigations of the behaviour of light rays reflecting off a plane mirror

'Student thinks X, do you agree?'

AO1, AO2, AO4

6.2.8 Explain the formation of shadows as an exemplification of the linear nature of light waves.

AO4, AO2 Fill in blank/ complete flow chart

Solubility and water

6.2.9 Explain industrial processes of filtration and sterilisation of drinking water.

AO2, AO3

Give experimental scenario, student hypothesises

6.2.10 Explain how solubility of substances can be measured and how solubility of a solid changes with temperature.

AO1 Short answer

6.2.11 Describe uses and hazards of water:

AO2 Show image and predict/explain interaction

- Drinking
- Sanitation
- Agricultural use
- Industrial use
- Flood hazard
- Drought hazard

Magnets

6.2.12 Explain interaction rules of magnets: like poles repel and opposite poles attract.

6.3 Measure physical properties • record the observations during the activity, experiments, surveys, field trips, etc.	• measures physical quantities and expresses in SI units, e.g., length	**Botany** 6.3.1 Measure abiotic conditions that affect plant growth: • Air temperature in degrees celsius • Rainfall in mm per hour.	AO2, AO3 Read off diagram of thermometer Explain use of apparatus
		Diet 6.3.2 Measure daily intake of key nutrients based on an analysis of food labels.	AO3 Record based on given data
		Light 6.3.3 Record angles of incidence and reflection in a plane mirror.	AO2 Measure from a picture
		Solubility and water 6.3.4 Measure boiling points as a means of determining the purity of water.	AO2, AO3 Application based on data
6.4 Drawing, presenting, analysing and interpreting data • analyse recorded data, interpret results and draw inference/ make generalisations and share findings with peers and adults	• draws labelled diagrams / flow charts of organisms and processes, e.g., parts of flowers; joints; filtration; water cycle, etc.,	**Botany** 6.4.1 Draw a labelled diagram of the parts of a flower: • Stamen, consisting of anther and filament • Carpel, consisting of stigma and style • Ovule • Petals and sepals	AO3, AO1 Complete a diagram
		6.4.2 Analyse pie charts of the relative proportions of nutrients in different diets and infer changes necessary to make the diet more healthy.	AO3, AO1 Suggest changes based on data
		Light 6.4.3 Construct ray diagrams for light reflecting off a plane mirror.	AO3 Complete a diagram with one ray shown.
		Solubility and water 6.4.4 Draw or annotate systems diagrams of the water cycle, with explanations of the storages and flows of matter and energy.	AO1 Complete a part-drawn diagram
		6.4.5 Draw standard scientific diagrams of apparatus to represent investigations of filtration, evaporation and distillation.	AO4, AO3 Identify or correct errors in a diagram

		Magnets	AO4, AO3
		6.4.6 Describe how to use plotting compasses or iron filings to produce a diagram of a magnetic field around a bar magnet.	Explain how to do this in short answer/ complete diagram/ explain photo
6.5 Scientific models and creativity • exhibit creativity presenting novel ideas, new designs/patterns, improvisation, etc.	• constructs models using materials from surroundings and explains their working, e.g., pinhole camera, periscope, electric torch, etc.	**Light** 6.5.1 Design, and explain the function of, pinhole cameras and periscopes. 6.5.2 Explain how a torch works **Solubility and water** 6.5.3 Explain the construction of a water-purification device. **Magnets** 6.5.4 Describe how to construct a simple floatation magnet.	AO3, AO4, AO2 Short answer AO2 Reading comprehension AO2, AO4 Give image and explain how made/ correct error in method
6.6 Application of scientific information to real life • internalise, acquire and appreciate values such as cooperation, collaboration, honest reporting, judicious use of resources, etc.	• applies learning of scientific concepts in day-to-day life, e.g., selecting food items for a balanced diet; separating materials; selecting season appropriate fabrics; using compass needle for finding directions; suggesting ways to cope with heavy rain/ drought, etc. • makes efforts to protect environment, e.g., minimising wastage of food, water, electricity and generation of waste; spreading awareness to adopt rainwater harvesting; care for plants, etc. • exhibits creativity in designing, planning, making use of available resources, etc. • exhibits values of honesty, objectivity, cooperation, freedom from fear and prejudices.	**Botany** 6.6.1 Describe methods for separating and preparing grains: • Threshing • Winnowing • Hand picking • Sedimentation • Filtration 6.6.2 Explain the importance of conserving insect pollinators. **Diet** 6.6.3 Evaluate a given weekly meal plan in terms of the balance of key nutrients. 6.6.4 Explain the conditions under which foods rot, showing an understanding of which foods are most prone to rotting: • Soft fruits and vegetables • Meat • Dairy products 6.6.5 Describe the ecological consequences of food waste	AO1 Short answer / Extended response AO2 Select valid reasons from list Complete table AO4, AO2 Select 'more' of 'less' based off given plan AO1, AO2 Select most likely from list / short answer / respond to stimulus AO2 Short answer

	Light		
	6.6.6 Evaluate the social and environmental implications of the use of electricity in light bulbs.	AO4, AO2 Present arguments opposed to given arguments	
	Solubility and water		
	6.6.7 Explain the importance of reducing domestic, industrial and agricultural water consumption and wastage.	AO4, AO2 Student says X, what would you tell them	
	Magnets		
	6.6.8 Explain the use of a compass for finding direction, with reference to the earth's magnetic field.	AO2, AO3 Response to stimulus e.g. image	

Class VII *The learner is to be provided with opportunities in pairs/groups/ individually in an inclusive setup and encouraged to —* **7.1 Scientific Classification** • explore surroundings, natural processes, phenomena using senses viz. seeing, touching, tasting, smelling, hearing.	*The learner —* • identifies materials and organisms, such as, animal fibres; types of teeth; mirrors and lenses, on the basis of observable features, i.e., appearance, texture, functions, etc. • differentiates materials and organisms such as, digestion in different organisms; unisexual and bisexual flowers; conductors and insulators of heat; acidic, basic and neutral substances; images formed by mirrors and lenses, etc., on the basis of their properties, structure and function. • classifies materials and organisms based on properties/ characteristics, e.g., plant and animal fibres; physical and chemical changes.	**Acidity and soils** 7.1.1 Define acids, bases and salts. 7.1.2 Identify acidic and basic substances. **Electric circuits** 7.1.3 Distinguish conductors and insulators of electricity. **Heat** 7.1.4 Distinguish conductors and insulators of heat. **Organs and systems** 7.1.5 Identify examples of plant and animal organs and organ systems 7.1.6 Categorise organisms based on their method of feeding: • Autotrophs/producers • Heterotrophs/consumers • Parasites • Saprophytes 7.1.7 Distinguish between different human teeth – molars, premolars, canines and incisors. 7.1.8 Distinguish aspects of plant reproductive morphology: • Bisexual and unisexual flowers	AO1 Match up / short answer AO2 Match up / complete table AO2 Tick box / table AO2 Tick box / table AO2 Short answer based on stimulus AO1 Food chain label / table AO1 Label diagram AO1 Complete table / label diagram	

		Colour and lenses	AO1
		7.1.9 Distinguish between concave and convex lenses.	
		7.1.10 Distinguish between real and virtual images formed by lenses.	AO1 Blank fill

| **7.2 Scientific investigations and causal effects** – **processes and phenomena**

• pose questions and find answers through reflection, discussion, designing and performing appropriate activities, role plays, debates, use of ICT, etc. | • conducts simple investigations to seek answers to queries, e.g., Can extract of coloured flowers be used as acid-base indicator? Do leaves other than green also carry out photosynthesis? Is white light composed of many colours?

• relates processes and phenomena with causes, e.g., wind speed with air pressure; crops grown with types of soil; depletion of water table with human activities, etc.

• explains processes and phenomena, e.g., processing of animal fibres; modes of transfer of heat; organs and systems in human and plants; heating and magnetic effects of electric current, etc.

• writes word equation for chemical reactions, e.g., acid-base reactions; corrosion; photosynthesis; respiration, etc. | **Acidity and soils**

7.2.1 Describe the use of biological and chemical pH indicators to investigate neutralisation reactions.

7.2.2 Explain that chemical reactions form new products.

7.2.3 Write word equations for:
• Simple acid-base neutralisation reactions
• Reactions of metals and acids
• Reactions of metal oxides with acids
• Reactions of metal carbonates with acids

7.2.4 Describe the causes of ground water depletion and explain the consequences to soil fertility such as land subsidence.

7.2.5 Explain the consequences for human and other life of high wind speeds and heavy rain.

7.2.6 **Electric circuits**
• Explain why electric current causes wires to heat up.

7.2.7 Describe the outcome of investigations of electromagnetism in terms of the magnetic fields that form around current-carrying wires and solenoids.

Heat

7.2.8 Explain the flow of heat from hotter to cooler areas.

7.2.9 Explain investigations of the effects of heat on materials:
• Bimetallic strip | AO1 Short answer

AO1 \|Short answer

AO2 \| Short answer / fill in blanks / table

AO4 Annotate diagram

AO1 Short answer

AO1

Short answer

AO1 Short answer

AO1, AO2 Annotate diagram

AO1 Annotate diagrams / short answer |

- Loss of heat in hot water held in containers of different materials.
- Thermal expansion with ring and ball

Organs and systems

7.2.10 Explain the structure and function of mammalian body parts:	AO1 Annotate diagrams / short answer / experimental data

- Heart and circulatory system
- Lungs
- Digestive system (human and ruminant)
- Skeletal system

7.2.11 Explain the structure and function of plant organs:	AO2, AO3 Respond to given data / interpret graphs

- Leaves
- Roots
- Flower
- Xylem and phloem

7.2.12 Conduct investigations of the effect of exercise of heart and breathing rates, and explain outcomes in terms of the need for oxygen for respiration.	AO2 Short answer / label diagrams
7.2.13 Describe methods of growing plants from seeds or by vegetative propagation.	AO2 Response to stimulus

Colour and lenses

7.2.14 Explain experimental demonstrations of how the position of lenses affects the image formed.	AO2 Short answer / correct errors
7.2.15 Explain how a prism can be used to demonstrate that white light is composed of many colours of light.	

7.3 Measure physical properties • record the observations during the activity, experiments, surveys, field trips, etc.	• measures and calculates e.g., temperature; pulse rate; speed of moving objects; time period of a simple pendulum, etc. • draws labelled diagrams/ flow charts e.g., organ systems in human and plants; electric circuits; experimental set ups; life cycle of silk moth, etc.	**Acidity and soils** 7.3.1 Measure soil pH levels and relate this to solubility of ions and effects on plant growth.	AO2, AO3 Short answers
		Electric circuits 7.3.2 Measure current and voltage in simple series and parallel circuits.	AO3, AO2 Correct errors
		7.3.3 Draw simple series and parallel circuits.	AO1, AO2 Draw
		Heat 7.3.4 Measure temperature of substances using a thermometer.	AO3 Read image of thermometer
		Organs and systems 7.3.5 Measure pulse and breathing rates.	AO3 Interpret written account
		7.3.6 Annotate a diagram of various organs and organ systems: • Human heart • Human digestive system • Generic flower • External features of a leaf	AO1 Annotate diagram
7.4 Drawing, presenting, analysing and interpreting data • analyse recorded data, interpret results and draw inference/ make generalisations and share findings with peers and adults.	• plots and interprets graphs e.g., distance-time graph.	**Electric circuits** 7.4.1 Identify voltage-current graphs for filament bulbs, ohmic resistors and diodes, and explain their appearance.	AO1, AO2 Label graph
		Systems and organs 7.4.1 Interpret data about changes in heart rate and breathing rate and relate to changes in level of activity.	AO3 As per left
		7.4.2 Analyse life cycle diagrams of flowering plants, as exemplified by a mung bean.	AO1 Short answer

| **7.5 Scientific models and creativity**

• exhibit creativity presenting novel ideas, new designs/patterns, improvisation, etc. | • constructs models using materials from surroundings and explains their working, e.g., stethoscope; anemometer; electromagnets; Newton's colour disc, etc. | **Acidity and soils**

7.5.1 Explain the design and use of an anemometer and relate this to the use of wind breaks to reduce soil erosion.

Electric circuits

7.5.2 Design simple series and parallel circuits.

7.5.3 Describe the construction and uses of an electromagnet.

7.5.4 Explain and evaluate the function of fuses and circuit breakers.

7.5.5 Explain the function of a simple electric bell.

Organs and systems

7.5.6 Describe how locally-available materials can be used to build a stethoscope.

Colour and lenses

7.5.7 Explain the construction and significance of a Newton's colour disc. | AO2 Extended response

AO2 Draw a circuit diagram from a photograph

AO2 Short answer

AO1 Compare table

AO1, AO2 Annotate diagram

AO2

Unjumble instructions

AO1, AO2 Fill in blanks |
| **7.6 Application of scientific information to real life**

• internalise, acquire and appreciate values such as cooperation, collaboration, honest reporting, judicious use of resources, etc. | • discusses and appreciates stories of scientific discoveries

• applies learning of scientific concepts in day-to-day life, e.g., dealing with acidity; testing and treating soil; taking measures to prevent corrosion; cultivation by vegetative propagation; connecting two or more electric cells in proper order in devices; taking measures during and after disasters; suggesting methods for treatment of polluted water for reuse, etc. | **Acidity and soils**

7.6.1 Explain methods for managing soil acidity: the application of lime to reduce acidity

7.6.2 Evaluate methods of conserving and restoring soil fertility:

Planting of wind break trees to reduce wind erosion.

Use of cover crops to reduce water erosion.

7.6.3 Select suitable crops for growing in different soil values acidity, when given data on preferred pH ranges for example crops.

7.6.4 Using given data about crop preferences, select appropriate crops for given conditions based on: | AO2 Told action taken, explain why

AO1, AO2

Advise a fictional farmer

AO4 Reading |

- makes efforts to protect environment, e.g., following good practices for sanitation at public places; minimising generation of pollutants; planting trees to avoid soil erosion; sensitising others with the consequences of excessive consumption of natural resources, etc.

- exhibits creativity in designing, planning, making use of available resources, etc.

- exhibits values of honesty, objectivity, cooperation, freedom from fear and prejudices.

Soil texture

Climate

Electric circuits

7.6.5 Explain the function of familiar electrical circuits : • Electric torch • Household parallel lights • Electric bell	AO2 Short answer from stimulus diagram

Heat

7.6.6 Explain the use of domestic insulation as a means of reducing heat loss or gain and thus reducing energy consumption	AO4 Advise homeowner

Organs and systems

7.6.7 Explain how a stethoscope can be used to identify health conditions such as fast or irregular heart beats.	AO2 AO4 Interpret data to diagnose
7.6.8 Explain the role of closed sewage systems in preventing disease outbreaks.	AO1
7.6.9 Explain the importance of biodiversity and interdependence in woodland habitats: • Feeding • Pollination • Seed dispersal • Purification of air and water by plants	AO1 Suggest what happens in absence – give scenario Reading comprehension / short answer

Colour and lenses

7.6.10 Explain the function of a simple telescope of the behaviour of light through lenses.	AO2 Annotate diagram

Class VIII

The learner is to be provided with opportunities in pairs/groups/ individually in an inclusive setup and encouraged to —

8.1 Scientific Classification

• explore surroundings, natural processes, phenomena using senses viz. seeing, touching, tasting, smelling, hearing.

The learner —

• differentiates materials and organisms, such as, natural and human made fibres; contact and non-contact forces; liquids as electrical conductors and insulators; plant and animal cells; viviparous and oviparous animals, on the basis of their properties, structure and functions.

• classifies materials and organisms based on properties/ characteristics, e.g., metals and non-metals; kharif and rabi crops; useful and harmful microorganisms; sexual and asexual reproduction; celestial objects; exhaustible and inexhaustible natural resources, etc.

Cells and reproduction

8.1.1 Distinguish between sexual and asexual propagation. Methods of asexual propagation:

AO1 Categorise based on images

• Budding Binary fission

• Vegetative propagation

• Bulbs and tubers

• Runners

• Cuttings

• Grafting

8.1.2 Distinguish between simplified plant, animal, fungal and bacterial cells.

AO1, AO2 Draw / annotate

8.1.3 Contrast internal and external fertilisation.

AO1 Short answer

Metals and combustion

8.1.4 With reference to their properties and position on the periodic table, distinguish between metals and non-metals.

AO1 Periodic table lookup

8.1.5 Identify fuels as substances that can be combusted to release energy.

AO1 Define, fill in blanks

8.1.6 Identify examples of exhaustible and inexhaustible natural resources

AO1, AO2

Short answer, complete table

Agricultural methods

8.1.7 Evaluate the different properties of threads of natural or synthetic origins:

AO1, AO2, AO4 Extended response

• Cotton

• Jute

• Wool

• Silk

• Nylon

• Polyester

Forces

8.1.8 Distinguish between contact and non-contact forces

8.1.9 Identify important forces:

AO1 Table

AO1, AO2 Annotate diagram

• Normal

• Friction

- Air resistance
- Buoyancy
- Gravity
- Magnetism

AO2 Pick values from given data

Sound and sight

AO1, AO2 Draw

8.1.10 Contrast the speed of sound in different media.

8.1.11 Explain why we see images in some objects, in terms of the different effects of regular and diffuse reflection.

8.2 Scientific investigations and causal effects – processes and phenomena - pose questions and find answers through reflection, discussion, designing and performing appropriate activities, role plays, debates, use of ICT, etc.	- conducts simple investigations to seek answers to queries, e.g., What are the conditions required for combustion? Why do we add salt and sugar in pickles and murabbas? Do liquids exert equal pressure at the same depth? - relates processes and phenomenon with causes, e.g., smog formation with the presence of pollutants in air; deterioration of monuments with acid rain, etc. - explains processes and phenomenon, e.g., reproduction in human and animals; production and propagation of sound; chemical effects of electric current; formation of multiple images; structure of flame, etc. - writes word equation for chemical reactions, e.g., reactions of metals and non-metals with air, water and acids, etc.	**Cells and reproduction** 8.2.1 Explain the use of methods of food preservation with reference to control of bacterial growth: - Salt, sugar and vinegar - Refrigeration and freezing 8.2.2 Describe the role of beneficial microorganisms: - Yeast in brewing and baking - Lactobacillus in yogurt making 8.2.3 Describe the structure and function of specialised plant and animal cells. 8.2.4 Explain the changes that take place during a menstrual cycle. 8.2.5 Describe the development of a human foetus during pregnancy. 8.2.6 Describe the stages of eukaryotic life cycles: - Amphibians, exemplified by frogs - Insects, exemplified by a silk moth **Metals and combustion** 8.2.7 Write word equations for reactions of metals with: - Oxygen - Water - Acids

AO2 Short answer / Do you agree?

AO1 Short answer / extended response combined with above

AO1 Draw / annotate

AO1 Explain diagram

AO1 Annotate diagram / short answer

AO1 Annotate diagram / extended response / contrast

AO2 Give reactants or products and complete

8.2.8 Write word equations for combustion reactions	AO1
8.2.9 Explain the origin of a variety of pollutants formed as a result of combustion reactions: • Carbon dioxide, a greenhouse gas • Particulate matter • Sulfur and nitrogen oxides, which contribute to acid rain • Smog, a secondary pollutant formed from the reaction of nitrogen oxides and various other pollutants (names of other pollutants not required).	AO2, AO4 Suggest possible consequences of a forest fire

Agricultural methods

8.2.10 Explain methods of increasing agricultural productivity: • Fertilisers • Pesticides	AO1, AO2 Reading comprehension
8.2.11 Evaluate the use of fertilisers and pesticides, both conventional and organic.	AO1, AO4 Complete compare and contrast table
8.2.12 Explain the impacts that agriculture has on ecological health: • Habitat loss • Release of atmospheric and water pollutants • Contribution to climate change	AO1 Suggest impacts of given farming approach
8.2.13 Describe the importance of conservation and evaluate methods of conserving biodiversity: • Protected areas • Species-level conservation of red-listed or endemic species.	AO1, AO4 Which method is best suited to X – discuss and conclude
Zoos and botanic gardens	

Forces

8.2.14 Describe forces as pushes and pulls.	AO1, AO2 Define
8.2.15 Describe the effects of applying a force:	AO1 Short answer

		• Change of direction	
		• Change of speed	
		• Change of shape	
		8.2.16 Apply *pressure = force/area*	AO2 Calculation
		8.2.17 Explain the effects of atmospheric pressure on wind and rainfall	AO2 Short answer
		8.2.18 Design investigations of the effect of friction on the motion of objects on an incline.	AO1 series of short answer
			AO1 Short answer
		8.2.19 Describe the motion of celestial bodies (comets and the 8 planets) in terms of orbits made possible by speed and by gravitational forces.	AO1 Short answer
		Sound and sight	AO1 Short answer
		8.2.20 Identify a variety of human and non-human sources of sound	
		8.2.21 Describe sound as vibrations propagated through a medium.	
8.3 Measure physical properties • record the observations during the activity, experiments, surveys, field trips, etc.	• measures angles of incidence and reflection, etc.	**Cells and reproduction** 8.3.1 Measure cell sizes under a microscope and apply *magnification = image size / actual size*	AO2 Give image and calculate
		Metals and combustion 8.3.2 Measure temperature of combustion reactions.	AO2 Read image of thermometer
		Forces 8.3.3 Measure forces with a Newton meter.	AO2 Read image of Newton meter
		Sound and sight 8.3.4 Explain how speed of sound can be measured with echoes against a distant wall.	AO1, AO2 Annotate diagram

8.4 Drawing, presenting, analysing and interpreting data • analyse recorded data, interpret results and draw inference/ make generalisations and share findings with peers and adults	• prepares slides of microorganisms; onion peel, human cheek cells, etc., and describes their microscopic features. • draws labelled diagram/ flow charts, e.g., structure of cell, eye, human reproductive organs, experimental set ups, etc.	**Cells and reproduction**	
		8.4.1 Describe how to prepare microscope slides.	AO1, AO2 Short answer
		8.4.2 Draw and label a simple light microscope.	AO1 Annotate
		8.4.3 Draw and annotate objects as seen under a light microscope: • Plant cells from an onion • Animal cells from a human cheek	AO1 Draw / annotate
		8.4.4 Draw and annotate diagrams of the human reproductive organs.	AO1 Draw / annotate
		Agricultural methods	
		8.4.5 Annotate diagrams of the carbon and nitrogen cycles	AO1 Annotate diagrams
		8.4.6 Analyse data on crop yields under various farming conditions.	AO3, AO4 Draw conclusions based on table or graph
		Forces	
		8.4.7 Draw freebody diagrams to represent balanced and unbalanced forces.	AO1, AO2 Draw / correct errors
		8.4.8 Draw distance-time graphs for a range of objects.	AO1 Draw / explain
		Sound and sight	
		8.4.9 Annotate diagrams of sound waves to show their frequency, wavelength and amplitude and the impact of these on the pitch and volume of the sounds.	AO2 Draw / short answer
		8.4.10 Annotate diagrams of the structure of the eye.	AO1 Annotate a picture
8.5 Scientific models and creativity • exhibit creativity presenting novel ideas, new designs/patterns, improvisation, etc.	• constructs models using materials from surroundings and explains their working, e.g., ektara, electroscope, fire extinguisher, etc.	**Metals and combustion**	AO1, AO2 Short answer
		8.5.1 Explain the construction and use of a variety of fire control devices: fire blankets and fire extinguishers.	
		FORCES	
		8.5.1 Explain the construction of a simple Newtonmeter with found materials.	AO2 Short answer with stimulus

8.6 Application of scientific information to real life		Cells and reproduction	
• internalise, acquire and appreciate values such as cooperation, collaboration, honest reporting, judicious use of resources, etc.	• applies learning of scientific concepts in day-to-day life, e.g., purifying water; segregating biodegradable and non-biodegradable wastes; increasing crop production; using appropriate metals and non-metals for various purposes; increasing/ reducing friction; challenging myths and taboos regarding adolescence, etc.	8.6.1 Describe the development of secondary sexual characteristics during puberty.	AO1 Short answer
		8.6.2 Explain errors in misconceptions about human sexuality: • A mother is responsible for the sex of her child. • A woman is unclean when menstruating	AO4 Correct errors AO1, AO4 Student thinks X, do you agree
	• discusses and appreciates stories of scientific discoveries.	8.6.3 Explain aspects of reproductive health: • The wearing of condoms to prevent STIs. • Parental care.	AO1, AO4 Evaluation table
	• makes efforts to protect environment, e.g., using resources judiciously; making controlled use of fertilisers and pesticides; suggesting ways to cope with environmental hazards, etc.	8.6.4 Describe the work of Janssen and van Leeuwenhoek in developing the light microscope	
		8.6.5 Explain how prior learning about lenses can be applied to the function of a microscope.	AO1 Short answer
		Metals and combustion	
		8.6.6 Explain the uses of different metals for different purposes, based on their properties.	
	• exhibits creativity in designing, planning, making use of available resources, etc.	8.6.7 Explain the concept of the fire triangle and apply it to explain how fires can be controlled.	AO2 Annotate diagram
	• exhibits values of honesty, objectivity, cooperation, freedom from fear and prejudices.	8.6.8 Evaluate the use of fossil fuels given: • They are energy dense. • They produce pollutants when combusted. • They are exhaustible.	AO2 Write in metal under picture of each use
		8.6.9 Evaluate the environmental consequences of the extraction and disposal of metals, and the importance of a more sustainable alternative of separating and recycling metal waste	AO1, AO2 Give a scenario and ask what to do and why
		Agricultural methods	AO4 Evaluate construction of new [coal] power station
		8.6.10 Design farming strategies and approaches on the basis of the relative long-term merits of different systems:	

• Mixed vs monoculture	**AO1, AO4** Propose solutions for a given scenario
• High vs low input	
8.6.11 Evaluate methods of managing risk of water damage to farmland during of natural disasters.	
Forces	**AO2** Give students a scenario and ask them to pick from different options, explaining their choice in each case.
8.6.12 Explain advantages and disadvantages of friction for human activities:	
8.6.13 Describe methods of increasing and decreasing friction:	**AO1, AO4** Advise a farmer on choices to be made in a given scenario.
• Increasing roughness of surface	
• Increasing mass	
• Lubrication	
• Streamlining	
8.6.14 Explain the use of liquid pressure in hydraulics.	**AO1** Short answer
Sound and sight	**AO2** Suggest ways of fixing a problem related to friction
8.6.15 Explain the environmental consequences of sound pollution:	
• On territorial birds	
• On marine animals	
• Hearing loss as an example of human health problems	
8.6.16 Explain how lenses can be used to correct short and long sightedness.	**AO1** Short answer
	AO1, AO2 Short answer
	AO3 Annotate diagram

Class IX

The learners may be provided with opportunities individually or in groups and encouraged to —

9.1 Scientific classification

observe, group or classify materials, such as mixtures, based on their properties, viz. solubility, passage of light, etc., by performing various activities. Based on the observations, a discussion may be facilitated to help arrive at the appropriate conclusions. Students with visual impairment or low vision may be motivated to observe solubility of the materials by touching (caution should be taken while using the materials).

The learner —

- differentiates materials, objects, organisms, phenomena, and processes, based on properties or characteristics, such as, prokaryotes and eukaryotes, plant cell and animal cell, diffusion and osmosis, simple and complex tissues, distance and displacement, speed and velocity, balanced and unbalanced forces, elements, compound and mixture, solution, suspension and colloid, isobars and isotopes, etc.

- classifies materials, objects, organisms, phenomena, and processes, based on properties or characteristics, such as, classification of plants and animals under various hierarchical sub-groups, natural resources, classification of matter based on their states (solid/liquid/gas) and composition (element/ compound/ mixture), etc.

Nature of matter

9.1.1 Definition of matter as solid, liquid and gas and the characteristics of each: shape, volume density and particle diagrams.

9.1.2 Define substances as elements, compounds and mixtures. Mixtures may be homogenous, heterogenous, colloids or suspensions.

9.1.3 Identify changes as chemical or physical

The living world

9.1.4 Classification of organisms

Diversity of plants and animals and the basic approach to scientific naming and grouping of organisms with nested hierarchies and binomial classification.

9.1.5 Hierarchy of categories of organisms and how organisms are classified and grouped on the basis of common morphological features and DNA.

9.1.6 Monera, Protista, Fungi and major groups of plants - Thallophyta, Bryophyta, Pteridophyta, Gymnosperms and Angiosperms with salient features.

9.1.7 Major groups of animals with salient features for invertebrates up to phyla (Porifera, Cnidaria, Platyhelminthes, Echniodermata, Mollusca, Nematoda, Arthropoda, Annelida and Chordata) and chordates up to class (Agnatha, Chondrichthyes, Osteichthyes, Amphibia, Reptilia, Aves, Mammalia).

9.1.8 Classification of diseases as infectious and non-infectious

AO1 Short answer or objective style questions asking for definitions.

AO1 short answer questions on taxonomy

AO2 questions giving an unknown organism and its features asking for a classification

AO1 Objective questions linking features to groups – matching approach

		Movement and force	AO1 asking for definitions and AO2 questions asking for features on graphs
		9.1.9 Identify balanced and unbalanced forces	
		9.1.10 Identify acceleration, deceleration and constant velocity	
		9.1.11 Describe the difference between mass and weight	
		Environment	AO1 questions – definitions and fill in the blanks on a diagram
		9.1.12 Classify resources as renewable and non-renewable.	
		9.1.13 Identify flows and stores in bio-geo chemical cycles (water, oxygen, carbon and nitrogen)	
		Food	AO1 questions – identify features of different agricultural systems
		9.1.14 Identify features of intensive and organic farming methods	
		9.1.15 Identify natural biological and chemical pest control methods	
9.2 Scientific investigation design and carry out activities. For example, 'Tug of war' to understand balanced and unbalanced forces. They may be encouraged to experiment by applying forces (equal and unequal) on an object in same and opposite directions, followed by peer group discussion to generalise.	• plans and conducts investigations or experiments to arrive at and verify the facts, principles, phenomena or to seek answers to queries on their own, such as, how does speed of an object change? How do objects float/sink when placed on the surface of a liquid? Is there any change in mass when chemical reaction takes place? What is the effect of heat on the state of substances? What is the effect of compression on different states of matter? Where are stomata present in different types of leaves? Where are growing tissues present in plants?	**Nature of matter** 9.2.1 Explain how to prepare: • true solutions of common salt, sugar and alum • suspensions of soil, chalk powder and fine sand in water • colloidal solutions of starch in water and egg albumin or milk in water • and distinguish between these on the basis of: • transparency • filtration criterion • stability 9.2.2 Explain how to prepare: • a mixture • a compound • using iron filings and sulphur powder • and distinguish between these on the basis of:	Assessment of practical skills in the written test applies to potentially all practical examples : AO1 recall methods, short or extended answers, sequencing questions, naming and identifying suitable apparatus, features, etc AO2 reviewing similar experiments and applying knowledge to them – short answer questions

- appearance, i.e., homogeneity and heterogeneity
- behaviour towards a magnet
- behaviour towards carbon disulphide as a solvent
- effect of heat

9.2.3 Explain how to separate the components of a mixture of sand, common salt and ammonium chloride (or camphor)

9.2.4 Explain how to perform the following reactions and classify them as physical or chemical changes:

- Iron with copper sulphate solution in water
- Burning of magnesium ribbon in air
- Zinc with dilute sulphuric acid
- Heating of copper sulphate crystals
- Sodium sulphate solution with barium chloride solution

9.2.5 Explain how to design and conduct an experiment to verify the law of conservation of mass in a chemical reaction.

9.2.6 Explain how to determine the melting point of ice and the boiling point of water

The living world

9.2.7 Explain how to prepare stained temporary mounts of

- onion peel,
- human cheek cells
- and record observations and draw their labelled diagrams.

9.2.8 Using prepared slides identify and draw labelled diagrams of:

- parenchyma, collenchyma and sclerenchyma tissues in plants
- striped, smooth and cardiac muscle fibres and nerve cells in animals

AO3 analysing data from experiments, drawing graphs, interpreting tables and graphs, identifying anomalous results, in short answer and extended response questions.

AO4 critiquing experiment design and methods, drawing conclusions from results in short answer and extended response questions

9.2.9 Study the external features of root, stem, leaf and flower of monocot and dicot plants

9.2.10 Study the characteristics of Spirogyra, Agaricus, Moss, Fern, Pinus (either with male or female cone) and an Angiospermic plant. Draw and give two identifying features of the group to which they belong.

9.2.11 Observe the given pictures/models of earthworm, cockroach, bony fish and bird. For

- each organism, draw their picture and record:
- specific features of its phylum.
- adaptive feature with reference to its habitat.

Movement and force

9.2.12 Explain how to determine the density of an irregularly-shaped solid by using a spring balance and a measuring cylinder

9.2.13 Explain how to establish the relation between the loss in weight of a solid when fully immersed in

- Tap water
- Strongly salty water
- with the weight of water displaced by it for two different solids.

9.2.14 Explain how to design and conduct an experiment to verify the laws of reflection of sound.

9.2.15 Determine the speed of a pulse propagated through a stretched string/slinky (helical spring).

Food

9.2.16 Investigate the impact of nutrient supply on plant growth (water or nitrogen)

Note: There will be a focus on carrying out the practical activities safely and using the correct equipment effectively

9.3 Application of scientific investigation to daily life

study the daily life experiences, using interdisciplinary approach such as the cause behind cooling of water in earthen pots. They may be encouraged to measure and compare the temperatures of water both in earthen pot and metal containers, thereby helping them to relate process of evaporation with cooling effect. Students with visual impairment or low vision may be encouraged to feel the difference in temperature by touching the surface of the containers.

Nature of matter

9.3.1 Explain how cooling by evaporation works and its uses in refrigeration/air conditioning.

9.3.2 Explain how mixtures can be used to create paints and dyes

9.3.3 Explain how mixtures of liquids can be separated using paper chromatography, distillation and fractional distilation

The living world

9.3.4 Explain how sweat evaporating from the skin causes cooling (thermoregulation)

9.3.5 Explain how infectious diseases can be controlled using basic hygiene measures, antibiotics and vaccinations

Movement and force

9.3.6 Explain how ships float even when they are made of steel which is heavier than water

9.3.7 Explain how bats use sonar to detect their prey and surroundings

9.3.8 Explain how ultrasound is used to scan human bodies to monitor the foetus during pregnancy or to look at joint injuries

Environment

9.3.9 Explain how air currents and condensation cause rain

9.3.10 Explain how CFCs react with ozone and cause ozone depletion

Food

9.3.11 Explain how selective breeding in plants and animals is used to improve quality, yield and manage diseases.

9.3.12 Investigate and explain the use of fertilisers/manure and their impact on crop growth

9.3.13 Explain methods of protection from pests and diseases, both biological and chemical;

9.3.14 Assess the benefits and drawbacks of organic farming vs intensive farming.

AO2 short and extended answer questions relating application of concepts to real-world examples.

9.4 Causal effects – processes and phenomena

conduct surveys to understand the process of spreading of diseases. They may be encouraged to collect data from doctors and nurses about various diseases. They can prepare a report on spread, causes, prevention, and cure of diseases. They may share their findings with the community through role plays, skits and also campaign for prevention.

- relates processes and phenomena with causes and effects, such as, symptoms with diseases and causal agents, tissues with their functions, production with use of fertilisers, process of evaporation with cooling effect, various processes of separation with the physical and chemical properties of the substances, production of sound with vibrations of source, etc.

- explains processes and phenomena, such as, functions of different organelles, spread of diseases and their prevention, effect of force on the state of motion of objects, action and reaction, rotation and revolution of planets and satellites, conservation laws, principle of separation of different gases from air, melting, boiling, freezing, how bats use ultrasonic waves to catch prey, etc.

Nature of matter

9.4.1 Explain the effect of temperature change on states of matter: melting, freezing, evaporation, condensation and sublimation.

9.4.2 Use atomic structure and periodic table position to explain valency and reactivity of elements and construct simple chemical formulae of compounds using valency information.

The living world

9.4.3 Explain the structure and functions of animal and plant tissues:

- striped/striated, smooth and cardiac muscle fibres, connective tissues (bone, cartilage and tendon), epithelial tissue and nerve cells (sensory neuron) in animals

- meristematic and permanent tissues. (parenchyma, collenchyma and sclerenchyma) tissues in plants

9.4.4 Health and its failure: Describe infectious and non-infectious diseases, their causes and manifestation – coronary heart disease, asthma, cancer, malaria, polio, measles, Cholera, AIDS, gonorrhoea, the common cold.

9.4.5 Describe diseases caused by microbes (Virus, Bacteria and Protozoans) and their prevention.

9.4.6 Explain principles of treatment and prevention of disease.

9.4.7 Describe the delivery and impact of Pulse Polio programmes

Movement and force

9.4.8 Explains motion of an object in terms of the forces acting on the object

9.4.9 Explains the principles of buoyancy

9.4.10 Explains the law of conservation of energy and energy transformations

AO4 short answer questions relating the state to the energy of the particles

AO2 short answer questions on formulae

AO2 short and extended response questions

AO4 short answer questions linking diseases to their causes

AO3 short answer questions analysing effectiveness of treatments

applies the interdependency and interrelationship in the biotic and abiotic factors of environment to promote conservation of environment, such as, organic farming, waste management, etc.	**Environment** 9.4.11 Physical resources: Air, Water, Soil, their properties and the main constituent parts of air (nitrogen, oxygen, argon, water vapour) and soil (mineral mater, organic matter, air, water, organisms) and their importance for supporting life. 9.4.13 Explain how air is necessary for respiration, for combustion, for moderating temperatures; movements of air and its role in bringing rains across India. 9.4.14 Explain the uses of water for drinking, agriculture and industry and the variation in supply and demand and challenges balancing these. Explain the processes involved in water treatment for drinking supply and sewage treatment. 9.4.15 Explain the importance of soil for agriculture – nutrient supply for crops, and how soil degradation and improvement can occur. 9.4.16 Explain Air water and soil pollution and its impact on life. 9.4.17 Air pollution from particulates and photochemical smog and carbon monoxide from burning. 9.4.18 Explain the 'Holes' in ozone layer - causes and effects. Sources of CFCs. Ozone absorbs incoming UV light. CFCs react with ozone and remove it from the upper atmosphere. Impact on health through increased exposure to UV light – cancer and cataracts. 9.4.19 Explain the causes and impact of water pollution from sewage, mining and industrial processes and fertiliser run off from farming. 9.4.20 Explain the causes and impact of soil pollution from farming, mining and industrial processes. 9.4.21 Explain the features and detailed processes of the Bio-geo chemical cycles in nature: Water, Oxygen, Carbon and Nitrogen.	AO2 draw force diagrams, short answer questions AO AO2/3/4 data response and short answer questions on the earth's physical resources, their necessity for life and how they are used by man and the impact man has on these resources AO2/4 short answer and extended response questions on impact of changes in cycles AO2/4 data response and short answer questions.

9.4.22 Explain how changes in the processes change the balance in these cycles – burning fossil fuels, deforestation, intensive farming.

Food

9.4.23 Explore how selective breeding can increase crop yields and create crops suitable to specific conditions

9.4.24 Explore how varying nutrient levels (water, nitrogen) impact on the growth of crop plants and the yield of food they produce.

9.4.25 Explain how the addition of fertilisers (natural manure and man made ammonium nitrate) change crop productivity but can have negative effects.

9.5 Using data and calculating answers gather data for calculating different physical quantities, such as distance, displacement, velocity, which can be shared and discussed in groups or with peers. Rubrics can be used to assess the conversion of units and reporting results.	• calculates using the data given, such as, distance, velocity, speed, frequency, work done, number of moles in a given mass of substance, concentration of solution in terms of mass-by-mass percentage of substances, conversion of Celsius scale to Kelvin scale and vice versa, number of neutrons in an atom from atomic number and mass number, speed of sound, kinetic and potential energies of an object, boiling points of liquids to predict the order of their separation from the mixture, etc. derives formulae, equations, and laws, such as, mathematical expressions for	**Nature of matter** 9.5.1 Calculate RMM from RAM and formulae of a compound 9.5.2 Use Mass = RMM x Moles to calculate the number of moles or mass of a substance. **The living world** 9.5.3 Calculate the size of a cell using a drawing and magnification data 9.5.4 Calculate infection rates from given data for a disease **Movement and force** 9.5.5 Calculate velocity, distance, time and acceleration from given data 9.5.6 Use F=ma in calculations in linear systems to calculate resultant forces acting on and acceleration of objects. 9.5.7 Calculate the momentum of an object 9.5.8 Calculate the weight of an object under different gravitational conditions 9.5.9 Calculate the density of an object 9.5.10 Calculate the work done by a force	AO2/3 calculation questions to find amounts of substances AO2 – use a scale/ magnification to calculate cell sizes AO3 and 4 short answer questions to calculate physical measurements, interpret the outcomes of these calculations and evaluate statements related to the outcomes.

		Newton's second law of motion, law of conservation of momentum., expression for force of gravity, equations of motion from velocity-time graphs, etc.	9.5.11 Calculate potential and kinetic energy 9.5.12 Calculate frequency and speed of sound waves	AO3 short answer questions on interpreting graphs.
			Environment 9.5.13 Calculate changes in stores when flows change in bio-geo chemical systems	AO2/3 questions calculating changes and balances in systems
			Food 9.5.14 Calculate crop yields for different environmental factors	AO3 short answer questions
9.6a Draw and present information present their observations/ ideas/ learning through flow charts/ concept maps/ graphs and ICT tools. **9.6b Analyse and interpret data** collect and analyse a wide variety of graphs from newspapers, magazines or the internet. They may be encouraged to draw, analyse and interpret the graphs (for example, distance-time, speed-time, or acceleration-time graphs of motion of a vehicle on a straight road).	• draws labelled diagrams, flow charts, concept maps, graphs, such as, biogeochemical cycles, cell organelles and tissues, human ear, distance-time and speed-time graphs, distribution of electrons in different orbits in an atom, process of distillation and sublimation, etc. • analyses and interprets graphs and figures such as, distance-time and velocity-time graphs, computing distance, speed, acceleration of objects in motion, boiling and melting points of a mixture to identify the appropriate method of separation, crop yield after use of fertilisers, etc.		**Nature of matter** 9.6.1 Draw and label structure of atoms 9.6.2 Draw atomic shell models for different elements up to number 20 in the periodic table 9.6.3 Analyse temperature-time graphs to identify melting and boiling points **The living world** 9.6.4 Draw and label structure of cells • onion peel, • human cheek cells 9.6.5 Draw labelled diagrams of: • parenchyma, collenchyma and sclerenchyma tissues in plants • striped, smooth and cardiac muscle fibres and nerve cells in animals 9.6.6 Draw and label characteristic features of major plant and animal groups: • Spirogyra, Agaricus, Moss, Fern, Pinus (either with male or female cone) and an Angiospermic plant. • earthworm, cockroach, bony fish and bird. 9.6.7 Draw the external features of root, stem, leaf and flower of monocot and dicot plants	AO2 short answer questions on atomic structure AO2/3 short answer questions AO1/2 short answer and objective questions drawing different biological features and identifying these features on given diagrams

Movement and force	AO2 graph plotting questions
9.6.8 Draw and interpret distance-time and velocity-time graphs	
9.6.9 Derive equations of motion by graphical method	AO3 short answer question
9.6.10 Draw a labelled diagram of the structure of the human ear to show how sound is propagated.	AO1 short answer/ objective question
Environment	
9.6.11 Draw and annotate the Water, Oxygen, Carbon and Nitrogen cycles showing detailed processes and flows.	
Food	AO1/2 short answer/ objective question – fill in the blanks
9.6.12 Analyse and interpret graphical data on crop yields in relation to nutrient levels.	
	AO2/3 short answer questions

9.7 Understanding scientific theory and conventions write chemical formulae of simple compounds, chemical equations, etc., using play way methods such as a game of cards.	• uses scientific conventions, symbols, and equations to represent various quantities, elements, and units, such as, SI units, symbols of elements, formulae of simple compounds, chemical equations, etc.	**Nature of matter** 9.7.1 Describe the structure of atoms – electrons, protons, neutrons, isotopes and isobars.	AO1 and AO2 short answer questions
		9.7.2 Explain atomic number and atomic and molecular mass and the concept of the mole related to number of particles, and atomic mass	AO2/3 short answer questions
		The living world 9.7.3 Explain the cell as a basic unit of life.	AO1/2/3 short and extended answer questions about the importance and function of cells and cell structures
		9.7.4 Describes the differences between prokaryotic and eukaryotic cells and organisms.	
		9.7.5 Describe the differences and similarities between single cell and multicellular organisms;	
		9.7.6 Explain cell structures and their functions: cell membrane and cell wall, cell organelles and cell inclusions; chloroplast, mitochondria, vacuoles, endoplasmic reticulum, Golgi apparatus; nucleus, chromosomes.	
		Movement and force 9.7.7 Explain motion in terms of distance, displacement and velocity.	AO1/2/3 short and extended answer questions about the motion of bodies
		9.7.8 Explain uniform and non-uniform motion along a straight line and acceleration. Construct and interpret distance-time and velocity-time graphs for uniform motion and uniformly accelerated motion.	
		9.7.9 Explain simple uniform circular motion in terms of the forces acting on a body.	AO1/2/3 short answer questions about force, inertia and momentum
		9.7.10 Explain the relationship between force and motion using Newton's Laws of Motion, and Action and Reaction forces.	
		9.7.11 Explain the concept of inertia of a body and relate Inertia to acceleration and mass.	AO2/3 short answer questions about gravity, mass and weight
		9.7.12 Explain momentum in terms of force and velocity and conservation of momentum when objects collide.	

9.7.13 Explain the force of gravity covering the Universal Law of Gravitation, force of gravitation of the earth (gravity), acceleration due to gravity; the difference between mass and

- weight; and the acceleration of an object in free fall.

9.7.14 Explain the principles of floatation covering thrust and pressure. Explain Archimedes' Principle and buoyancy of an object and the concept of density and that relative density causes some object to float and others to sink.

9.7.15 Work, energy and power: Explain the relationship between work done by a force, energy, and power. Identify and explain kinetic and potential energy and how one can be transformed into the other related to the Law of conservation of energy. Explain how energy can be lost from a system, usually as heat.

9.7.16 Sound: Explain the nature of sound and its propagation in various media, how the speed of sound varies, the range of hearing in humans; what ultrasound is and its uses and how reflection of sound causes an echo and this is the principle behind SONAR. Describe the structure of the human ear (auditory aspect only).

9.8 Measure physical properties

select and use appropriate devices for measuring physical quantities. They may be encouraged to find the minimum and maximum value that can be measured by an instrument and note down the readings correctly.

- measures physical quantities using appropriate apparatus, instruments, and devices, such as, weight and mass of an object using spring balance, mass using a physical balance, time period of a simple pendulum, volume of liquid using measuring cylinder, temperature using thermometer, etc.

Nature of matter

9.8.1 Describe how to measure the melting point and boiling point of a substance using a thermometer

9.8.2 Describe how to measure the mass of a substance (in order to calculate the number of moles)

The living world

9.8.3 Describe how to measure the size of cells under a microscope

Movement and force

9.8.4 Describe how to measure the distance travelled by an object in a given time

9.8.5 Describe how to measure the mass and volume of an object (in order to calculate density)

9.8.6 Describe how to measure force applied to an object using a Newton meter

9.8.7 Describe how to measure speed of a wave in a slinky or string.

Environment

9.8.9 Describe how to measure rainfall using a simple rain gauge

9.8.10 Describe how to measure the frequency, wavelength and amplitude of a given sound wave

Food

9.8.11 Describe how to measure the growth and yield of plant crops under different conditions

AO1/4 short answer and objective questions about the best equipment to use, the process to follow, how to read a scale, measurement accuracy and reliability and repeating measurements

9.9 Application of scientific theories and concepts	9.9a applies scientific concepts in daily life and solving problems, such as, separation of mixtures, uses safety belts in automobiles, covers walls of large rooms with sound absorbent material, follows intercropping and crop rotation, takes preventive measures to control disease causing agents, etc. 9.9b applies learning to hypothetical situations, such as, weight of an object at moon, weight of an object at equator and poles, possibility of life on other planets, etc.	**Nature of matter** 9.9.1 Explain how to separate mixtures of solids using differences in solubility 9/9.2 Explain how to separate liquids using distillation and fractional distillation including desalination of water for drinking and irrigation and fractional distillation of crude oil.	AO1/2 short answer question with known and unknown substances and their solubility
		The living world 9.9.3 Identify actions to prevent spread of disease	AO2 data response questions
		Movement and force 9.9.4 Explain how an inertia reel seat belt works 9.9.5 Explain how the volume of sound can be reduced using sound absorbent materials 9.9.6 Explain why the weight of an object varies on different planets	AO1 short or extended response questions
		Environment 9.9.7 Explain the impact of industry and agriculture on the environment in the form of pollution – Acid rain from burning and metal production, ozone depletion caused by CFCs, industrial effluent discharge into rivers poisoning wildlife, fertiliser run off promoting eutrophication of water courses, pesticides and drugs used in farming poisoning animals because of bioaccumulation. 9.9.8 Explain how water can be purified for personal use.	AO2/4 short answer or extended response questions
		Food 9.9.9 Explain how crop yields can be increased by optimising nutrient levels 9.9.10 Explain how nutrient deficiency impacts plans and animals	AO2/4 short answer or extended response questions

• collect information from books, e-books, magazines, internet, etc., to appreciate the efforts of scientists made over time, for example, various models of atoms, discovery of microscope, etc., and showcase it in the form of a project or role play.

9.10 Draws conclusions	9.10 draws conclusion, such as, classification of life forms is related to evolution, deficiency of nutrients affects physiological processes in plants, matter is made up of particles, elements combine chemically in a fixed ratio to form compounds, effect of action and reaction on two different bodies, etc.	**Nature of matter** 9.10.1 Identify the atomic structure from atomic mass and atomic number (up to number 20 in the periodic table) 9.10.2 Derive the formula of a compound from given valency data	AO1 short answer questions
			AO2 short answer questions
		The living world 9.10.3 Use a dichotomous key to classify an unknown organism 9.10.4 Identify a cell type from its features	AO2 short answer questions
		Movement and force 9.10.5 Identify the effects of different forces on an object 9.10.6 Identify the effects of an object colliding with another object. 9.10.7 Explain how circular motion occurs	AO2/4 short answer questions
		Environment 9.10.8 Identify what will happen in a bio-geo chemical cycle if one of the flows changes	AO1 short answer questions
		Food 9.10.9 Identify positive and negative aspects of organic and intensive farming.	AO2/4 short or extended answer questions
			AO1/2/4 evaluation and data response questions

| **9.11 Describes scientific discoveries** | 9.11 describes scientific discoveries and inventions, such as, discovery of various atomic models, discovery of cell with invention of microscope, experiments of Lavoisier and Priestley, beliefs regarding motion, discovery of real cause for peptic ulcers, Archimedes principle, classification of living things, etc. | **Nature of matter**

9.11.1 Describe the history of atomic models from Dalton's spherical atoms, to Thomson's plum pudding model, Rutherfoprd's nuclear atom and Chadwick's discovery of the neutron.

The living world

9.11.2 Discovery of cells using early microscopes

9.11.3 Linnaeus work on classifying organisms – the binomial system.

9.11.4 Discovery of sources of infection - bacteria for peptic ulcers, protist transmitted by mosquitos for malaria

9.11.5 Discovery of vaccines – Jenner, Lister and Salk

9.11.6 Discovery of penicillin

Movement and force

9.11.7 Discovery of Archimedes Principle

9.11.8 Discovery of gravity and Newton's work on the laws of motion

Environment

9.11.9 Discovery of the holes in the ozone layer at the poles and Montreal protocol for the protection of the ozone layer

9.11.9 Impact of DDT on bird life championed by Rachel Carson

Food

9.11.10 Discovery of crop rotation

9.11.11 Invention of artificial fertilisers to replace manure and guano

9.11.12 Impact of Diclofenac (anti-inflammatory drug for livestock) on vulture populations | All AO1 Short answer or objective questions recalling the history of science |

• observe various technological devices and innovative exhibits such as waste management kits, water filtration system, using low-cost or no-cost eco-friendly materials, develop them and showcase it in science exhibitions, clubs and parent-teacher meets.	• designs models using eco-friendly resources, such as, 3D model of a cell, water purification system, stethoscope, etc.	Not assessable in a written exam at this level as it requires devices to be available or models to be created so should be covered in internal teacher assessments.	Not assessed
9.12 Evaluates evidence share and discuss their beliefs and views regarding myths, taboos, superstitions, etc., by initiating an open-ended debate, leading to the alignment of their beliefs to the scientifically proven facts. They may also be involved in awareness campaigns in the community.	• exhibits values of honesty, objectivity, rational thinking, freedom from myths, superstitious beliefs while taking decisions, respect for life, etc., such as, records and reports experimental data exactly, myth that sexually transmitted diseases are spread by casual physical contact, belief that vaccination is not important for the prevention of disease etc. • communicates the findings and conclusions effectively, such as, those derived from experiments, activities, and projects both in oral and written form using appropriate figures, tables, graphs, and digital forms, etc.	9.12.1 Designs experiments to be a fair test and collect accurate and reliable data 9.12.2 Analyses data objectively and without bias 9.12.3 Reviews sources of information and subjects them to scrutiny about their reliability and potential bias before drawing conclusions **The living world** 9.12.4 Understands how disease is transmitted 9.12.5 Understands the benefits and risks of vaccination and the misinformation which exists about vaccination. **Environment** 9.12.6 Understand different interest groups positions on global warming and how they portray information. Reasons why people may be climate change deniers. **Food** 9.12.7 Understands the positions adopted by people about the benefits and risks of intensive and organic farming. 9.12.8 Understands the debate about vegetarianism/veganism and the impact of animal production on climate and resource use.	AO4 short answer and data analysis questions evaluating scientific method AO4 short answer and extended response questions analysing positions and arguments for and against them to draw conclusions

Class X

The learners may be provided with opportunities individually or in groups and encouraged to —

10.1 Scientific classification

- recognise the difference between reactions, such as, exothermic and endothermic, oxidation and reduction, etc.

- nvestigate the ways of segregation of waste material on the basis of their degradation property. They may be encouraged to practice the segregation of waste before disposal at home, school, and public places.

The learner —

- differentiates materials, objects, organisms, phenomena, and processes, based on, properties and characteristics, such as, autotrophic and heterotrophic nutrition, biodegradable and non-biodegradable substances, various types of reactions, strong and weak acids and bases, acidic, basic, and neutral salts using different indicators, real and virtual images, etc.

- classifies materials, objects, organisms, phenomena, and processes, based on properties and characteristics, such as, metals and non-metals, acid and bases on the basis of their physical and chemical properties.

Chemical substances

10.1.1 Define types of chemical reactions: combination, decomposition, displacement, double displacement, precipitation, neutralization, oxidation and reduction.

10.21.2 Define oxidation and reduction in terms of loss and gain of electrons

10.1.3 Define acids and bases

10.1.4 Define elements as metals and non-metals and relate this to their position in the periodic table and their properties

10.1.5 Define bonding as ionic, covalent and metallic and relate this to physical and chemical properties.

10.1.6 Classify carbon compounds as alkanes, alkenes alkynes, alcohols, carboxylic acids, ketones, aldehydes

10.1.7 Define hydrocarbons as being saturated or unsaturated

10.1.8 Define homologous series prefixes of carbon compounds up to 10 carbon atoms long

Living world

10.1.9 Define a "Living Being" and the characteristics living organisms share

10.1.10 Define photosynthesis and respiration

10.1.11 Define actions in animals as being voluntary, involuntary and reflex.

10.1.12 Identify the differences between hormonal and nervous controls in animals

10.1.13 Define reproduction as sexual and asexual

Natural phenomena

10.1.14 Defines reflection and refraction

10.1.15 Identifies convex and concave lenses

10.1.16 Define focal length for a concave spherical mirror and convex spherical lens

10.1.17 Differentiate between real and virtual images

Predominantly short answer or objective AO1 questions testing recall of knowledge through definitions and descriptions

Effects of current

10.1.18 Define current, potential difference, resistance and power.

10.1.19 Identify the factors which control the strength of a magnetic field in a coil (radius of the coil, number of turns in the coil, the current flowing through the coil)

10.1.20 Define an electric motor and an electric generator

10.1.21 Identify the features of AC and DC

Natural resources

10.1.21 Define an ecosystem in terms of communities of organisms interacting with abiotic factors.

10.1.22 Define primary producers, primary and secondary consumers in food chains and webs

10.1.23 Define substances as biodegradable and non-biodegradable

| **10.2 Scientific investigation**

• observe to understand the difference in the temperatures in both the reactions using laboratory thermometer. | • plans and conducts investigations and experiments to arrive at and verify the facts, principles, phenomena, or to seek answers to queries on their own, such as, investigates conditions necessary for rusting, tests the conductivity of various solutions, compares the foaming capacity of different types of soap samples, | **Chemical substances**

10.2.1 Describe how to finding the pH of the following samples by using pH paper/universal indicator:

(i) Dilute Hydrochloric Acid

(ii) Dilute sodium Hydroxide solution

(iii) Dilute Ethanoic Acid solution

(iv) Lemon juice

(v) Water

(vi) Dilute Hydrogen Carbonate solution

10.2.2 Describe and explain the properties of acids and bases (HCl & NaOH) on the basis of their reaction with: | Assessment of practical skills in the written test applies to potentially all practical examples :

AO1 recall methods, short or extended answers, sequencing questions, naming and identifying suitable apparatus, features, etc |

- verifies laws of reflection and refraction of light, Ohm's law, etc. Do variegated leaves perform photosynthesis? Which gas is evolved during fermentation? Why does the shoot of a plant move towards light?

i) Litmus solution (Blue/Red)

ii) Zinc metal

iii) Solid sodium carbonate

10.2.3 Describe how to perform the following practical activities and classify the reactions as:

- Combination reaction
- Decomposition reaction
- Displacement reaction
- Double displacement reaction

(i) Action of water on quicklime

(ii) Action of heat on ferrous sulphate crystals

(iii) Iron nails in copper sulphate solution

(iv) Reaction between sodium sulphate and barium chloride solutions

10.2.4. Describe the reactions seen for Zn, Fe, Cu and Al metals on the following salt solutions:

i) $ZnSO_4(aq)$

ii) $FeSO_4(aq)$

iii) $CuSO_4(aq)$

iv) $Al_2(SO_4)_3(aq)$

and arrange Zn, Fe, Cu and Al (metals) in the decreasing order of reactivity based on the above results.

10.2.5 Describe the processes for investigating the following properties and reactions of acetic acid (ethanoic acid):

i) Odour

ii) solubility in water

iii) effect on litmus

iv) reaction with Sodium Hydrogen Carbonate

10.2.6. Explain how to carry out an investigation of the comparative cleaning capacity of a sample of soap in soft and hard water.

AO2 reviewing similar experiments and applying knowledge to them – short answer questions

AO3 analysing data from experiments, drawing graphs, interpreting tables and graphs, identifying anomalous results, in short answer and extended response questions.

AO4 critiquing experiment design and methods, drawing conclusions from results in short answer and extended response questions

with the help of prepared slides and explain how they reproduce.

10.2.10. Draw describe and identify the different parts of an embryo of a dicot seed (Pea, gram or red kidney bean) from grown/germinated seeds and sprouts.

Natural phenomena

10.2.11 Explain how to determine of the focal length of

i) Concave mirror

ii) Convex lens

by obtaining the image of a distant object.

10.2.12 Describe an experiment to measure the angle of incidence, angle of refraction, angle of emergence by tracing the path of a ray of light passing through a rectangular glass slab for different angles of incidence and interpret the result.

10.2.13. Trace the path of the rays of light through a glass prism onto a piece of paper.

10.2.14. Finding the image distance for varying object distances in case of a convex lens and drawing corresponding ray diagrams to show the nature of image formed.

Effects of current

10.2.15 Explain how to study the relationship between potential difference (V) across a resistor on the current (I) passing through it and determine its resistance. Plot a graph showing the relationship between of V and I for a resistor.

10.2.16 Explain how to determine the equivalent resistance of two resistors when connected in series and in parallel.

Note: There will be a focus on carrying out the practical activities safely and using the correct equipment effectively

Living world

10.2.7 Describe how to prepare a temporary mount of a leaf peel to show stomata and identify the features seen under a microscope.

10.2.8 Design and describe an experiment to show that carbon dioxide is given out during respiration.

10.2.9 Describe :

i) binary fission in Amoeba, and

ii) budding in yeast and Hydra

10.3 Causal effects – processes and phenomena • find out 'why' and 'how' of processes or phenomena, such as, transportation in plants and animals, extraction of metals from ores, with the help of activities, experiments, and demonstration. The learners may be encouraged to discuss, relate, conclude and explain processes or phenomena to their peers using interdisciplinary approach.	• explains processes and phenomena, such as, nutrition in human beings and plants, transportation in plants and animals, extraction of metals from ores, placement of elements in modern periodic table, displacement of metals from their salt solutions on the basis of reactivity series, working of electric motor and generator, twinkling of stars, advanced sunrise and delayed sunset, formation of rainbow, etc • relates processes and phenomena with causes and effects, such as, hormones with their functions, tooth decay with pH of saliva, growth of plants with pH of the soil, survival of aquatic life with pH of water, blue colour of sky with scattering of light,	**Chemical substances** 10.3.1 Explain how chemical reactions involving the following mechanisms take place: combination, decomposition, displacement, double displacement, precipitation, neutralization, oxidation and reduction. 10.3.2 Explain the properties of metal and non-metal elements and relate this to their atomic structure and bonding. 10.3.3 Explain how the properties and reactivity of elements change down groups and along periods of the periodic table and link this to their atomic structure. 10.3.4 Explain how the reactivity series of metals is linked to their atomic structure and position in the periodic table. 10.3.5 Explain how copper, iron and aluminium are extracted from their ores (Chalcopyrite, Magnetite and Bauxite) and the conditions required and reactions which take place. 10.3.6 Explain how corrosion of iron occurs, the conditions required and the methods of preventing it. 10.3.7 Explain how neutralisation reactions produce salts 10.3.8 Explain the chemical properties of carbon compounds and how they react in combustion, oxidation, addition and substitution reactions.	AO1/2 short answer questions on different reaction types AO1 short answer questions AO1 short answer questions AO1/2 short answer and listing type questions AO1/2/4 short and extended answer questions AO2/3 short answer questions

• deflection of compass needle due to magnetic effect of electric current, etc.	**Living world** 10.3.9 Explain the processes of photosynthesis and respiration in plants and respiration in animals	AO1/2 short answer questions
	10.3.10 Explain tropic movements in plants being caused by external stimuli and relate this to hormone controls – phototropism in shoots and gravitropism in roots of a developing plant related to auxin distribution, chemotropism in the development of the pollen tube during fertilisation in response to sugars.	AO1/2 short answer questions
	10.3.11 Explain the movements of nutrients in plants and animals through nutrition, transport respiration and excretion including the source of nutrients in plants and different categories of animals (herbivore and carnivore) and the importance of balanced nutrient intake.	
	10.3.12 Explain how control and movement in animals occurs and is co-ordinated in through the nervous system.	AO1/2/3/4 short answer and extended response questions on theory and analysing nutrient flows
	10.3.13 Explain how hormones regulate systems in humans: insulin, growth hormones, adrenaline, testosterone (in males) and oestrogen (in females).	
	10.3.14 Explain how sexual reproduction leads to features of both parents being present in the offspring through the transfer of genes.	AO1/2 short answer and extended response questions
	10.3.15 Explain the laws of inheritance linked to the features of the offspring for a monohybrid cross	
	10.3.16 Explains how the sex of an offspring is determined.	AO1/2/3 short answer questions
	10.3.17 Explain how organisms evolve to adapt to their environment through genetic mutation, inheritance and survival of the fittest leading to natural selection.	
	Natural phenomena 10.3.18 Explain how an image is formed by a spherical mirror	
	10.3.19 Explain why light is refracted when passing between two media	

	10.3.20 Explain how an image is formed by a spherical lens.	AO1/2/4 short answer and extended response questions
	10.3.21 Explain why light is dispersed to create a spectrum by a glass prism	
	Effects of current	
	10.3.22 Identify the relationships between current, potential difference, resistance and power.	AO1 short answer questions including drawings
	10.3.23 Explain the factors which govern the resistance of a conductor (material, length, cross sectional area and temperature).	
	10.3.24 Explain the impact of resistors in series and in parallel on the resistance of a simple circuit.	
	10.3.25 Explain how an electric current flowing through a wire heats the wire.	
	10.3.26 Explain the structure of a magnetic field using a bar magnet as a model.	AO1/2 short answer questions including drawings
	10.3.27 Explain how an electric wire creates a magnetic field and causes a motor effect the direction of which is determined using Fleming's left hand rule.	
	10.3.28 Explain how a wire coil creates a magnetic field in a solenoid and an electromagnet.	
	10.3.29 Explain how an electric motor works.	
	10.3.30 Explain how the movement of a magnet in a coil of wire generates a current and Flemming's right hand rule is used to determine the direction of the current.	
	10.3.31 Explain how AC current is produced (in a generator).	
	Natural resources	AO2/3 short answer analysis questions
	10.3.32 Explain major environmental problems and their causes, impacts and solutions which can be implemented – desertification, deforestation, water deficit, waste production.	

10.4 Using data and calculating answers

- study how chemical equations are balanced using simple mathematical skills. Discussion may be conducted on the significance of balancing of chemical equations.

- derive equations, formulae, laws, etc. For example, the derivation for formula of the equivalent resistance of resistors in series (or parallel). They should be encouraged to practice the derivation till they are confident.

- get familiar with New Cartesian Sign Convention using illustrated cards and may be given ample opportunities to apply the sign convention in various situations of reflection by spherical mirrors

- calculates using the data given, such as, number of atoms in reactants and products to balance a chemical equation, resistance of a system of resistors, power of a lens, electric power, etc.

- derives formulae, equations, and laws, such as, equivalent resistance of resistors in series and parallel, etc.

Chemical substances

10.4.1 Balance chemical equations

10.4.2 Calculate mass and percentage yields of metals from ores.

Living world

10.4.3 Calculate numbers of offspring with different characteristics using laws of heredity.

Natural phenomena

10.4.4 Using the mirror formula calculate object distance, image distance and focal length of a concave spherical mirror.

10.4.5 Calculate the magnification of a concave spherical mirror.

10.4.6 Using the lens formula calculate object distance, image distance and focal length of a convex spherical lens.

10.4.7 Calculate the magnification and power of a convex spherical lens.

10.4.7 Use the Law of Refraction to calculate the angle of incidence and angle of refraction and refractive index

Effects of current

10.4.8 Use Ohm's Law to calculate current, potential difference and resistance

10.4.9 Use Joule's Law to calculate power, current and resistance

10.4.10 Use *force = magnetic flux density x current x length* in calculations of motor effect force.

Natural resources

10.4.11 Calculate proportions of energy production by energy type for a given country or region

10.4.12 Calculate overall energy efficiency of a system

AO2/3 short answer questions

AO2/3 short answer questions

AO2/3/4 short answer questions

AO2/3/4 short answer questions

AO2/3 short answer questions ion given data

10.5a Draw and present information

- observe diagrams, such as that of digestive system and the names given to various organs. The learners may be motivated to make poster of the digestive system for displaying in school. They may also be provided opportunities to use ICT tools for drawing.

10.5b Analyse and interpret data

- collect wide variety of graphs from newspapers, magazines, or the internet, with a view to understand the information contained therein. The learners may be facilitated to draw a graph, such as V-I graph for analysing the relationship between the potential difference across a conductor and the current through it.

- draws labelled diagrams, flow charts, concept maps, and graphs, such as, digestive, respiratory, circulatory, excretory, and reproductive systems, electrolysis of water, electron dot structure of atoms and molecules, flow chart for extraction of metals from ores, ray diagrams, magnetic field lines, etc.

- analyses and interprets data, graphs, and figures, such as, melting and boiling points of substances to differentiate between covalent and ionic compounds, pH of solutions to predict the nature of substances, V-I graphs, ray diagrams, etc.

Chemical substances

10.5.1 Draw and label a diagram showing ionic and covalent bonding (a dot-cross diagram)

10.5.2 Draw and label a diagram of a blast furnace

10.5.3 Draw and label a diagram of an electrolysis cell for aluminium and copper

10.5.4 Draw and label a diagram of fractional distillation of crude oil

10.5.5 Draw structures of simple alkanes, alkenes, alkynes, chloroethane, ethanol, ethanoic acid, ethanal (acetaldehyde) and propanone (acetone).

Living world

10.5.6 Draw and label diagrams showing the flow of nutrients in plants and animals.

10.5.7 Draw and label diagrams showing the main development features of a human foetus in each trimester

10.5.8 Draw diagrams of inheritance

10.5.9 Interpret heredity data

Natural phenomena

10.5.10 Draw and label ray diagrams of spherical mirrors.

10.5.11 Draw and label ray diagrams of spherical lenses

10.5.12 Draw and label a diagram of refraction across a media interface

10.5.13 Draw and label a diagram of dispersal of light through a prism.

10.5.14 Draw and label the structure of the human eye.

Effects of current

10.5.15 Draw a graph of current variation for an AC and DC generator

10.5.16 Draw magnetic field lines produced by a bar magnet, a solenoid and electromagnet.

10.5.17 Draw and label simple circuit diagrams for a domestic circuit

AO2 short answer and drawing questions. Could be given a diagram and asked to name the parts or be asked to draw and label a diagram.

AO3 short answer question on ratios of offspring features

AO3 questions on drawing and interpreting graphical data

AO3 questions on drawing and interpreting graphical data

Natural resources

10.5.18 Draw and label diagrams showing the main features of an ecosystem.

10.5.19 Draw or interpret a food chain or food web

10.5.20 Plot and interpret graphs of changing energy use over time.

10.5.21 Analyse data on impacts of changes on the environment

10.6 Understanding scientific theories and conventions

This is not explicitly called out in the NCERT class X curriculum but it mirrors the approach in class IX and helps define the basic concepts needed which underpin many of the other aspects of the assessment content.

Chemical substances

10.6.1 Write balanced word and symbol equations, including phase information for common examples of combination, decomposition, displacement, double displacement, precipitation, neutralization, oxidation and reduction reactions.

10.6.2 Understand the pH scale as a measure of concentration of hydrogen ions and relate it to furnishing of H^+ and OH^- ions and the properties of acids and bases

10.6.3 Understand that the periodic table is based on the atomic structure of the elements and that the variation in properties shown (melting and boiling point, the valency and reactivity and atomic number and RAM) are related to this structure and hence the position in the table.

Living world

10.6.4 Explain gene theory and the role of chromosomes and DNA.

10.6.5 Explain the theory of evolution and how life has evolved over time using the different species of Galapagos finches to illustrate this.

Natural phenomena

10.6.6 Explain the electromagnetic spectrum in terms of waves and relate the wavelength to the different portions of the spectrum

10.6.7 Explain why light travels in straight lines and how it can be scattered and dispersed.

AO1/2 short answer, objective and gap fill questions.

AO1/2/3/4 short answer or extended response questions

		Effects of current	AO1 short answer or drawing question
		10.6.8 Understand SI units for electricity and magnetism and their relationships	
		Electric current = Amps	AO1 short answer questions
		Potential Difference = Volts	
		Resistance = Ohms	
		Magnetic flux density = Tesla	
		Electrical energy = Joules	
		Power = Watts = Joules per second	
		Natural resources	AO2/3/4 short answer or extended response questions – comparison between fuels, case studies.
		10.6.9 Explain how different forms of energy are created and used – fossil fuels, nuclear, solar energy, biogas, ethanol wood/biomass, wind, water and tidal and describe the advantages and disadvantages of each.	
10.7 Measure physical properties • explore the relationship between two physical quantities, such as, between potential difference across a conductor and electric current flowing through it; design, conduct, and share the findings of an activity	• handles tools and laboratory apparatus properly; measures physical quantities using appropriate apparatus, instruments, and devices, such as, pH of substances using pH paper, electric current and potential difference using ammeter and voltmeter, etc.	**Chemical substances** 10.7.1 Describe how to measure mass of reactants accurately using top pan balance, measuring cylinder. **Natural phenomena** 10.7.2 Describe how to measure focal length, object and image height, and object and image distance for a concave spherical mirror and convex spherical lens. 10.7.3 Describe how to measure angle of incidence and angle of reflection of light at a media interface. **Effects of current** 10.7.4 Understand how to measure, current and potential difference using a multimeter or ammeter and voltmeter. **Natural resources** 10.7.5 Explain how to measure rainfall and temperature	AO1/4 short answer and objective questions about the best equipment to use, the process to follow, how to read a scale, measurement accuracy and reliability and repeating measurements

10.8 Application of scientific theories and concepts

- perform a role-play on ecosystem in a hypothetical situation, such as, what will happen if all herbivores suddenly vanish from earth. This may be followed by a discussion about how the loss of biodiversity disrupts the food chain hereby adversely affecting the energy flow in an ecosystem.

- applies scientific concepts in daily life and solving problems, such as, suggest precautions to prevent sexually transmitted infections, uses appropriate electrical plugs (5/15A) for different electrical devices, uses vegetative propagation to develop saplings in gardens, performs exercise to keep in good health, avoids using appliances responsible for ozone layer depletion, applies concept of decomposition reaction of baking soda to make spongy cakes, etc.

- applies learning to hypothetical situations, such as, what will happen if all herbivores are removed from an ecosystem? What will happen if all non-renewable sources of energy are exhausted?

Chemical substances

10.8.1 Explain the importance of pH in every day life:

- soil pH governs solubility of nutrient ions which effects plant growth
- acid foods cause tooth decay
- stomach acid in digestion of food
- acidified rainwater dissolves rocks in weathering
- alkaline substances are used in many cleaning agents
- animals and plants secrete acid and alkaline substances as a defence against attack

AO2/3 short answer questions

AO2/3 short answer questions

10.8.2 Explain how iron, copper and aluminium are extracted from their ore at an industrial scale and the environmental impact.

AO1 short answer and drawing question

10.8.3 Explain how rusting of iron can be prevented

AO1/2/3 short answer questions

10.8.4 Explain how crude oil is distilled to produce different fractions and the uses of those fractions related to their boiling points.

10.8.5 Describe the preparation, properties and applications of sodium hydroxide, bleach, baking soda, washing soda and plaster of Paris

AO1 short answer question

10.8.6 Describe the properties and uses of soaps and detergents.

10.8.7 Describe the properties and uses of ethanol and ethanoic acid

AO2/3/4 short answer questions

Living world

10.8.8 Explains how the processes of photosynthesis, respiration, transport and excretion in animals and plants sustain life.

AO1/2 short answer questions

10.8.9 Explains how the theory of evolution and genetics in terms of selective breeding of plants and animals for agriculture.

10.8.10 Explain how genetic modification is used in agriculture and describe the advantages and disadvantages of the approach.

10.8.11 Explains how problems with hormone production can impact on human health – insulin and diabetes (types I and II), growth hormone imbalances cause gigantism and dwarfism and the formation of goitres.	AO1 short answer/drawing question
10.8.12 Describes the methods of contraception in humans and the importance of safe sex in relation to sexually transmitted diseases and HIV/ AIDS.	AO1/2 short answer/drawing question
Natural phenomena	AO2 short answer question
10.8.13 Explain how the human eye works to gather images.	
10.8.14 Explain how sight defects can occur (long and short sightedness) and how they can be corrected.	AO2 short answer and objective questions
10.8.15 Explain the use of lenses in microscopes and telescopes	
10.8.16 Explain the use of mirrors in telescopes.	
10.8.17 Explain how rainbows are formed and why the sky is blue and becomes red at sunset	
Effects of current	AO2/4 short answer and extended response questions
10.8.18 Explain how electric heaters work and their use in hair dryers, water immersion heaters, and room heaters.	
10.8.19 Explain how a generator is used to produce electricity to recharge a battery in a car.	
10.8.20 Explain how speakers produce sound.	
10.8.21 Explain why high voltage supply is used in electricity distribution systems.	
10.8.22 Explain the advantages of AC over DC.	AO2/3/4 short answer and objective questions, case study analysis questions
Natural resources	
10.8.23 Explain the greenhouse effect and how human activities contribute to global warming through burning fossil fuels, agriculture and industry linked to the greenhouse effect of different atmospheric gases – methane and carbon dioxide.	

		10.8.24 Explain the importance of reducing fossil fuel usage and the global impact on the planet.	
		10.8.25 Explains the importance of resource conservation and methods for achieving it – reduce, replace, reuse, recycle.	
		10.8.26 Explain how giving people a stake in their environment can support conservation.	
		10.8.27 Explain the advantages and disadvantages of large dam projects.	
10.9 Draws conclusions • study the features inherited through genes, such as, attached or free earlobes. They may be encouraged to observe and compare the earlobes of their friends with the earlobes of their parents and grandparents to arrive at the conclusion that characters or traits are inherited in offspring from their parents.	• draws conclusion, such as, traits or features are inherited through genes present on chromosomes, a new species originates through evolutionary processes, water is made up of hydrogen and oxygen, properties of elements vary periodically along the groups and periods in periodic table, potential difference across a metal conductor is proportional to the electric current flowing through it, etc.	**Chemical substances** 10.9.1 Identify products of different reactions involving combination, decomposition, displacement, double displacement, precipitation, neutralization, oxidation and reduction reactions 10.9.2 Identify relative reactivity of a metal given chemical reaction data 10.9.3 Identify different properties of elements given data on those elements near by in the periodic table – melting point, boiling point, valency. **Living world** 10.9.4 Identify the impact of changes in hormone levels in a system 10.9.5 Predict proportion of features in offspring given genetic data. **Natural phenomena** 10.9.6 Identify the power and magnification of optical instruments from given data **Effects of current** 10.9.7 Identifies direction of motion in motors and direction of current in generators from given diagrams **Natural resources** 10.9.8 Use data and information about different environmental situations to draw conclusions and justify recommendations – Major dam construction, logging and forest clearance for agriculture and industrial development impacting on local habitat.	AO4 short answer questions, often linked to AO2 or AO3 contexts

10.10 Describes scientific discoveries

- collect print and non-print materials by exploring the library and the internet about scientists and their findings to appreciate how concepts evolved with time. They may be motivated to share their findings by preparing posters and performing role plays or skits.

- takes initiative to know about scientific discoveries and inventions, such as, Mendel's contribution in understanding the concept of inheritance, Dobereiner for discovering triads of elements, Mendeleev for the development of the periodic table of elements, Oersted's discovery that electricity and magnetism are related, discovery of relation between potential difference across a metal conductor and the electric current flowing through it by Ohm, etc

Chemical substances

10.10.1 Describe the developments leading to the modern periodic table:

Dobereiner - Law of Triads

Newland - Law of Octaves

Mendeleev – Periodic table

Living world

10.10.2 Mendel's work on heredity in plants

10.10.3 Darwin's and Wallace's work on the theory of evolution.

Natural phenomena

10.10.4 Janssen invention of the microscope

10.10.5 Galileo's use of the telescope in astronomic observations of Jupiter's moons

10.10.6 Newton's splitting of light into the spectrum

Effects of current

10.10.7 Ohm's discovery of the relationship between voltage and current

10.10.8 Oersted's discovery that electricity and magnetism are linked

10.10.9 Farady's work on electromagnetism leading to the electric motor

Natural Resources

10.10.10 Tyndall and the greenhouse effect

Mostly AO1 short answer questions which could be linked to extended response questions on the relevant topic area.

| 10.11 Evaluates evidence | • exhibits values of honesty, objectivity, rational thinking, and freedom from myth and superstitious beliefs while taking decisions, respect for life, etc., such as, reports and records experimental data accurately, says no to consumption of alcohol and drugs, sensitises others about its effect on physical and mental health, sensitises for blood and organ donations, understands the consequences of pre-natal sex determination, etc. | 10.11.1 Designs experiments to be a fair test and collect accurate and reliable data

10.11.2 Analyses data objectively and without bias

10.11.3 Reviews sources of information and subjects them to scrutiny about their reliability and potential bias before drawing conclusions

Living world

10.11.4 Understands the need for balanced nutrition and potential impact if it is not achieved.

10.11.5 Understands the importance of contraception and safe sex and the possible consequences of not following good practice.

Natural resources

10.11.6 Evaluate the competing factors involved in environmental and wildlife exploitation and conservation and the need for sustainable development.

10.11.7 Evaluates evidence for bias for those producing or presenting the evidence about exploitation of natural resources.

10.11.8 Evaluates the advantages and disadvantages of major dam construction. | AO4 short answer questions |

10.12 Uses science to change behaviour

- visit classrooms, laboratories, library, toilets, playground, etc., to identify places where wastage of electricity and water may be occurring. Discussion may be held on importance of natural resources and their conservation, leading to the conviction for adoption of good habits in their day-to-day life. The learners may also organise a sensitisation programme on such issues.

- encourage learners to visit science museums, biodiversity parks, aviaries, zoological parks, botanical gardens, fisheries, poultry farms, factories, etc.

- makes efforts to conserve environment realising the inter-dependency and inter-relationship in the biotic and abiotic factors of environment, such as, appreciates and promotes segregation of biodegradable and non-biodegradable wastes, minimises the use of plastics, takes appropriate steps to promote sustainable management of resources in day-to-day life, advocates use of fuels which produce less pollutants, uses energy efficient electric devices, uses fossil fuels judiciously, etc.

Chemical substances

10.12.1 Explain the impact of metal extraction on the environment and the advantages of recycling – pollution reduction from production and disposal and lower energy use.

Living world

10.12.2 Understands the importance of contraception to help manage the human population to sustainable levels.

10.12.3 Understands the importance of safe sex to limit the spread of sexually transmitted diseases and HIV/AIDS

Effects of current

10.12.4 Understands the importance of the electric generator in relation to the use or renewable energy and impact on the environment.

Natural resources

10.12.5 Understands the importance of ecosystems and the conservation of wildlife as a natural resource, for tourism and as part of maintaining the balance of processes on Earth so that a sustainable environment is created to support life.

10.12.6 Explain how they can change their own behaviour to reduce their impact on the environment and be more sustainable.

This cannot be assessed directly as you cannot assess a behaviour but you can assess whether the student understands how they could change their behaviour to reduce their impact on the environment in AO2/4 short answer and extended response questions. Attitudes and behaviours are best assessed by the class teacher through discussion, debate and group research project activities.

• collect eco-friendly, commonly available materials to design and develop technological devices and innovative exhibits, such as, electric motor, soda acid fire extinguisher, respiratory system, etc. They may be motivated to display their exhibits or models in science exhibitions, science club, classrooms, during parent-teacher meet and to respond to the queries raised during interaction.	• exhibits creativity in designing models using eco-friendly resources, such as, working model of respiratory, digestive, and excretory systems, soda acid fire extinguisher, periodic table, micelles formation, formation of diamond, graphite, and uckminsterfullerene, human eye, electric motor and generator, etc.	Not assessable in a written test at this level as requires access to materials and products. Could be assessed by teachers as part of classroom based activities.
• share their findings of the activities, projects, and experiments, such as, extraction of metals from ores, working of electric motor and generator, formation of rainbow, etc., in oral and written forms. Report writing may be facilitated to share their findings by using appropriate technical terms, figures, tables, graphs, etc. They may be encouraged to draw conclusions on the basis of their observations.	• communicates the findings and conclusions effectively, such as, those derived from experiments, activities, and projects orally and in written form using appropriate figures, tables, graphs, and digital forms, etc.	Covered throughout the assessment so not explicitly listed here as if communication is not clear and effective then no marks can be awarded. Other non-written forms of communication can be assessed by the teacher through presentations, discussions and projects.

CBSE example assessment item - Science-class 6-plant growth

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class	Assessment
Science	6	Science-Class 6

Item purpose

This question assesses the student's understanding of experimental investigation of factors that affect plant growth and how to present data graphically.
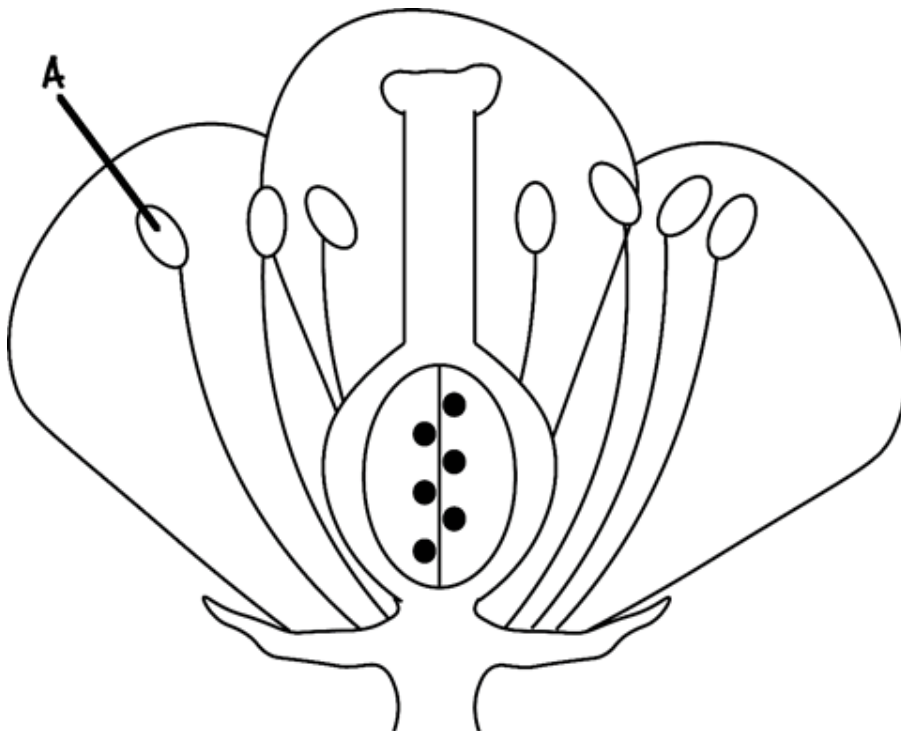
Source

Figure 1 A flower

Rainfall (mm per day)	Mean number of tomatoes per plant
5	0
10	8
15	12
20	6
25	1

Figure 2 Mishka's data on plant growth and rainfall

Question(s)

1 (a) State the name of the flower part labelled A. (1 mark)

1 (b) The waxy cuticle on a leaf allows light through. Select the correct word from the list to describe this property of the waxy cuticle.

• Translucent

• Opaque

• Reflective (1 mark)

Some plants are grown inside glasshouses. In a glasshouse, a farmer can control the amount of light than plants are exposed to by using electric lamps.

You need to design an investigation to find the best distance for an electric lamp to be placed away from a plant to ensure maximum plant growth.

1 (c) (i) Describe how you will control the distance between the plants and the lamp. (1 mark)

1 (c) (ii) Describe how you will measure the growth of the plants. (1 mark)

1 (c) (iii)Identify another variable other than distance from the lamp and amount of water you would need to control to make it a fair test. (1 mark)

1 (d) State one disadvantage of using electric lamps in glasshouses (1 mark)

(Total marks 6)

2 Mishka conducts an investigation of the effect of rainfall on the average number of tomatoes grown by tomato plants. Her data is shown in figure 2.

Plot Mishka's data on the graph paper. (3 marks)

(Total marks 3)

Mark scheme

Point based

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1 (a) State the name of the flower part labelled A.

Answer	Guidance
Anther (1)	Accept stamen

1 (b)

The waxy cuticle on a leaf allows light through. Select the correct word from the list to describe this property of the waxy cuticle.

- Translucent

- Opaque

- Reflective

Answer	Guidance
Translucent (1)	Accept transparent

1 (c) i)

(i) Describe how you will control the distance between the plants and the lamp.

Answer	Guidance
Range of distances / near and far / stated distances; (1)	At least two different distances Mark

1 (c) (ii)

(ii) Describe how you will measure the growth of the plants

Answer	Guidance
Appropriate method, apparatus and units; (1)	Any valid combination based on method e.g. use ruler to measure height in cm / use balance to measure mass in grams. Method, apparatus and units all required for 1 mark.

1 (c) (iii)

(iii) Identify another variable other than distance from the lamp and amount of water you would need to control to make it a fair test.

Answer	Guidance

Any one from:

External light levels (1)

Temperature (1)

Carbon dioxide levels (1)

Amount of watering (1)

Type/species/size of plant (1)

Nutrient levels (1)

1 (d)

State one disadvantage of using electric lamps in glasshouses

Answer	Guidance
Any one from:	
Uses electricity which often produces greenhouse gases/ carbon dioxide (1)	
Expensive for the grower (1)	
May create heat and damage plants (1)	

2

Mishka conducts an investigation of the effect of rainfall on the average number of tomatoes grown by tomato plants. Her data is shown in figure 4.

Plot Mishka's data on the graph paper.

Answer	Guidance
Axes correct orientation and labelled including units (1)	Rainfall on X
	Labels and units copied from table
	All points acurate
Points plotted correctly (1)	Dot-to-dot or curved. Reject line of best fit.
Trend line shown (1)	

AO coverage

Question	AO1	AO2	AO3	AO4
1 (a)	1			
1 (b) (i)	1			
1 (c) (i)		1		
1 (c) (ii)		1		
1 (c) (iii)		1		
1 (d)				1
2			3	
Total	3	3	3	1

Content coverage

Question	Content areas covered
1 (a)	Draw a labelled diagram of the parts of a flower: • Stamen, consisting of anther and filament • Carpel, consisting of stigma and style • Ovule • Petals and sepals
1 (b)	Design investigations of plant growth under various conditions, including light level and the impacts of over and under watering and interpret the results of these experiments.
1 (c)	• Distinguish between materials that are: • Transparent • Translucent • Opaque • Reflective
1 (d)	*Evaluate the social and environmental implications of the use of electricity in light bulbs.*
2	Measure abiotic conditions that affect plant growth, including: • Air temperature in degrees celsius • Rainfall in mm per hour.

# CBSE example assessment item – Science-9-velocity time graph

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class
Science	IX

Item purpose

The purpose of the item is to assess whether students understand and can interpret a velocity time graph and use one to calculate distance and acceleration and then link it to calculate kinetic energy of an object.

Source
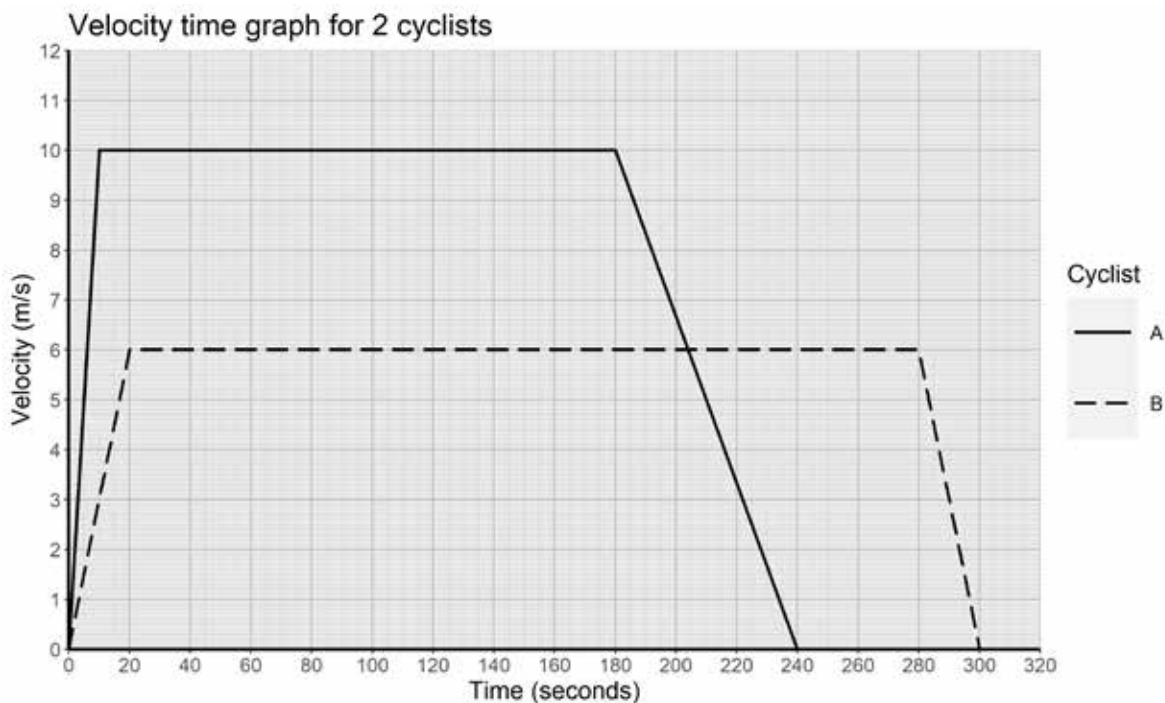
Velocity time graph for two cyclists

Question(s)

1 Study the velocity time graph of two cyclists travelling along a flat straight road and answer the questions below.

    1 (a) Which cyclist decelerated most rapidly?   (1 mark)

    1 (b) Calculate the maximum rate of acceleration of cyclist B   (1 mark)

    1 (c) Calculate the average velocity for the complete journey for cyclist A   (1 mark)

    1 (d) Which cyclist travels furthest and how far do they travel?   (2 marks)

    1 (e) Cyclist B weighs 80 kg and their bike weighs 15 kg. Calculate the kinetic energy of the cyclist and their bike when at maximum velocity?   (2 marks)

    1 (f) Explain 1 reason why cyclist B uses more energy than the kinetic energy you calculated?

                                        (1 mark)

(Total marks 8)

Mark scheme

1 (a) Which cyclist decelerated most rapidly?	
Answer	**Guidance**
B	

1 (b) Calculate the maximum rate of acceleration of cyclist B?	
Answer	**Guidance**
0.3 m/s^2	Must have correct units for the mark – accept ms^{-2}

1 (c) Calculate the average velocity for the complete journey for cyclist A?	
Answer	**Guidance**
5.6 m/s	Must have correct units for the mark – accept ms^{-1}

1 (d) Which cyclist travels furthest and how far do they travel?	
Answer	**Guidance**
A (1)	Must have correct units for the mark
2175 m or 2.175 km (1)	Accept +/- 50m
	Accept rounding withing the range given

1 (e) Cyclist B weighs 80 kg and their bike weighs 15 kg. Calculate the kinetic energy of the cyclist and their bike when at maximum velocity?	
Answer	**Guidance**
1710 J or 1.71 KJ (2)	2 marks for correct answer with no workings
KE= ½ mv^2 or KE= ½ x 95 x 6^2(1)	1 mark for correct formulae either in symbols or in figures even if answer is incorrectly calculated

1 (f) Explain 1 reason why cyclist B uses more energy than the kinetic energy you calculated?

Answer	Guidance
The cyclist expends energy that doesn't get transferred to the movement of the bike e.g. heat loss or they have to overcome wind resistance or friction.	1 mark for stating the system loses energy and a reasonable example of this. No marks for the cyclist is going up a hill (as the road is flat). No mark for just stating the system loses energy

AO coverage

Question	AO1	AO2	AO3	AO4
1 (a)			1	
1 (b)		1		
1 (c)		1		
1 (d)		1	1	
1 (e)		1	1	
1 (f)				1
Total	**0**	**4**	**3**	**1**

Content coverage

Question	Content areas covered
1 (a)	9.6.8 Draw and interpret distance -time and velocity-time graphs
1 (b)	9.5.5 Calculate velocity, distance, time and acceleration from given data
1 (c)	9.5.5 Calculate velocity, distance, time and acceleration from given data
1 (d)	9.6.8 Draw and interpret distance -time and velocity-time graphs 9.5.5 Calculate velocity, distance, time and acceleration from given data
1 (e)	9.5.11 Calculate potential and kinetic energy
1 (f)	9.4.10 Explain the law of conservation of energy and energy transformations

CBSE example assessment item - Science- Class X-plant growth

This example assessment item illustrates the type of approach that is taken to end of class assessments for CBSE schools.

Subject	Class
Science	X

Item purpose

The question assesses the students understanding of the process of extraction of iron from its ore, the chemical reactions which underpin this and the potential impact on the environment.

Question(s)

1 Iron is extracted from its ore by heating it with carbon.

   1 (a) Complete and balance the equation below to show this reaction, including the state symbols.

   $Fe_3O_{4\ (s)} + C_{(s)}$ $Fe + $ _____   (3 marks)

   1 (b) What type of reaction does the iron ore undergo to produce the iron?

   Decomposition

   Neutralisation

   Oxidation

   Reduction

   (1 mark)

   1 (c) In a blast furnace iron ore, coke and limestone are used to produce iron. Draw a labelled diagram of a blast furnace showing the inputs and outputs to the furnace. (4 marks)

   1 (d) Explain why limestone is added to the iron ore and coke in the blast furnace. (1 marks)

   1 (e) A company is planning to build a blast furnace near an area of forest and some homes on the edge of the city.
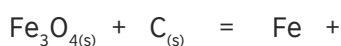
   Explain 2 negative environmental impacts of the production of iron in a blast furnace on the local environment and people.   (4 marks)
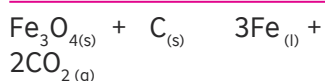
(Total marks 13)

Mark scheme

Point based

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1 (a) Complete and balance the equation below to show this reaction, including the state symbols.

$Fe_3O_{4(s)} + C_{(s)} = Fe +$

Answer	Guidance
$Fe_3O_{4(s)} + C_{(s)}$ $3Fe_{(l)} + 2CO_{2(g)}$ CO_2 product (1) balanced equation (1) both state symbols correct for products(1)	No half marks so both state symbols are required for the mark.

1 (b) What type of reaction does the iron ore undergo to produce the iron?

- Decomposition

- Neutralisation

- Oxidation

- Reduction

Answer	Guidance
Reduction	Correct answer only

1 (c) In a blast furnace iron ore, coke and limestone are used to produce iron. Draw a labelled diagram of a blast furnace showing the inputs and outputs to the furnace.
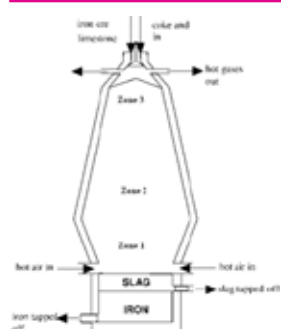
Answer	Guidance
   Clear and neat drawing (1) Iron ore, coke and limestone inputs at the top(1) Iron and slag outputs at the bottom (1) (Hot) air flowing into the furnace at the bottom and waste gases out at the top (1)	Diagram shown is indicative but main features should be shown for the drawing mark and it should be neat and clear. There is no need to include temperatures and different zones within the furnace.

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1 (d) Explain why limestone is added to the iron ore and coke in the blast furnace

Answer	Guidance
It removes impurities (in the form of slag)	Guidance No need to mention which impurities (eg silica)

1 (e) Explain 2 negative environmental impacts of the production of iron in a blast furnace on the local environment and people

Level	Description	Marks
4	Clear well structured explanation linking effects to causes or underpinning theory	4
3	Clear description of relevant facts with some explanation relating effects to causes or underpinning theory.	3
2	Description of the basic facts but no link of effects to causes or underpinning theory	2
1	Limited isolated descriptive points relevant to the topic	1
0	Nothing worthy of credit	0

Note: Two different negative impacts on the local environment need to be explained to gain 4 marks.

Indicative content

- Noise pollution scares wildlife, is unpleasant for the local population and is harmful to workers hearing

- Dust and particulates from the furnace can cause respiratory problems in the local population

- Transportation of large quantities of ore and coke to the furnace and steel from the furnace can damage the local environments and create exhaust fumes which are harmful to the local population.

- Release of CO_2 contributes to the greenhouse effect and man made global warming which can lead to extreme weather events for the local area.

Note: Only accept global warming if it is linked to the impact on the local environment and local people.

AO coverage

Question	AO1	AO2	AO3	AO4
1 (a)	1	2		
1 (b)		1		
1 (c)	1	3		
1 (d)	1			
1 (e)			2	2
Total	3	6	2	2

Content coverage

Question	Content areas covered
1 (a)	10.4.1 Balance chemical equations 10.6.1 Write balanced word and symbol equations, including phase information for common examples of combination, decomposition, displacement, double displacement, precipitation, neutralization, oxidation and reduction reactions. 10.3.5 Explain how copper, iron and aluminium are extracted from their ores (Chalcopyrite, Magnetite and Bauxite) and the conditions required and reactions which take place.
1 (b)	10.1.1 Define types of chemical reactions: combination, decomposition, displacement, double displacement, precipitation, neutralization, oxidation and reduction.
1 (c)	10.5.2 Draw and label a diagram of a blast furnace
1 (d)	*10.3.5 Explain how copper, iron and aluminium are extracted from their ores (Chalcopyrite, Magnetite and Bauxite) and the conditions required and reactions which take place.*
1 (e)	10.5.21 Analyse data on impacts of changes on the environment. 10.9.8 Use data and information about different environmental situations to draw conclusions and justify recommendations – Major dam construction, logging and forest clearance for agriculture and industrial development impacting on local habitat.

Acknowledgements

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