



TEACHERS' MANUAL ON FORMATIVE ASSESSMENT

SCIENCE

CLASS – IX



CENTRAL BOARD OF SECONDARY EDUCATION

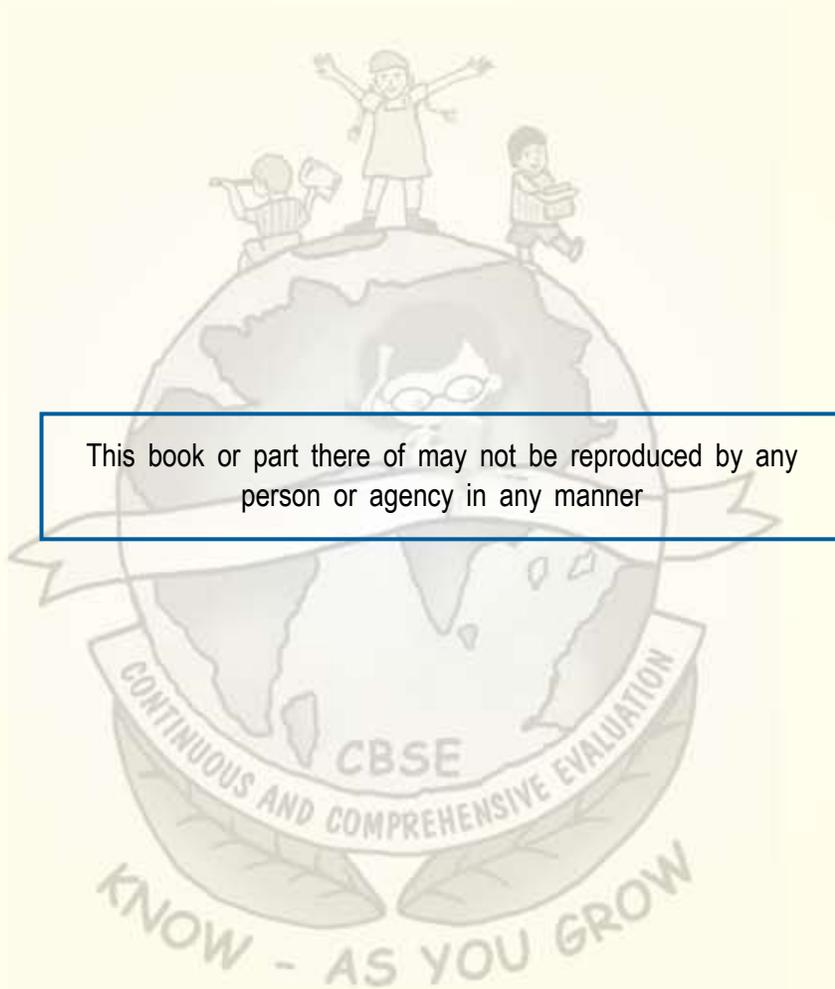
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Teachers' Manual on Formative Assessment in Science Class IX

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भारत का संविधान

उद्देशिका

हम, भारत के लोग, भारत को एक ' [सम्पूर्ण प्रभुत्व-संपन्न समाजवादी पंथनिरपेक्ष लोकतंत्रात्मक गणराज्य] बनाने के लिए, तथा उसके समस्त नागरिकों को:

सामाजिक, आर्थिक और राजनैतिक न्याय, विचार, अभिव्यक्ति, विश्वास, धर्म और उपासना की स्वतंत्रता, प्रतिष्ठा और अवसर की समता प्राप्त कराने के लिए, तथा उन सब में, व्यक्ति की गरिमा और [राष्ट्र की एकता और अखण्डता] सुनिश्चित करने वाली बंधुता बढ़ाने के लिए दृढ़संकल्प होकर अपनी इस संविधान सभा में आज तारीख 26 नवम्बर, 1949 ई० को एतद्वारा इस संविधान को अंगीकृत, अधिनियमित और आत्मार्पित करते हैं।

1. संविधान (बयालीसवां संशोधन) अधिनियम, 1976 की धारा 2 द्वारा (3.1.1977) से "प्रभुत्व-संपन्न लोकतंत्रात्मक गणराज्य" के स्थान पर प्रतिस्थापित ।
2. संविधान (बयालीसवां संशोधन) अधिनियम, 1976 की धारा 2 द्वारा (3.1.1977 से), राष्ट्र की एकता" के स्थान पर प्रतिस्थापित ।

भाग 4 क

मूल कर्तव्य

51 क. मूल कर्तव्य - भारत के प्रत्येक नागरिक का यह कर्तव्य होगा कि वह -

- (क) संविधान का पालन करे और उसके आदर्शों, संस्थाओं, राष्ट्रध्वज और राष्ट्रगान का आदर करे;
- (ख) स्वतंत्रता के लिए हमारे राष्ट्रीय आंदोलन को प्रेरित करने वाले उच्च आदर्शों को हृदय में संजोए रखे और उनका पालन करे;
- (ग) भारत की प्रभुता, एकता और अखंडता की रक्षा करे और उसे अक्षुण्ण रखे;
- (घ) देश की रक्षा करे और आह्वान किए जाने पर राष्ट्र की सेवा करे;
- (ङ) भारत के सभी लोगों में समरसता और समान भ्रातृत्व की भावना का निर्माण करे जो धर्म, भाषा और प्रदेश या वर्ग पर आधारित सभी भेदभाव से परे हों, ऐसी प्रथाओं का त्याग करे जो स्त्रियों के सम्मान के विरुद्ध हैं;
- (च) हमारी सामासिक संस्कृति की गौरवशाली परंपरा का महत्त्व समझे और उसका परीक्षण करे;
- (छ) प्राकृतिक पर्यावरण की जिसके अंतर्गत वन, झील, नदी, और वन्य जीव हैं, रक्षा करे और उसका संवर्धन करे तथा प्राणिमात्र के प्रति दयाभाव रखे;
- (ज) वैज्ञानिक दृष्टिकोण, मानववाद और ज्ञानार्जन तथा सुधार की भावना का विकास करे;
- (झ) सार्वजनिक संपत्ति को सुरक्षित रखे और हिंसा से दूर रहे;
- (ञ) व्यक्तिगत और सामूहिक गतिविधियों के सभी क्षेत्रों में उत्कर्ष की ओर बढ़ने का सतत प्रयास करे जिससे राष्ट्र निरंतर बढ़ते हुए प्रयत्न और उपलब्धि की नई उंचाइयों को छू ले।

THE CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC and to secure to all its citizens :

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity; and to promote among them all

FRATERNITY assuring the dignity of the individual and the [unity and integrity of the Nation];

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949, do HEREBY TO OURSELVES THIS CONSTITUTION.

1. Subs, by the Constitution (Forty-Second Amendment) Act. 1976, sec. 2, for "Sovereign Democratic Republic (w.e.f. 3.1.1977)
 2. Subs, by the Constitution (Forty-Second Amendment) Act. 1976, sec. 2, for "unity of the Nation (w.e.f. 3.1.1977)
-

THE CONSTITUTION OF INDIA

Chapter IV A

Fundamental Duties

ARTICLE 51A

Fundamental Duties -It shall be the duty of every citizen of India

- (a) to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;
- (b) to cherish and follow the noble ideals which inspired our national struggle for freedom;
- (c) to uphold and protect the sovereignty, unity and integrity of India;
- (d) to defend the country and render national service when called upon to do so;
- (e) To promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;
- (f) to value and preserve the rich heritage of our composite culture;
- (g) to protect and improve the natural environment including forests, lakes, rivers, wild life and to have compassion for living creatures;
- (h) to develop the scientific temper, humanism and the spirit of inquiry and reform;
- (i) to safeguard public property and to abjure violence;
- (j) to strive towards excellence in all spheres of individual and collective activity so

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Preface

At the centre of the transformation that School Education is undergoing presently is the new perspective to assessment and its relationship to the teaching-learning process. It is widely agreed that assessment influences what is taught and how teaching and learning are delivered. There is also a widespread belief among educational researchers and practitioners that assessment can and often does constrain rather than enhance learning outcomes. If we restrict our choices of teaching and learning activities to exercises that simply rehearse for examinations, then we run the risk of failing our learners during the teaching and learning process as a whole. Another pitfall in working towards assessment is that learners may concentrate simply on doing the bare minimum needed in order to guarantee a pass.

Hence the challenge of changing the traditional system of examination and evaluation has emerged as a major focus. By introducing Continuous and Comprehensive Evaluation at the secondary level in all its affiliated schools, CBSE has sent out a clear message that assessment must take into account all the aspects of the personality development of the learner and that since learning is a continuous process, assessment also has to be continuous. CCE fundamentally shifts the focus from testing to learning by perceiving assessment as an integral part of the overall framework of teaching and learning. It follows from this that when incorporated into classroom practice, assessment tends to lose its individual identity, getting subsumed into the instructional process.

Such a conceptualization necessitates a greater thrust on formative assessment. It must be said, at this stage, that though many schools have been practicing CCE and as a consequence, formative assessment procedures for classes I-VIII for many years, the overall thrust still continues – assessment for ‘measuring’ rather than ‘enhancing’ learning. In other words, there has been a general lack of conceptual clarity with regard to the formative assessment practices among stakeholders as a result of which, many apparently formative assessment tools and procedures have, in effect, been summative in nature, ie, exercises to gauge, at a particular point in time, student learning relative to content standards. Although the information gleaned from this type of assessment is important, it can only help in evaluating certain aspects of the learning process.

It brings us to the vital need of strengthening formative assessment because our overall aim is to facilitate learning by improving the teaching-learning process on the basis of information gathered from assessment.



In this sense formative assessment is a part of the instructional process, underpinning the importance of student involvement. Students need to be involved both as assessors of their own learning and as resources to other students bringing into focus the importance of self and peer assessment besides teacher assessment. Research shows that the involvement in and ownership of their work increases students' motivation to learn. The most significant advantage of formative assessment is that it makes learning an enjoyable experience because of student involvement, enhanced learning and unobtrusive techniques of assessment.

Summative assessment constitutes a public recognition of achievement and we are fairly familiar with most of the tools and procedures of summative assessment. However, many teachers may find it a challenge to develop effective formative assessment tools; they may also experience some difficulties in integrating them with classroom instruction. In order to provide conceptual clarity in this regard and to place some illustrative examples of formative assessment tasks in the hands of the teachers, the Board is bringing out a series of Manuals for classes IX and X in all the major subjects. This manual in Science for Class IX is one of them. The tasks exemplified in this Manual are of different types such as Role Plays, Crossword Puzzle, Flow Charts, Popular Science, Book Review, Field Trips, Class Work/Home Work Assignments, Group Work, Survey, Project Work, Worksheets, Games and Multiple Choice Questions. The tasks provided are varied and cater to the different multiple intelligences.

It is fervently hoped that teachers and students will derive maximum benefit from these publications. By studying the contents carefully and by using the tasks in classroom teaching, teachers would be able to build their capacity not only for enhanced learning to take place but also for preparing their own materials to add value to curriculum delivery. Certain practical guidelines have been included in the manuals to enable schools and teachers to implement formative assessment within the CCE framework as proposed by the Board for classes IX and X.

This document has been prepared by a group of Science teachers and other subject experts and I record the sincere appreciation of the Board to each of these contributors. I also convey my appreciation to Dr. Sadhana Parashar, Head (I & R), Mr. R.P. Sharma, Consultant, CBSE for conceptualizing and coordinating the task of deciding the content and bringing out the manual.

I sincerely hope that with the availability of rich materials, teachers will be able to implement the CCE scheme in the right spirit in all the schools affiliated to CBSE. Comments for improvement of the manual are always welcome.

(VINEET JOSHI)

Chairman



Continuous and Comprehensive Evaluation

Education aims at making children capable of becoming responsible, productive and useful members of a society. Knowledge, skills and attitudes are built through learning experiences and opportunities created for learners in school. It is in the classroom that learners can analyse and evaluate their experiences, learn to doubt, to question, to investigate and to think independently. The aim of education simultaneously reflects the current needs and aspirations of a society as well as its lasting values and human ideals. At any given time and place they can be called the contemporary and contextual articulations of broad and lasting human aspirations and values.

An understanding of learners, educational aims, the nature of knowledge, and the nature of the school as a social space can help us arrive at principles to guide classroom practices. Conceptual development is thus a continuous process of deepening and enriching connections and acquiring new layers of meaning. Alongside is the development of theories that children have about the natural and social worlds, including themselves in relation to others, which provide them with explanations for why things are the way they are and the relationship between cause and effect.

Characteristics of learning

- All children are naturally motivated to learn and are capable of learning.
- Understanding and developing the capacity for abstract thinking, reflection and work are the most important aspects of learning.
- Children learn in a variety of ways-through experience, making and doing things, experimentation, reading, discussion, asking, listening, thinking and reflecting, and expressing themselves in speech or writing-both individually and with others. They require opportunities of all these kinds in the course of their development.
- Teaching something before the child is cognitively ready takes away real learning. Children may 'remember' many facts but they may not understand them or be able to relate them to the world around them.
- Learning takes place both within school and outside school. Learning is enriched if the two arenas interact with each other. Art and work provide opportunities for holistic learning that is rich in tacit and aesthetic components. Such experiences are essentially to be learnt through direct experience and integrated into life.
- Learning must be paced so that it allows learners to engage with concepts and deepen understanding rather than remembering only to forget after examinations. At the same time learning must provide variety and challenge, and be interesting and engaging. Boredom is a sign that the task may have become mechanically repetitive for the child and of little cognitive value.



- Learning can take place with or without mediation. In the case of the latter, the social context and interactions, especially with those who are capable, provide avenues for learners to work at cognitive levels above their own.

Place of Evaluation in the Curriculum

A curriculum is what constitutes a total teaching-learning program composed of overall aims, syllabus, materials, methods and assessment. In short it provides a framework of knowledge and capabilities, seen as appropriate to a particular level. Evaluation not only measures the progress and achievement of the learners but also the effectiveness of the teaching materials and methods used for transaction. Hence evaluation should be viewed as a component of curriculum with the twin purpose of effective delivery and further improvement in the teaching learning process.

If properly understood, evaluation or assessment will not be perceived as something administered by the teachers and taken by the learners on the conclusion of a period of learning. When evaluation is seen as an end of the learning exercise, both the teachers and the learners will tend to keep it outside the teaching-learning process, rendering assessment broadly irrelevant and alien to the curriculum. Further such a perception associates anxiety and stress with evaluation for learners. On the contrary, if evaluation is seen as an integral part built into the teaching learning process; it will become continuous like both teaching and learning. When evaluation is subsumed into teaching-learning, learners will not perceive tests and examinations with fear. It will lead to diagnosis, remediation and enhancement of learning.

The scope of evaluation in schools extends to almost all the areas of learners' personality development. It should include both scholastic and co-scholastic areas, i.e. it should be comprehensive in nature. This is in line with the goals of education. Evaluation is continuous and reveals the strengths and weaknesses of learners more frequently, so that the learners have better opportunity to understand and improve themselves. It also provides feedback to the teachers for modifying their teaching strategies.

In view of getting a complete picture of the child's learning, assessment should focus on the learner's ability to –

- learn and acquire desired skills related to different subject areas.
- acquire a level of achievement in different subject areas in the requisite measure
- develop child's individual skills, interests, attitudes and motivation
- understand and lead a healthy and a productive life.
- monitor the changes taking place in a child's learning, behaviour and progress overtime.
- respond to different situations and opportunities both in and out of school.
- apply what is learned in a variety of environments, circumstances and situations
- work independently, collaboratively and harmoniously.
- analyze and evaluate.



- be aware of social and environmental issues
- participate in social and environmental projects and causes.
- retain what is learned over a period of time.

Thus assessment is a useful, desirable and an enabling process. To realize this one needs to keep the following parameters in mind –

The need to:

- assess the learner.
- use a variety of ways to collect information about the learner’s learning and progress in subjects and cross curricular boundaries.
- collect information continuously and record the same.
- give importance to each learner’s way of responding and learning and the time it takes to do so.
- report on an ongoing continuous basis and be sensitive to every learner’s responses.
- provide feedback that will lead to positive action and help the learner to do better

In the assessment process, one should be careful NOT to:

- label learners as slow, poor, intelligent etc.
- make comparisons between them.
- make negative statements.

Continuous and Comprehensive Evaluation

Continuous and Comprehensive Evaluation (CCE) refers to a system of school-based evaluation of students that covers all aspects of a students’ development. It is a developmental process of a child which emphasizes on two fold objectives. These objectives are continuity in evaluation on one hand and assessment of broad based learning and behavioural outcomes on the other.

The term ‘continuous’ is meant to emphasise that evaluation of identified aspects of students ‘*growth and development*’ is a continuous process rather than an event, built into the total teaching-learning process and spread over the entire span of academic session. It means *regularity of assessment, diagnosis of learning gaps, use of corrective measures and feedback of evidence to teachers and students for their self evaluation.*

The second term ‘comprehensive’ means that the scheme attempts to cover both the scholastic and the co-scholastic aspects of students’ growth and development. *Since abilities, attitudes and aptitudes can manifest themselves in forms other than the written*



word, the term refers to application of a variety of tools and techniques (both testing and non-testing) and aims at assessing a learner's development in areas of learning like:

- Knowledge
- Understanding/Comprehension
- Application
- Analysis
- Evaluation
- Creativity

Objectives of CCE are:

- To help develop cognitive, psychomotor and affective skills.
- To lay emphasis on thought process and de-emphasise memorization.
- To make evaluation an integral part of teaching-learning process.
- To use evaluation for improvement of students' achievement and teaching – learning strategies on the basis of regular diagnosis followed by remedial instruction.
- To use evaluation as a quality control device to maintain desired standard of performance.
- To determine social utility, desirability or effectiveness of a programme and take appropriate decisions about the learner, the process of learning and the learning environment.
- To make the process of teaching and learning a learner-centered activity.

Features of CCE are:

- The '*continuous*' aspect of CCE takes care of '*continual*' and '*periodicity*' aspect of evaluation.
- Continual means assessment of students in the beginning of instruction (*placement evaluation*) and assessment during the instructional process (*formative evaluation*) done informally using multiple techniques of evaluation.
- Periodicity means assessment of performance done frequently at the end of unit/term (*summative*)
- The '*comprehensive*' component of CCE takes care of assessment of all round development of the child's personality. It includes assessment in Scholastic as well as Co-Scholastic aspects of the pupil's growth.
- Scholastic aspects include curricular areas or subject specific areas, whereas co-scholastic aspects include Life Skills, Co-Curricular Activities, Attitudes, and Values.



- Assessment in scholastic areas is done informally and formally using multiple techniques of evaluation continually and periodically. The diagnostic evaluation takes place at the end of a unit/term test. The causes of poor performance in some units are diagnosed using diagnostic tests. These are followed up with appropriate interventions followed by retesting.
- Assessment in Co-Scholastic areas is done using multiple techniques on the basis of identified criteria, while assessment in Life Skills is done on the basis of Indicators of Assessment and checklists.

Source - Examination Reforms, NCERT

The functions of CCE are:

- It helps the teacher to organize effective teaching strategies.
- Continuous evaluation helps in regular assessment to the extent and degree of learner's progress (ability and achievement with reference to specific scholastic and co-scholastic areas).
- Continuous evaluation serves to diagnose weaknesses and permits the teacher to ascertain an individual learner's strengths and weaknesses and her needs. It provides immediate feedback to the teacher, who can then decide whether a particular unit or concept needs re-teaching in the whole class or whether a few individuals are in need of remedial instruction.
- By continuous evaluation, children can know their strengths and weaknesses. It provides the child a realistic self assessment of how he/she studies. It can motivate children to develop good study habits, to correct errors, and to direct their activities towards the achievement of desired goals. It helps a learner to determine the areas of instruction in which more emphasis is required.
- Continuous and comprehensive evaluation identifies areas of aptitude and interest. It helps in identifying changes in attitudes, and value systems.
- It helps in making decisions for the future, regarding choice of subjects, courses and careers.
- It provides information/reports on the progress of students in scholastic and co-scholastic areas and thus helps in predicting the future successes of the learner.

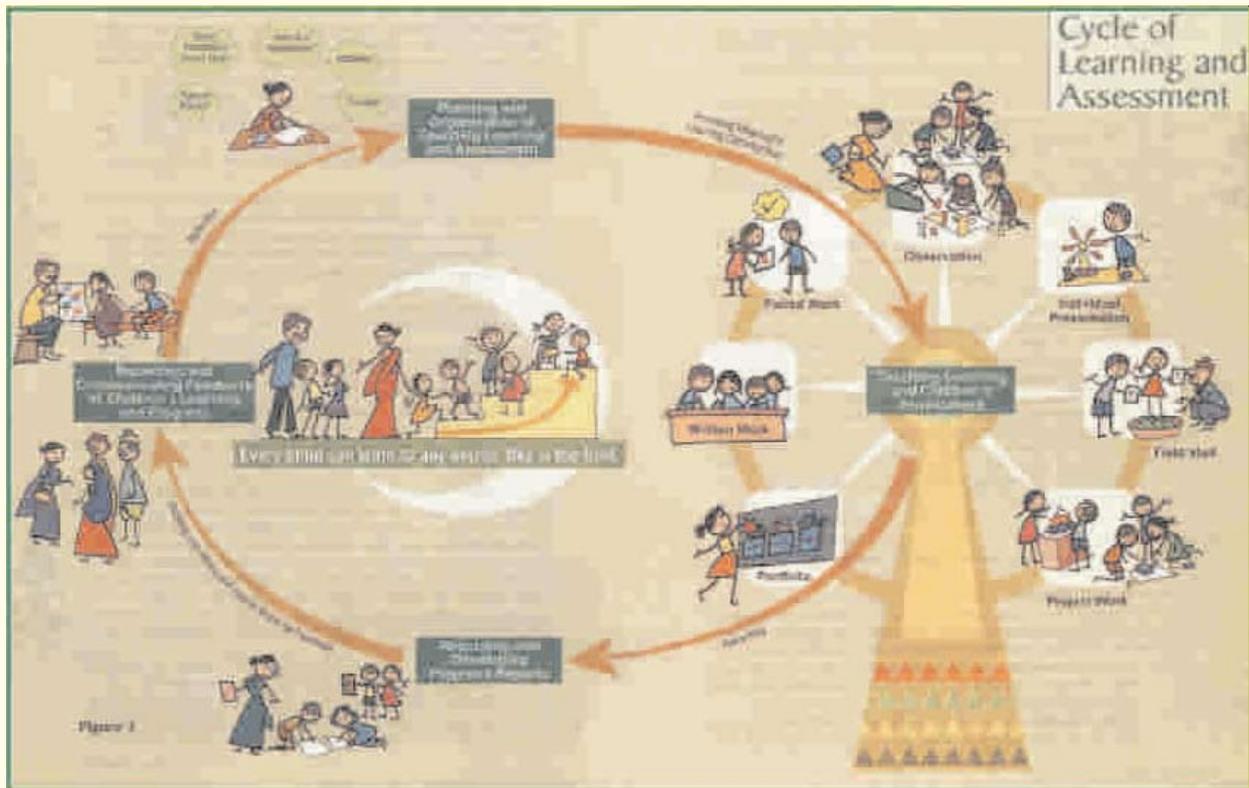
Continuous evaluation helps in bringing awareness of the achievement to the child, teachers and parents from time to time. They can look into the probable cause of the fall in achievement if any, and may take remedial measures of instruction in which more emphasis is required. Many times, because of some personal reasons, family problems or adjustment problems, the children start neglecting their studies, resulting in a sudden drop in their achievement. If the teacher, child and parents do not come to know about this sudden drop in the achievement and the neglect in studies by the child continues for a longer period then it will result in poor achievement and a permanent deficiency in learning for the child.

The major emphasis of CCE is on the continuous growth of students ensuring their intellectual, emotional, physical, cultural and social development and therefore will not



be merely limited to assessment of learner's scholastic attainments. It uses assessment as a means of motivating learners in further programmes to provide information for arranging feedback and follow up work to improve upon the learning in the classroom and to present a comprehensive picture of a learner's profile.

It is this that has led to the emergence of the concept of School Based Continuous and Comprehensive Evaluation.



Source : Ncert

Scholastic and Co-scholastic Assessment

In order to have Continuous and Comprehensive evaluation, both scholastic and co-scholastic aspects need to be given due recognition. Such a holistic assessment requires maintaining an ongoing, changing and comprehensive profile for each learner that is honest, encouraging and discreet. While teachers daily reflect, plan and implement remedial strategies, the child's ability to retain and articulate what has been learned over a period of time also requires periodic assessment. These assessments can take many forms but all of them should be as comprehensive and discreet as possible. Weekly, fortnightly, or quarterly reviews (depending on the learning area), that do not openly compare one learner with another and are positive and constructive experiences are generally recommended to promote and enhance not just learning and retention among children but their soft skills as well.



School Based Continuous & Comprehensive Evaluation

There has been a consistent move towards reducing the load on the student by making public or board examination stress free. Over the decade there has been a high pitched race towards more marks and thus more competitiveness among students and schools.

The move of the CBSE to replace marks with grades is a step in the right direction. The paradigm shift is to empower schools by creating a workable school based continuous and comprehensive scheme.

School Based Continuous and Comprehensive Evaluation system should be established to:

- reduce stress on children
- make evaluation comprehensive and regular
- provide space for the teacher for creative teaching
- provide a tool of diagnosis and remediation
- produce learners with greater skills

Position Paper on Aims of Education - NCF 2005, NCERT

Aims of School Based CCE

- Elimination of chance element and subjectivity (as far as possible), de-emphasis of memorization, encouraging Comprehensive evaluation incorporating both scholastic and co-scholastic aspects of learners development.
- Continuous evaluation spread over the total span of the instructional time as an integral built-in aspect of the total teaching-learning process.
- Functional and meaningful declaration of results for effective use by teachers, students, parents and the society.
- Wider uses of test results for purposes not merely of the assessment of levels of pupils' achievements and proficiencies, but mainly for its improvement, through diagnosis and remedial/enrichment programmes.
- Improvement in the mechanics of conducting examinations for realizing a number of other allied purposes.



- Introduction of concomitant changes in instructional materials and methodology.
- Introduction of the semester system from the secondary stage onwards.
- The use of grades in place of marks in determining and declaring the level of pupil performance and proficiency.

The above goals are relevant for both external examination and evaluation in schools

Characteristics of School Based Evaluation

- Broader, more comprehensive and continuous than traditional system.
- Aims primarily to help learners for systematic learning and development.
- Takes care of the needs of the learner as responsible citizens of the future.
- Is more transparent, futuristic and provides more scope for association among learners, teachers and parents.

School based evaluation provides opportunities to teachers **to know the following about their learners:**

- What they learn
- How they learn
- What type of difficulties / limitations they face in realising learning objectives together
- What the children think
- What the children feel
- What their interests and are dispositions

The focus has shifted to developing a deep learning environment. There is a paradigm shift in the pedagogy and competencies of 'controlling' to 'enriching' to 'empowering' schools.

Traditional Schooling	Enriching Schooling	Empowering Schooling
<ul style="list-style-type: none"> • Teacher centred • Subjects and classes • Sorting and ranking individuals <p>Competency:</p> <ul style="list-style-type: none"> • Memory • Competitive 	<ul style="list-style-type: none"> • Student centred • Self Directed • Continuous assessment <p>Competency:</p> <ul style="list-style-type: none"> • Critical thinking • Collaborative • Creative 	<ul style="list-style-type: none"> • Experience centred • Virtual authenticity • Multi literacies <p>Competency:</p> <ul style="list-style-type: none"> • Risk taking • Ethical • Interactive



There are four Assessment Paradigms

Assessment of Learning

Most commonly, assessment is defined as a process whereby someone attempts to describe and quantify the knowledge, attitudes or skills possessed by another. Teacher directedness is paramount and the student has little involvement in the design or implement of the assessment process in these circumstances–

- Summative
- Teacher designs learning
- Teacher collects evidence
- Teacher judges what has been learnt (and what has not)

Assessment for Learning

The assessment for learning involves increased levels of student autonomy, but not without teacher guidance and collaboration. The assessment for learning is sometimes seen as being akin to 'formative assessment' and can be seen as informing teaching. There is more emphasis towards giving of useful advice to the student and less emphasis on the giving of marks and the grading function–

- Teacher designs learning
- Teacher designs assessment with feedback to student
- Teacher assesses what has been learnt (student develops insight into what has not)

Assessment as Learning

'Assessment as learning' is perhaps more connected with diagnostic assessment and can be constructed with more of an emphasis on informing learning. Assessment as learning generates opportunities for self assessment and for peer assessment. Students take on increased responsibility to generate quality information about their learning and that of others–

- Teacher and student co-construct learning
- Teacher and student co-construct assessment
- Teacher and student co-construct learning progress map

Assessment for learning and assessment as learning activities should be deeply embedded in teaching and learning and be the source of iterative feedback, allowing students to adjust, rethink and re-learn.

Assessment in Learning

The assessment in learning places the question at the centre of teaching and learning. It deflects the teaching from its focus on a 'correct answer' to focus on 'a fertile



question'. Through the inquiry, students engage in processes that generate feedback about their learning, which come from multiple sources, and activities. It contributes to the construction of other learning activities, lines of enquiry and the generation of other questions–

- Student at the centre of learning
- Student monitors, assesses and reflects on learning
- Student initiates demonstration of learning (to self and others)
- Teacher as coach and mentor

Teachers and students need to understand the purpose of each assessment strategy so that the overall assessment 'package' being used by learners and teachers accurately captures, generates and uses meaningful learning information to generate deep learning and understanding.

Purpose of Assessment

- To ascertain what learning, change and progress takes place in the child over a period of time in different subjects of study and other aspects of the child's personality.
- To find out the needs and learning style of every learner.
- To devise a teaching-learning plan that is responsive to the individual needs and learning styles.
- To improve the teaching-learning materials by adding value.
- To help every learner find out their interests, aptitudes, strengths and weaknesses so that the learner can evolve effective learning strategies.
- To measure the extent to which curricular objectives have been realized.
- To enhance the effectiveness of the teaching-learning process.
- To record the progress of every learner and communicate it to parents and other stakeholders.
- To maintain a dialogue between the teacher and the student and also the parents as a collaborative endeavor for overall improvement of the system.
- To involve the learners in the process through peer and self assessment.

Different stages in Assessment

Examination is not assessment; it is only one of the tools of assessment. As we have seen above, assessment is an integral part of the teaching-learning process and hence cannot be seen as the final stage in isolation. The overall aim of assessment is to gather information to improve the teaching-learning process. So it has certain distinct stages.



Stage-1: Gathering information about and evidence of the extent of effectiveness of teaching and learning

We gather information in a variety of ways, using a number of tools. Observation, conversation and discussion, assignments, projects, different types of tests etc are some of the methods and tools we use for collecting information.

Stage-2: Recording of Information

The information gathered has to be systematically recorded because it constitutes not only rich inputs that have to be used for improving teaching and learning but also evidence to support the conclusion we come to about the progress made by the students. In order to make the recording effective, we must use different recording devices such as learner profile, anecdotal records, case studies, report books etc. It is essential that the information is recorded in both quantitative and qualitative terms along with well thought out and objective observations by the teacher. It is also necessary to keep samples of students' work as evidence to support the report of the teacher. The most important aspect of good recording and reporting is that it shows the progress of the learner in different domains over a period of time.

Stage-3: Analysing and Reporting the Information Collected

The recorded information constitutes valuable feedback that the teacher, the student and the parents should use to enhance the learning process. To do this, the gathered information has to be analysed periodically so that the teacher can draw conclusions about how a child is learning and progressing. Such analysis and the grading that is done is actually a mapping of the progress of students in a learning environment. Analysis and review also leads to unambiguous statements about the strengths of every child and the aspects requiring further improvement. The report has to be communicated to the learners and their parents so that they are able to collaborate with the teacher to take the necessary steps for improving learning. It is essential that the child is encouraged to compete with self rather than with others. One of the key components of engaging students in the assessment of their own learning is providing them with descriptive feedback as they learn. Research shows descriptive feedback to be the most effective instructional strategy to move students forward in their learning. Descriptive feedback provides students with an understanding of what they are doing well, links to classroom learning and specific input on how to reach the next step.

Stage-4: Using the Information for Improvement

Assessment should result in improvement. Though the student, the teacher and the parents are all stakeholders in this paradigm, it is the teacher who has to take the initiative to use the analysis of information on each learner to enhance learning. This calls for reflective practices. Some questions that the teacher could ask himself/ herself are:

1. Are all the learners involved in the activities of the class?
2. Are there learners who face problems in coping with the pace and flow of the teaching-learning process ?
3. What are their problems and how should I help them?



4. Is there something in my teaching strategy that has to be modified to make the class learn better? How should I go about it?
5. Are there some learners who are not challenged by the materials and methods and hence lose motivation quickly? How should I respond to their special needs?
6. Are there some lessons/ chapters/ units that pose difficulties to many learners? How should I add value to these portions of the syllabus?
7. Have I identified certain common errors, mistakes and instances of lack of conceptual clarity from the information collected and analysed? How should I go about an effective programme of remediation?
8. Is my classroom time management effective? What are the changes that I could introduce to make it more learner and learning oriented?
9. Am I getting adequate support from the school management, my colleagues, the parents and the community? How can I involve all the stakeholders more actively in what I am doing for the benefit of my learners?
10. What are my own needs of professional development? How can I fulfil them in a continuous manner?

Such reflective questions will help the teacher modify and refine the programme of teaching to achieve the learning objectives as well as to enhance his/ her professional competence continuously.

By now it is well established that learning is a continuous process and it involves informal, formal and non-formal modes. It is also widely acknowledged that children learn by constructing their knowledge and it makes learning a process that takes place within the children rather than without. In this paradigm of constructivism, the teacher ought to recognize the importance of different stages of learning i.e., the initial stage where the existing knowledge of the learner is seen as the entry level, the second stage where new knowledge is understood and accommodated with the existing knowledge and the third stage where the constructed knowledge as a 'whole' is tested by the learner by applying it to real life situations for making sense of the world and the self and for drawing conclusions, problem solving, decision making etc. What constitutes knowledge at the third stage automatically becomes the learner's existing knowledge for further learning and thus it is a cyclical process.

The main purpose of assessment is to enhance the effectiveness of the learning process and hence it has to be integrated appropriately with every stage of learning. Since learning is continuous, assessment also must be continuous. Otherwise the learner will not be able to know whether she/ he is proceeding along the right lines, what is the stage at which he experiences difficulties, what are the new inputs and strategies that are required to successfully continue the process of construction of knowledge and what is the help that is expected from the teacher.

Similarly the teacher also has to know at what stage of learning each learner is at a particular point of time, what are the changes that are to be made to the teaching strategies to make every child learn effectively and what further help can be provided.



For instance, when a child in class I comes to school, it is probable that the child has not had any formal schooling earlier. It does not mean that the child has no prior knowledge because learning, as has been pointed out earlier, can be through informal and non formal modes too. So the teacher's duty is to identify the prior knowledge of the child while dealing with a particular concept or skill. It is only then that the teacher can facilitate the process of construction of knowledge by each learner.

To ascertain the prior knowledge of the learner, the teacher has to adopt many tools and techniques, including questions. In the same manner, during the process of learning as well as at the subsequent stage of application of knowledge to real life, the teacher has to continuously assess the learner to facilitate a smooth process of accommodation, assimilation and extension.

From the above, it may be apparent that assessment, which is in essence formative, has to be integrated with the teaching-learning process. Formative assessment by definition, is the process of finding out the felicity with which a learner is able to 'form' concepts and skills and hence it is process rather than product oriented. When assessment is divorced from the process of construction of knowledge, it ceases to be an effective learning-enhancing procedure. Hence teachers, principals, students and other stakeholders are to read this manual keeping in mind the broader prospective of the entire teaching-learning process instead of limiting it to assessment even though the manual is on formative assessment.

It is to be understood then that all assessments, if they are to be effective, ought to be formative. However, there are subtle differences between formative and summative assessments which are more procedural than absolute. We can safely say that the broad frame work of formative assessment consists of a larger sub set of formative and a smaller sub set of summative assessments. Even a summative assessment could be used formatively when the information gathered from the summative assessment is used to improve the pedagogy, the materials and the assessment tools. When assessment is seen predominantly as formative, learners will be able to enjoy learning and they will not experience undue stress. On the other hand, when we give importance to only year-end or term-end summative tests or examinations, as has been the practice in many schools till recently, the system will throw up situations like the following:

- The examination time table was announced yesterday. When I went home and showed a copy of the time table to my mother, she got very excited. She gave me a lot of instructions about what I should and should not do. TV was out as was chatting with friends. Examination jitters and nerves suddenly gripped the entire household. When my father returned from office, he too joined the frenzied discussions which were all about preparation, hard work, marks and the frightening consequences of poor performance. I didn't sleep that night.

– Shruti

- When I started writing the answer, my mind went completely blank. On the answer sheet in front of me I saw my father's face. He was telling me how important it was that I should do much better than my elder sister who he called a 'wash out'. In this trance like state I also heard my grandfather saying that if I didn't do well, his dreams would be shattered. Infact they all said that this was the foundation of my life.

– Deepak



- I am under a lot of stress ever since the time table for the examination was announced. If the Board results are not upto to the expectations, my performance will be assessed and I will be given junior classes from next session. I feel very frustrated and hassled. I should take some special classes and make the dull students practice many sample question papers. Let them also learn answers to important questions by heart. I should somehow make them get good marks. Otherwise I will not hear the end of it.

– Kavita, a teacher

Aren't we all familiar with such outpourings? Education ought to liberate children from fear, anxiety, stress, insecurity and humiliation and lead them to enlightenment. But, over the years we have turned this sublime process into a mundane instrument for material gains. When scoring marks, gaining admission, landing a job and creating wealth come to constitute the main purpose of education, it creates intense competition and consequently, enormous pressure on children. If we want to make learning an enjoyable experience for every child, the challenge of changing the traditional system of examination should be accorded top priority.

MINDSET : We have got so used to the examination driven education system that any attempt to put alternatives in place is received with doubt and even skepticism. The examination- oriented education has created a well-defined paradigm whose main features could be identified as the following:

- Learning is geared towards appearing in an examination that usually comes at the end of the academic session.
- So, teachers and students see assessment as something that comes after the stage of learning, i.e., first children learn and then they will be examined.
- Since formal examinations are based on prescribed syllabi, teaching and learning becomes text book based where the teacher's job is only to transact the information included in the text book.
- Learning becomes synonymous with storage and retrieval of information with very little scope for individual thinking, originality and creativity.
- Since examinations are conducted in the remote future, teachers and students tend to be relaxed initially and get increasingly anxious towards the end.
- The build-up of stress becomes scary to students and they hardly ever look forward to examinations (unless of course they see them as the final obstacle before the release of tension and anxiety).
- In this paradigm the teacher does not necessarily focus on the process of teaching- learning since it is only the final product that is going to be assessed as the student's performance in the examination.
- The student can and often does postpone learning till the last minute. On the one hand learning ceases to be continuous and on the other



it becomes unrealistically daunting due to the accumulated volume of learning to be attempted within a limited period.

- Students who have mastered the knack of cramming within a short period do well and those who lack this ability fare badly.

The above features, among all others that are often discussed and well known to all the stakeholders, have created a mindset that stems from the following beliefs.

- If there is no examination, teachers will not teach and students will not learn.
- Examination system is very comfortable for teachers because mostly they have only to teach the text books and prepare the students for the examinations at some distant future.
- If teachers have to take up continuous and comprehensive assessment, they have to put in more work. Hence status -quo is more comfortable.
- Assessment, if restricted to only the scholastic subjects, is a lot simpler than when it includes all the aspects of the student's personality.
- When assessment comes only at the end, teachers do not have the need to reflect on their practices and review them for causing better learning. It also means that no value addition is imperative to the materials and methods.
- The Changing Scenario: Now the mindset has to change because, the world over, the child is seen as the centre of the teaching-learning process. Assessment should take into account individual differences in terms of sociocultural and economic background, learning strategies, styles and aptitudes. While the belief that 'one size fits all' has to be discarded, there is a need to individualise the teaching-learning process that is constantly improved to help every child learn, albeit in his/ her own way. It means that assessment should go hand in hand with the teaching-learning process, providing rich inputs to the teacher and the students to continuously enhance the effectiveness of the process. This can be achieved if
 - assessment is integrated with teaching-learning
 - the teacher uses assessment for ascertaining the strengths and weaknesses of the materials, the methods and the learners
 - the teacher makes use of assessment to improve his own teaching and the learning of every student
 - the learner gains an insight into his learning style and strategies and uses this insight to improve his learning.



Scholastic Assessment

The desirable behaviour related to the learner's knowledge, understanding, application, evaluation, analysis, and creativity in subjects and the ability to apply it in an unfamiliar situation are some of the objectives in scholastic domain.

In order to improve the teaching learning process, Assessment should be both Formative and Summative.

Formative and Summative Assessment

Formative Assessment is a tool used by the teacher to continuously monitor student progress in a non threatening, supportive environment. It involves regular descriptive feedback, a chance for the students to reflect on their performance, take advice and improve upon it. It involves students' being an essential part of assessment from designing criteria to assessing self or peers. If used effectively it can improve student performance tremendously while raising the self esteem of the child and reducing the work load of the teacher.

Features of Formative Assessment

- is diagnostic and remedial
- makes the provision for effective feedback
- provides the platform for the active involvement of students in their own learning.
- enables teachers to adjust teaching to take into account the results of assessment
- recognizes the profound influence assessment has on the motivation and self-esteem of students, both of which are crucial influences on learning
- recognizes the need for students to be able to assess themselves and understand how to improve
- builds on students' prior knowledge and experience in designing what is taught.
- incorporates varied learning styles into deciding how and what to teach.
- encourages students to understand the criteria that will be used to judge their work
- offers an opportunity to students to improve their work after feedback,
- helps students to support their peers, and expect to be supported by them.

Formative Assessment is thus carried out during a course of instruction for providing continuous feedback to both the teachers and the learners for taking decisions regarding appropriate modifications in the transactional procedures and learning activities.



- ‘... often means no more than that the assessment is carried out frequently and is planned at the same time as teaching.’ (Black and Wiliam, 1999)
- ‘... provides feedback which leads to students recognizing the (learning) gap and closing it ... it is forward looking ...’ (Harlen, 1998)
- ‘ ... includes both feedback and self-monitoring.’ (Sadler, 1989)
- ‘... is used essentially to feed back into the teaching and learning process.’ (Tunstall and Gipps, 1996)

Summative Assessment is carried out at the end of a course of learning. It measures or ‘sumsup’ how much a student has learned from the course. It is usually a graded test, i.e., it is marked according to a scale or set of grades. Assessment that is predominantly of summative nature will not by itself be able to yield a valid measure of the growth and development of the child. It, at best, certifies the level of achievement only at a given point of time. The paper pencil tests are basically a one-time mode of assessment and to exclusively rely on them to decide about the development of a child is not only unfair but also unscientific. Over emphasis on examination marks focusing on only scholastic aspects makes children assume that assessment is different from learning, resulting in the ‘learn and forget’ syndrome. Besides encouraging unhealthy competition, the overemphasis on Summative Assessment system also produces enormous stress and anxiety among the learners.

Features of Summative Assessment

- Assessment of learning
- Generally taken by students at the end of a unit or semester to demonstrate the “sum” of what they have or have not learned.
- Summative assessment methods are the most traditional way of evaluating student work.

Summative Assessment

- “Good summative assessments--tests and other graded evaluations--must be demonstrably reliable, valid, and free of bias” (Angelo and Cross, 1993).
- ‘...assessment (that) has increasingly been used to sum up learning...’(Black and Wiliam, 1999)
- ‘... looks at past achievements ... adds procedures or tests to existing work ... involves only marking and feedback grades to student ... is separated from teaching ... is carried out at intervals when achievement has to be summarized and reported.’ (Harlen, 1998)



Scholastic Assessment (Part I A)		
Formative Assessment (Flexible Timing)		Summative Assessment (Written-End of term)
Tools	Techniques	
<ul style="list-style-type: none"> • Objective type • Short Answer • Long Answers • Questions • Observation schedule • Interview schedule • Checklist • Rating scale • Anecdotal records • Document Analysis • Tests and inventories • Portfolio analysis 	<ul style="list-style-type: none"> • Tests • Assignments • Quizzes and Competitions • Projects • Debates • Elocution • Group discussions • Club activities 	<ul style="list-style-type: none"> • Objective type • Short Answer • Long Answers

Implications for the Teaching Community

The on going process of transformation of school education in general and evaluation practices in particular has re-defined the teacher's role. Some of the major implications are as follows:

- Teaching practices can no longer be a mechanical routine. Since formative assessment is an integral part of the classroom teaching, the teacher has to devise ways and means to use the feedback for improving curriculum transaction.
- Teaching the text book will not be the main mode of classroom practices. Value addition in terms of interactive tasks, co-operative assignments and projects and integration of new content will be required to involve all the learners in the teaching-learning process.
- Since formative assessment requires the teacher to devise appropriate tools and procedures that are specific to a unit or lesson taught, it will become imperative for the teacher to constantly add new materials and strategies to his/ her repertoire. It will also mean that the lesson plan becomes dynamic and constantly changing according to the needs of the lesson and the learners.
- The teacher has to become a true knowledge worker, referring to sources, reading



new materials, discussing curriculum-related issues with colleagues and experts, writing materials and taking up research.

- Teaching can no longer be a six or seven hour job. It is a profession and the practitioner has to prepare himself/ herself every day not only in the school but also outside the school.
- Recording and reporting will necessarily become more detailed because a number of parameters sometimes ignored or only weakly attempted have to be included effectively. Teachers will be required to devote adequate time on a regular basis for formative assessment and its recording. It also means that teachers should develop tolerance for complexity and ambiguity.

In short, the mindset has to change and the teaching community should develop a greater sense of accountability.

The Changing Paradigm

Introduction of Continuous and Comprehensive Evaluation has brought about a sea-change in the classroom. The main aspect of this change is the fact that assessment is becoming an integral part of the teaching-learning process. CCE and formative assessment are not new concepts and many schools have been practicing them for a long time now. However, assessment of scholastic and co-scholastic areas using a range of tools and indicators has provided the evaluation process a firmer scientific base as well as credibility. Similarly, though formative assessment has been part of the evaluation practices followed by schools, it has not been systematically used to identify learning gaps and for remediation. In a sense the system of unit tests, assignments and projects being used to reflect continuous assessment of learning has become more 'summative' in nature because the feedback is hardly used for improving the teaching-learning practices. It is necessary hence, to understand the concepts of formative assessment and summative assessment in proper perspective so that we are able to not only construct tools accordingly but also use them for the purposes for which we construct them.

What is Formative Assessment ?

Let us look at a task:

Subject: Social Science Class: VIII

Topic: Women, Caste and Reform

Task: Dramatization

Procedure:

1. Students will be divided into groups. They will in their groups, discuss and prepare a short skit on any of the social ills prevalent in the Indian Society at different periods of time.
2. The social ills may include Sati, Child Marriage, Female Infanticide, Denial of Education to Women and Gender Disparity.



3. Each group will prepare a small skit and perform it. Each student will be asked to speak some dialogue.
4. After the presentation, students will have a discussion.

Learning Objectives:

- To enable the learners to gain an insight into the social evils prevalent in India at different periods of time.
- To provide an opportunity to the learners to reflect on social evils and verbalize their feelings.

Skills:

To develop in the students the ability to

- Write scripts
- Deliver dialogue
- Act
- Work in teams

Assessment

The performance of the groups will be assessed on the basis of content, dialogue-delivery and clarity of concept.

Time:

- Discussion and script writing: 2 periods;
- Presentation: 1 period

Follow up:

The presentations could be discussed by the class. Wherever the concept is not clear, teacher could encourage students to give their comments. The teacher could also revisit any part of the lesson that has not been clearly understood by the students.

Is this a formative or summative assessment task?

It has the following features:

- The main objective is to enable the learners to gain an understanding of the concept of social evils perpetrated against the girl child and the woman in India at different periods of time.
- The task is part of the teaching-learning of the topic of women, caste and reform.



- The task involves students in group interaction and presentation.
- After the task is completed, the teacher gives feedback for improvement. Also, if needed, the lesson may be reviewed.
- Assessment is done on the basis of well-defined criteria.
- The task is done in the classroom as part of the lesson.
- The main purpose is not to measure the knowledge of the learners. The task aims to provide conceptual clarity to the learners through experiential learning.
- It also encourages further learning.

These attributes are at the heart of Formative Assessment.

Let us now look at the following questions given in a test:

What are the different social evils prevalent in Indian society at different times? How have they affected girl children and women? Write your answer in about 200 words.

This is a typical question that figures in a summative test or examination. Here the main aim is to measure the extent of knowledge of the learners in the lesson tested. The answers of the learners will be marked or graded on the basis of value points and a marking scheme. The information collected by the teacher may not be used to diagnose the problems faced by learners or for remediation since the test is usually conducted after completing the unit or lesson.

However, if a short quiz or test is conducted on the topic when the lesson is in progress to ascertain the learning gaps for the purpose of providing further help to learners, it will be formative in nature. So, by and large the way in which a tool is used, i.e. for enhancing learning or for ascertaining and measuring the extent of learning, decides whether it is for formative or summative purpose.

For our own conceptual clarity let us look at the attributes of Formative and Summative Assessment in detail.

Formative Assessment

- Formative Assessment is the assessment that takes place during a course or programme of study.
- It is an integral part of the learning process.
- It is often informal, i.e., it is carried out by teachers while teaching.
- It provides feedback to both teacher and learner about how the course is going and how learning can be improved during the course.
- It helps teacher and learner answer the following questions:
 - Are the learners doing what they need to do?
 - Are the teaching and learning strategies chosen by the teacher in need of modification?



When the cook tastes the soup, that's formative;
when the guests taste the soup, that's summative."

– Robert Stakes.

Summative Assessment

- Summative Assessments are given periodically to determine at a particular point in time what students know and do not know.
- Summative Assessments are usually associated with standardized tests such as Board Examination, Half-yearly and Annual Examination and even Unit Tests.
- They are spread out and occur after instruction every few weeks, months or once a year.
- Hence they are tools to help evaluate the effectiveness of programmes, school improvement goals, alignment of curriculum and student placement.
- Since they are used to 'sum up' learning they are called Summative Assessments.
- They are always formal in nature.
- These assessments happen too far down the learning path to provide information at the classroom level and to make instructional adjustments and interventions during the A good comprehensive assessment programme balances formative and summative assessments.

• Formative Assessment is assessment
for
learning

• Summative Assessment is assessment
of
learning

• Formative Assessment is
PEDAGOGY

• Summative Assessment is essentially
EVALUATION

• Formative Assessment can be
thought of as
'PRACTICE'

• Summative Assessment can be
seen as
PERFORMANCE AFTER PRACTICE

• A good comprehensive assessment programme balances
formative and summative assessments



What is NOT Formative Assessment?

It is seen that under the guise of continuous evaluation schools conduct a series of 'tests'. There are tests for almost every day of the week or every month of the academic session. The argument put forth is that only by conducting frequent tests continuous assessment can be ensured. However, such practices can hardly be called formative assessments because they are not integrated with the teaching-learning process. Nor is the information collected by the teachers from such tests effectively and systematically used for improving the teaching-learning process.

Case Study

Students of class IX are given the following project in science:

Project on Communicable Diseases

- Collect information about communicable diseases by referring to books and journals and surfing the internet.
 - Present the information in a folder with illustrations, pictures and photographs.

- The folders should be submitted for evaluation within 15 days.
- The folders will be evaluated on the following criteria:

Content, Neatness of Presentation and Illustration

Students complete the task individually and submit the folders by the dead line. Teacher grades the work of the students as per the assessment criteria.

Question:

- Is it a good formative task?
 - How are the students helped by the teacher and peer groups in doing the task?
 - What are the objectives of the project?
 - To assess the student's ability to collect information and present them?
- Or
- To enable the students to deepen their learning?

If the purpose is to help the learners acquire a deeper understanding of the topic of the project then the project should be organized differently.

- Teacher should discuss the project with the learners.
- They will explore ways in which information could be gathered, understood and adapted.



- Provide scope for group work so that learners study the topic collaboratively and help and support each other.
- Teacher monitors the entire process at regular intervals, giving feedback for correction, modification and refinement.
- Besides submitting a folder, the learners are also required to make a presentation to the class or take a viva voce.
- Assessment is done by involving the learners in peer assessment.
- The information gathered by the teacher and the learners is used to improve and further the teaching-learning process.

One major concern with regard to such projects and assignments is that the teacher has very little scope to ensure that they are done by the students themselves. It is now common knowledge that projects and assignments can be 'bought' from shops. Instances of parents doing the projects are also not uncommon. Furthermore, downloading information from the internet also leads to very little learning.

Hence, to use projects and assignments as effective tools of formative assessment, the teacher should take certain precautions:

- Make the learners do the task as far as possible in the school itself under the direct supervision of the teacher.
- Discuss the project with the learners and monitor their progress at every stage.
- Involve them in the assessment process through self and peer assessment.
- Give descriptive feedback as an instructional strategy to move students forward in their learning.
- Help students link their classroom learning with the task and their experience.
- Follow it up with activities like revisiting some of the concepts, explanations etc.

What does this Manual contain?

After the introduction of CCE in schools affiliated to CBSE in class IX during 2009-10, the Board felt it necessary to provide a holistic picture of CCE to all the stakeholders, particularly the teachers. Hence a Teacher's Manual on Continuous and Comprehensive Evaluation -Class IX & X was brought out. Besides giving detailed information about the scheme of CCE, fundamentals of assessment of co-scholastic and scholastic areas, dimensions of school-based assessment and tools and techniques of evaluation for formative and summative purposes have also been included in the manual. The term-wise split up of weightage for formative and summative assessments has also been provided in the manual.

As a sequel to this publication, the Board decided to bring out a series of manuals to provide exemplar and illustrative materials on Formative Assessment in Languages, Mathematics, Science and Social Science for classes IX and X. Detailed guidelines with



specifications for Summative Assessment have already been provided to schools. It is the formative assessment that needs to be strengthened and hence these manuals.

Objectives of the Manual on Formative Assessment

1. To clarify the concept of formative assessment within the broad framework of CCE.
2. To integrate formative assessments (FA 1, FA 2, FA 3 & FA 4) with the materials prescribed and classroom procedures.
3. To help teachers and learners use formative assessment for enhancing the teaching-learning process.
4. To provide a rich source of formative assessment tasks for the units/ lessons in Languages, Mathematics, Science and Social Science for classes IX and X.
5. To help teachers use the Formative Assessment tasks given in the manuals for generating further tasks on their own.
6. To enable teachers to gain conceptual clarity with regard to Formative and Summative Assessments.
7. To motivate teachers to build their capacity to add value to materials and methods.
8. To help teachers plan and manage time effectively.
9. To provide guidelines to schools to record formative and summative assessments in a systematic manner.
10. To provide scope for teacher development in the area of assessment as well as for consultations and enrichment.
11. To initiate a healthy and meaningful interaction between different stakeholders on CCE and the place of formative assessment in this scheme.
12. To make the teaching -learning process enjoyable for both the teachers and the learners.

Content:

The manual contains the following broad areas.

1. Formative Assessment & Summative Assessment: Concept and distinction.
2. What are NOT good formative assessment practices.
3. Overall framework of Formative Assessment with split up of units, time frame, periodicity, number of tasks for each formative assessment, calculation of weightage and recording, analysis and follow-up.
4. Formative Assessment Tasks for different units/ lessons in Languages, Mathematics, Science and Social Science for classes IX & X.



Overall Framework of Formative Assessment in Classes IX & X - Scholastic Areas

Scholastic Part 1 (A)

Evaluation of Academic Subjects in Class IX & Class X.

Six assessments are proposed. These are valid for most schools, however they can be varied or adapted with written communication to the Board.

Type of assessment	Percentage of weightage in academic session	Month	Term wise weightage
FIRST TERM			
Formative Assessment-1	10%	April-May	FA 1+2 = 20%
Formative Assessment-2	10%	July-August	
Summative Assessment-1	20%	September	SA1 = 20%
SECOND TERM			
Formative Assessment-3	10%	October-November	FA 3+4 = 20%
Formative Assessment-4	10%	January- February	
Summative Assessment-2	40%	March	SA2 = 40%
Total Formative Assessments = FA1 + FA2 + FA3 + FA4= 40%			
Summative Assessments = SA1 + SA 2= 60%			

The following points have to be noted by teachers and students (For Classes IX & X).

- There are two formative assessments each in the first and second term.
- Each Formative Assessment is again divided into smaller assessments (class assignments, quiz, projects, written tests) which can carry different marks.
- Each formative assessment has a weightage of 10% which can be arrived at by taking an average of all tasks or the best three or four.
- The total weightage of all the four formative assessments is 40%.
- The time-frame, split up of syllabus as per the four formative assessments, and the minimum number of suggested tasks for each formative assessment have been given in the annual planner for each subject. The annual planner is only suggestive and schools can adapt it as per their needs.



Formative Assessment and Classroom Teaching

The formative assessment tasks have been designed keeping the following principles in mind:

- Formative assessment is an integral part of classroom practices. So they have been related to the syllabus to be transacted.
- The tasks generally specify the following:
 - Unit/ Lesson
 - When to conduct the task.
 - Approximate time required for each task.
 - Objectives of the task.
 - Task specifications.
 - Procedure for conducting the task including preparation, if any.
 - Criteria for assessment
 - Feedback and follow-up.

Teachers, however, have the freedom to make minor modifications in the overall design of the task to suit their requirements.

The most important aspect to be kept in mind is that these tasks are meant to be integrated with the teaching-learning process, i.e. while teaching a unit/ lesson (and NOT after). Also the follow up in terms of providing further help to clear doubts, remove problems faced by learners and make modifications in teaching methods and strategies has to be given utmost importance. Hence FA tasks will figure in the teaching plans developed by teachers.

Split-up of Syllabi

To facilitate smooth implementation of CCE, CBSE has already provided split-up of syllabi for all the subjects term-wise. This manual has further sub-divided the syllabi reflecting the name and number of units/ lessons covered for FA 1, FA 2, SA 1, FA 3, FA 4 and SA 2. Though the weightage for each of the four Formative Assessments is 10 %, the number of units/ lessons may vary for each of these depending on the time available in the annual academic calendar. Teachers are advised to study the suggested annual calendar at the beginning of the academic session and collaboratively design their own annual plan making any minor modifications they feel necessary to suit their specific needs. However it is necessary that the overall scheme is retained to ensure that continuous and comprehensive evaluation is carried out in its true spirit.

Summative and Formative Assessments

In the first term the weightage given to formative assessment (FA 1 + FA 2) is 20%. The weightage given to SA 1 is 20%. Schools should assess the students in the entire



syllabus meant for the first term in SA 1. What it means is that there may be one or two units that are transacted after FA 2. These units will be included for assessment in SA 1. Similarly, in the second term, the rest of the syllabus will be assessed in SA 2. It implies that teachers need not be unduly concerned about assessment of the units/ lessons that are taught after conducting FA 4. These units/ lessons along with the others meant for second term will be covered by SA 2 for 40%. It is also to be noted that if any unit/ lesson has not been formatively assessed due to time constraint, it will be assessed summatively at the end of each term.

Procedure for Formative Assessments

- The suggested split up of syllabi will be followed by teachers for formative assessment.
- The minimum number of formative assessment tasks as suggested in the annual plan have to be conducted. However, teachers can give more than the minimum number of tasks depending on the need and time available.
- The performance of students in each task will be assessed on the basis of assessment criteria given.
- The total of marks obtained by each student in the formative tasks will be calculated and reduced to 10 marks. For instance, if three tasks of 5 marks each have been given for FA1 and a student obtains 3, 3 and 2 in these tasks, the total obtained by the student will be 8 out of 15. The weightage for 10 will be $(8 \div 15) \times 10 = 5.33 = 5 = \text{Grade C2}$ (The total will be rounded off to the next whole number if the decimal is 0.5 or more. If less, it will be ignored). Similarly the mark will be calculated for FA2, FA3 and FA4 and the total will yield the marks in formative assessment out of 40% marks for the whole academic session.

Record Keeping

It is absolutely essential that teachers maintain a clear record of the formative assessments conducted because they will be verified by CBSE from time to time. The following points have to be kept in mind while recording FA.

- Individual report book as suggested by CBSE has to be maintained in addition to student report form.
- A separate consolidated marks register must be maintained reflecting the following for each student.
 - Tools of Formative Assessment (quiz, MCQs, debate, group discussion, creative writing, presentation etc) must be recorded.
 - Maximum marks, marks obtained and weightage for 10 marks for each of the four formative assessments must be maintained.
 - Cumulative total in FA must be calculated and recorded.

Schools may devise a suitable format for the marks register. Many schools are computerising the entire process of recording the assessments. While evolving such a programme, care may be taken to ensure that all the relevant particulars are included in the programme.



- Recorded evidence of student performance and teacher/ self/ peer assessment has to be collated and maintained so that queries of parents may be answered based on such evidence. In this context the importance of student portfolio gains significance. It is suggested that every student maintain a portfolio consisting of the best of their written work in each subject. These should include the work submitted as draft as well as the edited and improved versions to demonstrate the progression of learning over a period of Teacher will find it convenient to open individual student portfolio folders at the beginning of an academic session, discussing with students the importance of and the procedure for maintaining the portfolios.
- It is to be noted that the assessment has to be reflected in the report book only as grades. The grades will be on the 9 point grading scale as given below:

91 - 100	A1
81 - 90	A2
71 - 80	B1
61 - 70	B2
51 - 60	C1
41 - 50	C2
33 - 40	D
21 - 32	E1
00 - 20	E2

- The marks in the consolidated marks register will be calculated to arrive at the weightages for different FAs & SAs and the equivalent grades will be entered in the Report Book. What it means is that the assessment of each task in FA and each SA test will be carried out in terms of marks which will be entered in the consolidated Marks Register. Grades to be entered in the Report Book once in each term will be calculated accordingly from the consolidated Marks Register.
- Apart from the above records, schools will also maintain a Results Register for each section which could be consolidated for primary and secondary classes at the end of the academic session.

Task Types Appropriate for Formative Assessment

The Teacher's Manual on CCE throws much light on the types of assessment tools available to the teacher. It also mentions that all the tools are not appropriate for formative assessment. In this manual an attempt has been made to clarify what is NOT formative assessment. Since the purposes of formative and summative assessments differ, the tools have to be chosen carefully. However, as a general rule, the following will help teachers in making a decision in this regard:

- Formal Paper Pencil tests are not always suitable for formative assessment because schools tend to make use of them more for summative rather than for formative purpose.



- Similarly, Projects and Assignments that need much work outside the school and class hours also may not be ideal for formative assessment. The reasons are obvious:
 - Without proper monitoring, these tasks may lose their validity and credibility. (Students may just copy or download from the internet. Parents and others may actually do the projects and assignments. Now a days projects and assignments could be bought from 'Education Shops'!)
 - **To be formative, the tasks should involve collaboration, discussion, reflection and improvement.**

On account of these reasons, projects and assignments should be very carefully used as tools of formative assessment. However, in the hands of imaginative and resourceful teachers, they may become effective formative assessment tools.

- What can be effectively assessed through formative assessment cannot be assessed through summative assessment. Presentation skills, Analytical skills, Practical skills and all the co-scholastic areas have to be assessed formatively.
- By combining formative and summative assessments all the aspects of a learner's personality development can be comprehensively covered.

Some of the Precautions that can be taken

- a) Give realistic projects and assignments.
 - b) It is not enough if we make the project or assignment simple and realistic. In order to ensure that further learning has taken place and that the students are able to link new knowledge with what they have learnt in the class, the teacher could interview each student on the project. The interview, if conducted imaginatively, could be very brief but at the same time give proof of the student's own research and presentation.
 - c) Make projects a group activity so that it can be done in the classroom itself. Groups will decide, with the teacher's help, what projects they will work on, division of the project into smaller units, allotment of smaller units among members etc. It means that project work should be discussed in the class to make it work.
 - d) Fix a time frame and interact with groups to see where they are at different stages, what they are doing and whether they need any help. This will instill seriousness of purpose, besides motivating the students to take up their work with keen interest.
5. As pointed out earlier, the formative and summative tools are determined by the purpose for which they are used.
- a. If the purpose is to formally ascertain at a given point in time what students know and do not know, then it is summative.
 - b. If the purpose is to informally get information regarding how the course is going, how learning can be improved during the course itself, what are the



challenges faced by individual learners and how the teacher should address them, then it is formative.

So it is the purpose of the tools that usually determines whether it is for formative or summative assessment. Having said this, we can still make an attempt to identify assessment tools that are more suitable for formative assessment than for summative assessment. Since summative assessment is formal and is usually a paper-pen test, what cannot be assessed by such means can be assessed only through formative assessment tools.

Suggested Tools for Formative Assessment

Language

- Listening Comprehension
- Reading Comprehension
- Debate/ speech/ Group Discussion/ Role Play /Presentation
- Dramatization/ Dialogue/ Conversation/ Commentary
- MCQs/ Quiz
- Grammar Exercises.
- Writing/ Completing a poem, story, script, play, diary entry etc.
- Web Charts, Concept Mapping
- Visual Representation
- Letter, E-mail, data interpretation, article, bio sketch and dialogue completion

It is suggested that at least one out of four tasks should be used for assessing conversation skills in the form of listening comprehension or conversation.

Mathematics

- Data handling and analysis.
- Group projects
- Problem solving
- Maths Lab Activities
- Quiz/ oral questions
- Experiments
- Presentations



- Chart, model making
- Visual Representation
- Simple and interesting assignments
- Mathematical puzzles based on various theorems.

It is suggested that for Mathematics at least one activity out of four should be used for assessing performances in maths lab activities.

Science

- Experiments
- Information gathering and deducing
- Presentations on science concepts/ experiments
- Investigations for stated problems
- MCQs and Science Quiz
- Simple and interesting assignments
- Group assignments and projects
- Model Making
- Science symposium/ seminar.
- Preparation of various compounds/salts
- explanation of different natural phenomenon using scientific principles.

It is suggested that for science, at least one out of four formative assessments in the year are experiments.

Social Science

- Written assignments involving inference, interpretation and evaluation
- Commentaries
- Simple projects (group & individual)
- Presentations (group & individual)
- Quiz and MCQ's
- Models and charts.
- Debates



- Symposium / Seminar
- Conducting interviews of historical figures
- Role plays
- Dramatization of historical events

It is suggested that in social Science at least one out of four should be based on project. In addition to the tools listed above teachers can devise other informal ways in which formative assessment can be done. For instance observation of student's performance in the class (participation, answering questions etc) can also be used effectively for formative assessment. Written tests have not been included in the above list because they tend to become formal and hence are more suitable for summative assessment. Moreover, if written tests are also used for formative purposes, there will be a tendency to use them more often as they are relatively easy to construct and administer. This will lead to an increase in the stress level of students. They are better used for summative assessment. This, however, does not prevent teachers from holding one minute tests, open book tests and concept-based questions expecting written answers during the course of teaching a unit or lesson. The answers have to be analysed and discussed to provide conceptual clarity and address gaps in learning. Some of the formative assessment tasks included in this manual involve a fair bit of writing. However, they are all to be attempted in the class with scope for feedback.

How to use this Manual

As already mentioned, this manual contains a number of formative assessment tasks for classes IX & X in all the main scholastic subjects. Teachers can make use of them in a planned manner not only to assess learning but also to enhance the effectiveness of their own teaching. Some suggestions for the effective use of the formative tasks are given below:

a. Planning

At the beginning of the academic session teachers of the same subject can consult each other and draw out a plan of formative assessment for the entire session. A suggested annual planner is given for each subject in the manual. The annual plan drawn up by each school should include the following details:

- How many formative tasks will be used for FA 1, FA 2, FA 3 and FA 4. (The number of tasks should not be less than the minimum suggested)
- The identified tasks from the manual (Teachers are, however, free to add their own tasks to the ones given in the manual)
- While deciding/ choosing the tasks, care should be taken to select a variety so that knowledge and skills are covered comprehensively and there is no scope for monotony to set in the tasks may be chosen in such a way that they assess different skills and competencies using a variety of modes of assessment.



b. Classroom Strategies

Since the tasks are to be integrated with classroom instruction, teachers have to embed them in their lesson plans.

Task specification as given in the manual may be used by teachers in the following manner:

Objectives: These specify the learning outcomes for each task and hence help teachers and learners in developing a focus. They are also meant to be kept in view at the time of assessment.

Procedure: A task may need some preparations on the part of the teacher. These are included under 'Procedure'. The different steps to be followed, precautions to be taken and suggestions for collecting information are also provided under this heading.

Criteria for Assessment

In order to make the assessment objective and systematic, specific criteria have been provided for each task along with suggested marks. It is essential that the teachers put up these criteria or read them out to the class before commencing a task. Learners should know on what basis they will be assessed. It will also give them task clarity. The scores obtained by students in each of the tasks conducted must be recorded. The record of assessment should also be maintained. Wherever a written product emerges, it may be made part of the student portfolio.

Feedback/ Follow Up

This is a crucial stage in formative assessment. The performance of students gives valuable information about their understanding, conceptual clarity, problems faced and gaps in learning. Based on this information, teachers could give feedback and undertake follow up activities for remediation and enrichment. The information will also enable teachers to modify their practices for enhanced effectiveness of learning.

Some Challenges

Teachers may face certain challenges in integrating formative assessment with teaching. This may be due to

- Large class size
- Scarcity of time
- Constraints imposed by logistics
- Strategy to assess group/ pair tasks.

With the help of proper planning these challenges could be overcome. Some suggestions are given below:



Large Class Size

- Choose tasks that involve group work and pair work.
- Tasks that require written answers from the learners could be peer assessed.
- Answers to MCQs and other objective type questions could be marked by students themselves by exchanging their work sheets as the teacher calls out the answers.
- All the students in a class need not be assessed in one period. It means that the tasks may be distributed among groups of students so that the teacher is able to assess them in different periods. The implication is that in large classrooms all the students need not be assessed in all the tasks. By planning the tasks carefully, all the skills can however be covered by rotating the tasks among groups of students.
- It follows from this that all the students need not be involved in the same task at a time. In order to cater to multiple intelligence, teachers could adopt a flexible approach with regard to giving tasks to students. For instance, students good in written work may be given tasks different from students good at practical work.

Time Management

Since the number of teaching periods for each subject is pre-determined, teachers may feel that conducting formative assessment tasks within the allotted periods may prove to be difficult. However, it is to be borne in mind that formative assessment is to be built into the teaching-learning process and it only represents a change in the methods to be adopted for curriculum transaction. By reducing explanations and frontal teaching, adequate time could be found for tasks and activities. Some other suggestions are:

- Proper planning will result in efficient time management.
- Complete the preparations for each task well before the class begins so that there is no wastage of time.
- Use self and peer assessment strategically.
- Train learners in the initial part of the term to collaborate with each other and the teacher.
- Over a period of time they will be able to maintain efficiency and brisk pace.
- It is essential that the scoring sheet with names of students is prepared at the beginning of the academic session as per the annual plan. Columns for FA 1, FA 2, FA 3, FA 4 may be provided along with details of the tasks selected for each assessment and the maximum marks so that recording of scores does not take much time.
- Train the students in maintaining their portfolios. A folder may be maintained for every subject in which the best written products could be filed by each student. When students are helped to take responsibility for record keeping, it will ease some burden on the teachers besides leading to better time management.



Logistics

Photocopying of worksheets may not be feasible in all the schools. Teachers have to adopt a few strategies to overcome this problem.

Suggestions

- Only elaborate worksheets and those with diagrams and pictures need to be photocopied.
- Wherever possible, the worksheet can be put up on the blackboard.
- If technology is accessible, worksheets could be projected with the help of an LCD projector.
- MCQ's and objective type questions could be read out and students instructed to write only the answers on a sheet of paper.
- Instructions for pair work, group work and whole class work could be read out once or twice.
- Share with the Principal and school administration the requirement of photocopies in advance so that the school makes adequate arrangements.
- Always use both the sides of the sheet of paper for photocopying. It may mean that more than one task is photocopied on a single sheet. After the students complete one task the sheets may be collected and redistributed for the next task.
- Whenever possible, worksheets could be shared by two or more students.
- Train the students to observe economy in the use of paper/ worksheet.

Strategy to assess group/ pair tasks.

Initially teachers may find it a little difficult to assess group/ pair tasks because the product is usually from more than one student. Some suggestions are given below to help the teachers in this regard:

- Wherever possible group and pair tasks could be broken down into smaller areas and each member of the group could be assigned an area.
- Where the above is not feasible, the contribution of each student to group work has to be observed and monitored.
- Usually after group discussion a presentation is to be made by each group. Care may be taken to rotate the presentation among all the students so that over a period of time all are given an opportunity to present the group's views.
- Group tasks may be assessed for the entire group/ pair. It means that members of each group may get the same mark/ grade. However, in pair tasks it is easier to assess the performance individually.
- Since formative assessment is informal, group tasks may be assessed on broad parameters such as participation, contribution and effectiveness of each member of the group.



- It is necessary that the teacher monitors group tasks properly to ensure that every student is participating and no student dominates.

Conclusion

This document has laid emphasis on teacher-preparedness, planning and co-ordination. It is suggested that at the time of drawing out an annual plan, the principal interacts with each subject committee and helps the teachers prepare a plan of action ensuring that assessment is integrated with the teaching-learning process.

It may be necessary to prepare detailed lesson plans for each unit/ lesson besides the overall plan for the first and second term. While the lesson plan should essentially be an innovative tool evolved by each teacher depending on the concepts to be taught, the needs of the learners and other socio-cultural factors, it is perhaps advisable to include certain broad areas in the lesson plan to make it reflect the integration of continuous and comprehensive evaluation. While these broad areas, along with the format of the lesson plan could be decided by each school, the following components could be included to ensure holistic planning:

- Content/ topic/ lesson.
- Concepts/ skills
- Instructional Objectives.
- Levels -entry, process, integration, exit.
- Tools of assessment with specific questions
- Remediation.

It is also suggested that the formative tasks may be assessed for ten marks or multiples of ten to facilitate easy calculation of weightage. Similarly, self evaluation by students could be encouraged by integrating ICT and developing student self-access tools. While it will provide ample scope for learner autonomy, it will also reduce the burden on the teachers. Finally a word about projects. This document specifies that projects should, as far as possible, be done in the school itself. But certain projects that call for extensive research and work involving hands and using different materials may be difficult to be carried out within school hours. Since the main concern is about the genuineness and credibility of the work submitted for assessment by the students, if adequate care is taken by the teacher in monitoring the project work, students may be allowed to do some part of it outside the schools. Detailed guidelines on the precautions to be taken in this regard have been provided in this manual. By making the projects realistic and simple, teachers can ensure authenticity of the work of students.





How to use this material ?

The formative assessment tasks suggested in this document are meant to be integrated with the teaching-learning process. The response of students to every task needs to be analysed carefully and areas of learning difficulty may be identified. Follow up action in terms of further academic inputs and remediation deserves to be given utmost attention.

The format of tasks included in this document specify the following:

- Chapter/unit
- Assessment tool/technique
- Objectives of the task
- Approximate time
- Procedure for conducting the task
- Assessment parameters/criteria for assessment
- Student worksheet
- Feedback and remedial follow-up.

Thus, there is sufficient emphasis on pedagogical aspects of teaching learning process. The teacher has to be very clear about the purpose/objective of every task, the procedure, the criteria for assessment and the follow-up action resulting in enhanced learning as well as effective teaching methodology.

The following key dimensions of this material deserve special attention:

- The included tasks are suggestive in nature and may be modified or adapted for actual use.
- Though an effort has been made to cover all the chapters included in the prescribed NCERT textbook, the materials is neither exhaustive nor complete. Many more similar or different tasks may be designed by the subject teachers to cater to local specific requirements.
- It is not essential that only the tasks included in this document are to be used for different formative assessments. The teachers have complete autonomy to design their own tasks. However, the overall purpose of formative assessment should not be lost sight of .
- The document includes variety of technique and tasks for carrying our assessment. Any of these tasks may be used by the teacher depending upon the nature of the unit, desired learning outcomes, availability of time, class-size and availability of resources.



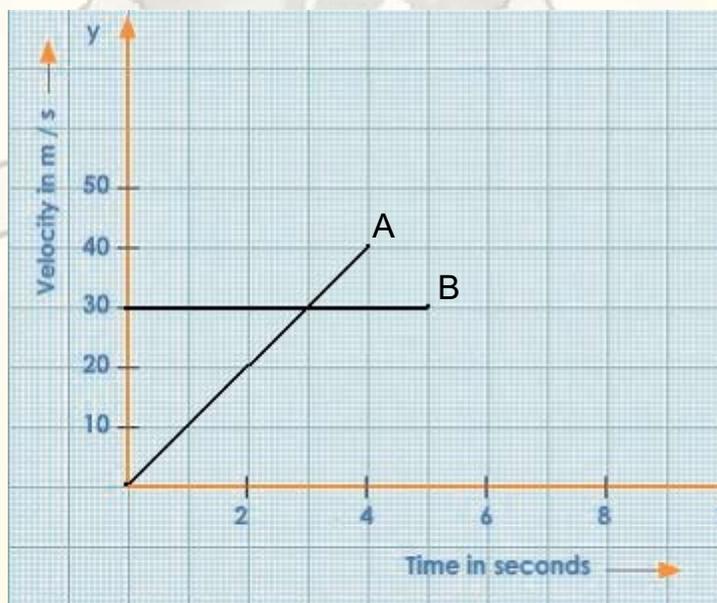
- Special care may be taken that the students are not burdened due to over assessment in the form of frequent formative assessments. A single formative assessment may include only minimum but sufficient number of meaningful tasks.
- The main objective of formative assessment is to diagnose the areas of learning difficulties and provide necessary remediation for enhanced learning. Feedback to the teacher as well as learner may be given utmost focus and attention.

Illustration

Graphical representation of motion is one of the important concepts in chapter-8 on Motion in Class-IX.

The task given below aims at assessing whether the students can read and interpret a velocity-time graph correctly for the motion of a body or not.

Task: Velocity-time graphs for the motion of two bodies A and B are as shown. Observe the given graphs carefully and answer the questions that follow.



- Which of the two bodies is moving with constant velocity?
- Which of the two bodies has higher velocity at time $t=1s$
- Which of the two bodies has higher velocity at time $t=4s$
- At what time is the velocities of two bodies A and B equal?
- What are the velocities of the bodies A and B at time $t=1s$?

Above questions included in the student worksheet have been designed in such a way that one can assess whether they can read and interpret the given graphs correctly or not.

Depending upon the analysis of responses, the teachers will be required to provide necessary additional inputs and explanations in order to help the students understand the related concept.



Formative Assessment in Science Suggested Assessment Tools and Techniques

Any of the following assessment tools and techniques may be used for carrying out different formative assessments. This document includes examples of many such tools. Any other suitable tools may also be designed and used.

- **Class Response Assessment worksheets**
 - Demonstration based
 - Graph based
 - Diagram based
 - Numerical based
 - Flow chart
 - Crossword puzzle/games
 - Writing of Balanced chemical Equations/Formulae/Units
 - MCQs
- **Active-learning assessment tools**
 - Model making
 - Chart making
 - Assignments
 - Popular Science Book Review
 - Current Science events/news report
- Hands-on practical examination
- Class work/home work Assessment
- Group work - Seminar/Symposium/Presentation/Bulletin Board Display/Role Play
- Survey/Field Visit
- Project Work-Group or individual
- Short formal written Paper-pen test

Important

- Hands-on practical examination may be necessarily conducted once in each term.
- Class work and Home Work assessment may also be conducted necessarily once in each term.



- Any one formative assessment may include one short written paper-pen test/hands-on practical examination and a maximum of two other assessments using any of the above suggested tools. The average of these assessments may be calculated out of 10%.
- Due care may be taken to ensure that students are not put to any stress due to over assessment in the form of Formative Assessments.



Matter In Our Surroundings

Chapter 1

Assessment technique

Role play

Objectives: To enable the students to—

- Get familiarised with the states of matter.
- Compare the properties of the three states of matter at the particle level.
- Visualise the effect of heat and pressure on the states of matter.

Task:

Groups of five

Approximate Time: 3-5 minutes to every group

Procedure:

The teacher may:

- Make three groups of five students (so fifteen students would be involved in this activity, rest of the students will observe, can do peer assessment and may be involved in other role plays during the academic year)
- Assign each team a task to act like the 'state of matter' assigned to them. The use of verbal mode, bodily kinesthetic mode and props is on the discretion of the group.
- Guide them as to depict the—
 - a) inter particle distances
 - b) inter particle forces of attraction
 - c) Kinetic energy possessed by the particles.
 - d) Effect of heat and pressure on the state.

Assessment parameters:

One mark for each of the following indicators:

1. Does the child understand the task given? *Yes /No*
2. Is the child able to work in a team? *Yes /No*
3. Is the child inquisitive about different phenomena? *Yes /No*
4. Can the child think logically and rationally? *Yes /No*
5. Is the child able to apply theoretical knowledge in practical situation? *Yes /No*
6. Does the child have good understanding of the following concepts? *Yes /No* (1 mark for each of the following)
 - Inter particle distance
 - Inter particle forces of attraction
 - Kinetic energy possessed by the particles
 - Effect of heat on state of matter
 - Effect of pressure on state of matter

Total marks: 10



Suggestive Remediation:

- A few students may find it difficult to understand the correspondence between observing themselves as particles and the particles of matter. The teacher may explain it to them.
- Since it is an exercise for promotion of self-learning, encouragement may be given to those who take more time to understand and are shy of performing.

Matter In Our Surroundings**Chapter-1****Assessment technique****Activity based Worksheet****Objectives:** To enable the students to—

- Appreciate that liquids cannot be compressed though we say that the inter particle distances in liquids are more as compared to solids.
- Observe that the gases can be compressed.
- Visualise how the application of pressure can bring about change of state and relate in to liquefied gas in LPG cylinders
- Visualise and compare inter particulate distances between gases and liquids.

Task:**Individual****Procedure/Directions:**

The teacher may give the following instructions in the class and let the students perform the given activity in groups before attempting the questions in the worksheet.

1. Take a plastic syringe.
2. Pull out its piston to have the maximum capacity in the syringe.
3. Plug the nozzle of the syringe, by fixing a rubber cork and then either holding it tightly with thumb or pressing it against the table.
4. Push the piston in, observe carefully and note how far you were able to push the piston, note the reading on the syringe or measure with the help of a scale.
5. Remove the rubber cork and fill the syringe with water, oil and sand in turn.
6. Repeat the process of plugging the nozzle and pushing the piston again for each of the material chosen respectively.

Assessment Parameters:

- Performance of activity- 2 marks
- Observation Table-3 marks
- Q1, 2 and 4- 1 mark each
- Q3- 2 marks



Total marks: 10

Student Worksheet

Time: 05 minutes

Complete the following observation table:

S. No.	Material in the Cylinder of syringe	Initial Position of the piston	Final position of the piston
1.	Air		
2.	Water		
3.	Oil		
4.	Sand		

Answer the following questions on the basis of the activity performed.

Q.1. Was the syringe empty in first step?

Q.2. What do you conclude about the inter-particle space in case of liquids and gases?

Q.3. How would your observation differ if we had filled the cylinder of syringe with

a) cotton wool

b) A cylindrical wooden piece cut to size of the inner diameter of the syringe?

a)

b)

Q.4. Is there any thing between the particles of air, water and wood?

Suggestive Remediation

- ▲ A brainstorming session would be necessary with the students, before they actually start performing the activity. Let the students make hypothesis about what they think would be the results.
- ▲ A few students may not be able to understand the correspondence between ability to apply pressure and the inter particle spaces in matter this can be brought about an analogy of sponge. But the sponge analogy has to be used very carefully bringing home the idea that sponge has air spaces but between the gas molecules/particles it is totally empty space
- ▲ Answering Q 4 might be difficult for the students, encourage students to brain storm what is present in between the particles. Help them visualize this by discussing that space is needed for the gas particles to move about randomly.



Matter In Our Surroundings

Chapter-1

Assessment technique

Activity based Worksheet

Objectives: To enable the students to—

- Examine and record the change in temperature before, during and after the phase change.
- Compare the effect of heat before, during and after the phase change.
- Conclude that there is no change of temperature during phase change and use this information to arrive at the concept of latent heat.
- Draw and use graphs for interpretation of data.
- Apply the knowledge of latent heat to some real life situations.

Task: Group of two to three for activity and individual worksheet

Procedure:

You may form groups of two or three students in the class and give following instructions for performing the activity.

1. Take a 250cm³ beaker. Fill half the beaker with slightly crushed ice.
2. Place the beaker in a water bath / trough of water at a temperature of approx 50°C
3. Put a thermometer into the beaker containing ice. The bulb of the thermometer must be surrounded by ice.
4. Record the temperature every 1 min till all the ice has melted. Record the temperature for another 2 min. Write your readings in the observation table given.
5. Use these observations and plot a temperature Vs time graph.
6. Answer the questions included in the worksheet.
7. Answer the questions in the worksheet, after carrying out the activity.

Assessment Parameters:

- Observation Table-2 marks
- Graph with scale- 3 marks
- Q1 to Q5- 1 mark each



Student Worksheet

Time: 30 minutes

Observations:

S. No.	Time (min)	Temp. °C
1.	0	
2.	1	
3.	2	

Graph: Melting of ice temp. Vs. time



Questions

Choose the best correct option for Qs. 1–3 :

- Q.1. Which one of the following is an incorrect statement?
- Cooling is produced during melting
 - The temperature changes steadily on heating.
 - The melting point of ice is 0°C .
 - Once melting starts, the temperature stays at 0°C until all the ice has melted.
- Q.2. Melting is
- an endothermic process
 - an exothermic process
 - both
 - None
- Q.3. When heat is supplied to a solid substance
- the kinetic energy of the particles increases.
 - the potential energy of the particles increases.
 - the potential energy of the particles decreases
 - the potential energy of the particles decreases
- Q.4. Account for the observation that at the melting point, even though heat is being constantly supplied, the temperature does not rise till all the solid has changed into liquid.
-
-
-
- Q.5. Why does water become cold if we add some ice cubes to it?
-
-

Suggestive Remediation—

- Some students may face difficulty in reading the temperature. They may be given a practice before performing the activity.
- Some students may find it difficult to draw the graph. They may be guided.
- Some students may find it difficult to draw conclusions from the graph. They may be helped.



- It may be difficult for some students to accept that temperature of a substance may remain constant even when heat is supplied to it. They may be helped in understanding that when heat brings about a change in state, during this phenomenon all the heat energy is used up in increasing the kinetic energy of the particles due to which there is no change in temperature.

Matter In Our Surroundings

Chapter-1

Assessment technique

Multiple choice questions

Task:

Individual

Objectives: To enable the students to—

- learn that matter exists in three different states
- understand basic properties of three states of matter.
- explain different processes and phenomenon on the basis of properties of different states.

Time :

10 minutes

Procedure: You may

- explain that matter exists in three different states.
- explain that matter can be converted from one state to another.
- give detailed explanation for different processes on the basis of properties of different states

Assessment parameters: 1 mark for each correct answer

Student Worksheet

Choose the best correct option in the following questions :

Q.1. Which of the following changes represent sublimation?

- (a) solid \longrightarrow liquid
- (b) solid \longrightarrow gas
- (c) liquid \longrightarrow gas
- (d) gas \longrightarrow liquid



- Q.2. Gases do not have–
- (a) high compressibility
 - (b) high fluidity
 - (c) high density
 - (d) large volume
- Q.3. Evaporation
- (a) takes place below melting point
 - (b) is a bulk phenomenon
 - (c) takes place above boiling point
 - (d) is surface phenomenon
- Q.4. Particles of a liquid–
- (a) are most ordered
 - (b) move randomly
 - (c) have large intermolecular spaces
 - (d) can slip and slide over each other
- Q.5. Which of the following pairs will not exhibit diffusion?
- (a) hydrogen, oxygen
 - (b) oxygen, water
 - (c) salt, sand
 - (d) sugar, water
- Q.6. Which of the following is not a property of solids
- (a) fixed shape and volume
 - (b) interparticle spaces are minimum
 - (c) Particles can move freely within a limited space
 - (d) Forces of attraction between the particles are maximum
- Q.7. The solid that would sublime on heating is
- (a) wax
 - (b) solid carbon dioxide
 - (c) ice
 - (d) butter
- Q.8. Butter may be evaporated by
- (a) heating and compression
 - (b) heating and decompression
 - (c) cooling and decompression
 - (d) cooling and compression



- Q.9. A substance melts at -25°C and boils at 85°C , Which of the following statements about it is correct?
- (a) It would be in solid state at -15°C
 - (b) It would be in gaseous state at -90°C
 - (c) It would be in liquid state at -25°C
 - (d) It can in liquid state or in gaseous state at -85°C
- Q.10. Melting points of four solids A, B, C and D are 78°C , 262°C , 100°C and 168°C Inter particle forces of attraction are in the order
- (a) $A > C > D > B$
 - (b) $B > C > D > A$
 - (c) $A > D > C > B$
 - (d) $B > D > C > A$

Suggestive Remediation:

1. The concepts in which students give wrong answers or are not able to make a fair judgement need to be taught again.
2. Diffusion is a phenomenon in which particles move on their own and cause intermixing. Students have a misconception of using the words diffusion and intermixing interchangeably.
3. Some students might find it difficult to visualise diffusion of sugar in water and also why salt and sugar do not diffuse. A real activity may be set up to clarify the doubt.
4. Students also have a misconception about the spaces between the particles and their motion in different states of matter. It should be clarified.
5. Students usually have a misconception about evaporation, boiling and the role of temperature of bring about these two processes. It may be clarified.
6. It may be difficult for some students to correlate the properties of the three states of matter and the physical conditions like temperature and pressure, best suited for bringing about a given change in state. The correlation may be explained.



Matter In Our Surroundings

Chapter-1

Assessment technique

Diagram based worksheet

Objectives: To enable the students to—

- learn that pressure and temperature determine the state of a substance
- appreciate that the three states of matter are interconvertible.
- understand that with the change in temperature and pressure, the state of the matter may change.

Procedure:

Following information may be given to the students

- Pressure and temperature determine the state of matter.
- Three states of matter are interconvertible.
- When heat is provided, solid may change to liquid and the process is called fusion or melting.
- Liquid may be converted into solid by solidification.
- When heat is provided to the liquid, the kinetic energy may increase to such an extent that the liquid may change to vapours.
- By applying pressure or reducing temperature, vapours may be converted into a liquid.
- A few solids, on heating, are directly converted to vapours and on cooling, vapour is converted back to solid. The process is called sublimation.

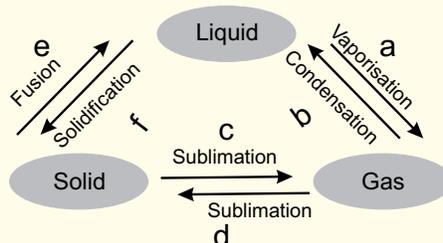
Assessment criterion: one mark for every correct answer.

Student Worksheet

Approximate time: 10 minutes

Instructions:

Study the figure given below for inter conversion of states of matter carefully and answer the questions that follow:



Q.1. Name the process marked as a, b, c, d, e, f.

- ⇒ a. _____
 b. _____
 c. _____
 d. _____
 e. _____
 f. _____

Q.2. To which state of matter a liquid changes on increasing its temperature?

Q.3. What change do we expect on increasing pressure and lowering temperature of a gas?

Q.4. When a liquid is cooled, it may change into a new state of matter. Name that state.

Q.5. What is sublimation?

Suggestive Remediation

- ▲ A few students may not understand how state changes with rise in temperature. They may be helped to understand the change of state on the basis of kinetic energy of particles. Separate explanation may be given for the process of sublimation.

Matter In Our Surroundings

Chapter-1

Assessment technique:

Demonstration based worksheet

Objectives: To enable the students to—

- understand that particles of matter are continuously moving (and intermixing on their own by getting into the space between the particles)
- understand the phenomena of diffusion
- learn that different substances diffuse at different rates
- enhance observation skills

Task :

Individual

Procedure:

The following information may be given to students in the class



- particles of matter are moving continuously
- particles of matter are intermixing on their own with each other
- the intermixing of particles of two types of matter on their own is called diffusion
- rate of diffusion depends on the size and mass of the particles
- bigger and heavier particles diffuse slower than smaller and lighter ones.

You may then demonstrate activity 1.4 on page 2, of class IX NCERT textbook. For better observation, take crystals of KMnO_4 in the place of honey may be taken.

Assessment parameters: one mark for every correct answer.

Student Worksheet

Time: 10 minutes

Answer the following questions on the basis of observations made during demonstration.

Q1. What change is observed in the two beakers?

Q2. In which beaker has the change occurred more quickly?

Q3. Name the process involved in the observed change.

Q4. Why is the time taken for the change to occur different in the two beakers?

Q5. Give an example of such a change from your daily life.

Suggestive Remediation

- ▲ Particles of matter are very small so the students would not be able to observe the intermixing of particles. Examples from real life situations may be taken for effective explanation.



Matter In Our Surroundings

Chapter-1

Assessment Technique

Numerical based worksheet

Objectives: To enable the learners to—

- Learn that temperature can be measured in two different scales-degrees Celsius and Kelvin.
- Appreciate that measurement in two scales are inter-convertible
- Convert the given temperature in one scale in another scale and vice-verse.

Procedure:

The following information may be given to the students in the class:

- Temperature can be measured in two different scales - °C and Kelvin (K)
- The SI unit of temperature is Kelvin
- $K = ^\circ C + 273$
 $^\circ C = K - 273$
- Some examples of interconversion may be given to the students.

Student Worksheet

Time: 10 minutes

Instructions : Answer the following questions.

Q.1. Convert the following temperature to the celsius scale.

a. 470 K

⇒

b. 300 K

⇒



c. 298 K

Q.2. Convert the following temperature to the Kelvin scale.

a. 25°C

⇒

b. 373°C

⇒

c. 273°C

A sample of water was heated from 25°C to 30°C.

(a) What were the initial and final temperatures of water in Kelvin scale?

(b) How much was the rise in temperature on Celsius scale?

(c) How each was the rise in temperature on Kelvin scale?

Assessment Parameters-

Assessment Area	Value Points
Formula	1 mark for formula for inter conversion of temperature on Celsius and Kelvin scales (1 Mark for formula for calculation of rise in temperature 1 mark for each calculation)
Calculation	(1 x 8) 8 mark

Suggestive Remediation

- ▲ Few Students may not be able to apply the formula correctly. Sufficient practice may be provided for the same.
- ▲ Same Students may put the sign of degree with Kelvin. They may be instructed clearly not to repeat this mistake.



Matter In Our Surrounding

Chapter-1

Assessment Technique

Project Work

Title: To study the effect of temperature and surface area on rate of evaporation of three different liquids.

Objective: To enable the students to—

- Learn that on heating, a liquid can be changed into vapours and the phenomenon is called evaporation.
- Understand that the rate of evaporation of any liquid depends on surface area, temperature, humidity and speed of the wind.
- Enhance observation skills

Task:

Group work

Procedure:

The following information may be given to the students.

- When a liquid is heated, a small fraction of particles at the surface, having higher kinetic energy, are able to break away from the forces of attraction of other particles and escape into air as vapours.
- The phenomenon of change of liquid into vapour at any temperature below its boiling point is called evaporation
- Evaporation is a surface phenomenon
- Rate of evaporation depends on
 - (a) Surface area
 - (b) Temperature
 - (c) Vapours of the liquid (humidity in case of water) in the surroundings
 - (d) Speed of wind
 - (f) Nature of the liquid

You may then ask the students to study the effect of increase in temperature of the liquid and surface area on the rate of evaporation using three different liquids e.g. Water, Benzene, alcohol etc.

Assessment Parameters:

- Correct procedure : 02 Marks
- Correct recording : 02 Marks
- Conclusion & result : 01 Marks

Requirement: 6 China dishes of the same of size, stop watch, 10 mL. pipette, measuring cylinder, thermometer, burner / spirit lamp .



Procedure:

- (1) Make 3 sets of 6 Petridish .
- (2) Mark them A_1 B_1 ; A_2 and B_2 ; A_3 and B_3 .
- (3) Pour 10 mL. of the same liquid in each chinadish of one set .
- (4) Heat one china dish of each set (with different liquid) .
- (5) Note the volume of the liquid left after every two minutes and record the observation in the following table:.

Petridish Marked	Time	Temperature	Volume Taken	Volume Left
A1 B1				
A2 B2				
A3 B3				

Conclusion: _____

The experiment may be repeated by students in groups to study the other factors.

Suggestive Remediation

- ▲ The students may find it difficult to observe the changes in the volume of liquids after regular intervals of time. Repeated adjustments in experiment may help them to observe desired result
- ▲ The work may be extended to conduct of experiment on different days/ when humidity in the air is different and by taking same amount of the liquid in containers of different sizes to change surface area.
- ▲ The project may be carried out in small groups of three or four.



Is Matter Around Us Pure?

Chapter-2

Assessment technique:

Data based worksheet

Objectives: To enable the students to–

- Learn that solubility is the amount of solute present in a saturated solution at a temperature.
- Understand that solubility depends on temperature.
- Appreciate that different substances in a given solvent have different solubility at same temperature.
- To enhance data analyzing skill.

Task:

Individual

Procedure:

Teachers may give the following information to the students –

- The amount of solute present in a saturated solution at a temperature is called solubility of that solute at that particular temperature.
- At any particular temperature, a solution that has dissolved as much solute as it is capable of dissolving is called saturated solution.
- If the amount of solute contained in a solution is less than the saturation level, it is called unsaturated solution.
- Different substances in a given solvent have different solubility at the same temperature.
- Solubility of a solute increases with the temperature.
- When a saturated solution is cooled, solute may reappear again.

Assessment Parameters: 1 mark for each correct answer

Student Worksheet

A student studied the solubility of three different substances at different temperature and collected the following data-

(Solubility of a substance is given as grams of substance dissolved in 100 grams of water to form a saturated solution)



(Temperature – Kelvin)

Temperature	283	293	313	333	353
Substance dissolved	Solubility				
A	22	33	63	104	166
B	37	37	37	38	38
C	36	37	41	45	53
D	25	38	42	54	64

Answer the following questions on the basis of the given data:

Q.1. What mass of A would be required to produce its saturated solution in 50 grams of water at 313 K?

Q.2. Find the solubility of C at 293 K.

Q.3. Which salt has the highest solubility at 293K?

Q.4. What is the effect of change of temperature on the solubility of salt?

Q.5. The student prepares a saturated solution of C at 353 K and then cools it to room temperature . What would he observe?

Q.6. Which salt has lowest solubility at 353 K ?

Q.7. A student prepared a saturated solution of D in 100 g.e, added 50 g water to it. What mass of the salt D should he dissolved in it to make it saturated once again.



Q.8. On the solubility of which salt the effect of temperature is minimum?

Q.9. On the solubility of which salt the effect of temperature is maximum?

Q.10. A saturated solution of the salt C was prepared at 333 K and then it was cooled to 293 K. What mass of the salt would reappear?

Suggestive Remediation

- ▲ Some students may not be able to understand and analyze the data. They may be given sufficient practice for the same. Others may not even understand the meaning of the terms solubility, saturated and unsaturated solutions. These basic concepts may be clarified by repeating the explanation.

Is Matter Around Us Pure?

Chapter-2

Assessment technique:

Data based worksheet

Objectives: To enable the students to—

- Differentiate between mixture and pure substance.
- Differentiate between element and a compound.
- Enhance their communication skills.

Task:

Individual

Procedure:



The give following information may be given to the students –

- An element is a pure substance made up of same type of atoms.
- A compound is a pure substance composed to two or more elements that are chemically combined with one another in a fixed proportion.
- A mixture is formed on combining two or more different substances physically in any combination.
- The students may be asked to conduct a survey of their homes and prepare a list of various materials used in daily life. They may be further asked to classify these materials as pure substances or mixtures and pure substances into elements and compounds and then prepare a survey report.

Student Worksheet

Time: 2-3 days

Aim of the survey: To classify the materials commonly used at home into mixture and pure substances; elements and compounds.

Format of the report

1. Aim of the survey
2. Introduction(with purpose)
3. Method used for survey
4. Information
5. Interpretation of data
6. Conclusion
7. Reference

Assessment parameter:

Area of assessment	Value points
Presentation	1
Data collection & reporting	2
Analysis	1
Viva	1

Suggestive Remediation

- ▲ The purpose of this activity is to connect classroom learning to life outside school. It is possible that some of the students are not able to classify commonly used materials into elements, mixtures and compounds. They may be helped to do so by taking suitable examples from everyday life



Is Matter Around Us Pure?

Chapter-2

Assessment technique

Demonstration based worksheet

Objectives: To enable the students to—

- Compare various separation techniques for separation of components of a mixture.
- Justify the use of sublimation technique for the separation of a mixture containing a component that sublimes.
- Find the best suited method for separation of components of a given mixture.
- Appreciate that components of a mixture can be separated using physical methods of separation.

Task

Individual worksheet

Procedure:

You may give a demonstration for separating a mixture of common salt and ammonium chloride on the basis of method discussed in section 2.3.4 on page 20 of Class-IX, NCERT, Science textbook.

Experimental set up as given in activity 1.13 on page no.8 of Class-IX, NCERT, Science textbook may be used.

Assessment Parameters:

- Q1, 3, 4 carry 1 mark each
- Q2, 3, 5 carry 2 mark each
- Q6, carries 3 mark

Student worksheet

Time: Approximate 10 Minutes

Q.1. Which separation technique was used for the separation of the given mixture?

Q.2. Why was this technique used?

Q.3. Why can't we use filtration technique for separation of this mixture?



Q.4. Name two more substances which undergo sublimation.

Q.5. Suggest the sequence of separation technique you will use for separation of a mixture of camphor, common salt and sand

Q.6. Label the diagram given below.



Suggestive Remediation

- ▲ Some students may find it difficult to give a correct sequence of separation technique for question 5. They may be helped to visualise the effects of various techniques by giving them hands on practice.
- ▲ Some students may not label the diagram correctly. This may be explained by the teacher while making demonstration.

Is Matter Around Us Pure?

Chapter-2

Assessment technique

Diagram based Individual worksheet

Objectives: To enable the students to—

- Learn that two miscible liquids with sufficient difference in boiling temperature can be separated through the technique of distillation.
- Recognise different components of apparatus used for the separation of miscible liquids through distillation.



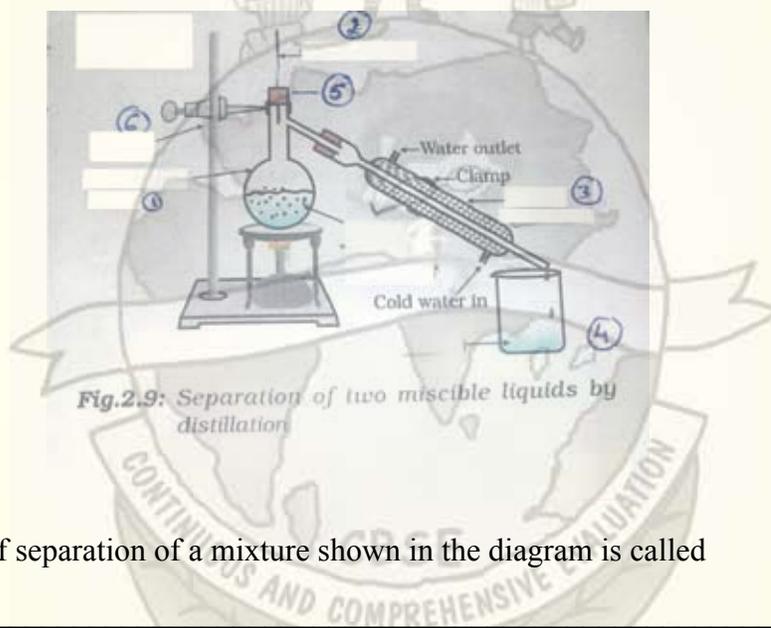
Procedure

- You may show the experimental set up or the diagram of the distillation set up to the students and also tell them the names of its different components.
- You may show the separation of two liquids through the process of distillation. (e.g. water+ethanol)
- The students need to be told that this technique of separation is used to separate two miscible liquids with sufficient difference in their boiling temperature.

Student worksheet

Time: 10 Minutes

Look at the given diagram carefully and answer the questions which follow:



Q. 1 The process of separation of a mixture shown in the diagram is called [1]

⇒ _____

Q. 2 The above procedure is used to separate a mixture of two _____ liquids with sufficient difference in their _____ [0.5 x 2=1]

Q. 3 Label the areas marked 1-6 in the diagram [0.5 x 6=3]

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____



Suggestive Remediation

- ▲ A few students may not be able to identify different parts of the apparatus . They may be helped with repeat explanation..
- ▲ You may give examples of more pairs of miscible liquids with their boiling temperature for better understanding and retention of the concept by the students.
- ▲ In order to motivate students, you may involve some of them to arrange the apparatus.

Is Matter Around Us Pure?**Chapter-2****Assessment technique****Demonstration based Individual Worksheet**

Objectives: To enable the students to—

- Enhance observation skill of students.
- Understand that dye in sketch pen ink is not a single colour but mixture of colours.
- Understand that the colours in the ink can be separated through the technique of chromatography
- Learn the practical skill of chromatography
- Understand that chromatography can be used to separate the colours soluble in same solvent
- Draw inference from the observation that the colour which is more soluble in the solvent will rise faster.

Task**Individual Worksheet**

Procedure: Activity no. 2.7 on page 19 of NCERT Science Textbook may be demonstrated
The following informations may be given to the students.

- Dye in ink is not a single colour but a mixture of colours
- These colours can be separated through the technique of chromatography
- This technique is used when the mixture contains different colours soluble in same solvent. The substance which is more soluble in the solvent will rise faster.

Student Worksheet

Time: 10 Minutes

Instructions: Answer the following questions based on the demonstration [1 x 5=5]

Q.1. After the completion of the activity what do you observe on the filter paper?

⇒ _____



Q.2. Why do you observe the spots above on line while the ink spot was put on the line drawn at bottom?

⇒ _____

Q.3. Why did the two colours rise to different heights?

⇒ _____

Q.4. What do you infer from the demonstration?

⇒ _____

Q.5. What could be the essential conditions to separate any dye using this method?

⇒ _____

Assessment Parameters: 1 mark for every correct answer.

Suggestive Remediation

- ▲ Some students may not be able to draw the inference. The teacher may help them to arrive at the conclusion based on the observations.
- ▲ A big class may not be able to observe the result. They may be asked to come near the experimental set up in small groups and observe the results carefully.
- ▲ Student may not be able to understand that why the colours are separated at different heights, teacher may explain the same with reasons.

Is Matter Around Us Pure ?

Chapter-2

Assessment Technique

Demonstration

Objectives: To enable the students to—

- understand that a mixture containing small particles which can't be seen through naked eye dispersed in a medium and which can easily scatter a beam of visible light is called colloidal solution.
- differentiate between a true solution and a colloidal solution
- draw inference/conclusion from the observation

Task

Individual worksheet

Procedure:

You may give the following information to the students :



- The particles of colloid are of the small size and can't be seen with naked eyes.
- The particles of a colloid are uniformly spread throughout the solution.
- Due to relatively smaller size of particles as compared to that of suspension, the mixture appears to be homogeneous, but actually a colloidal solution is a heterogeneous
- The colloidal particles can easily scatter a beam of visible light.
- The scattering of beam of light is called Tyndall effect.
- Experiment shown in Figure 2.3 on page 17 of Class-IX NCERT Science textbook may also be demonstrated.

Student Worksheet

Time: 15 minutes

Instructions: Answer the following questions in the basis of your observations made during the demonstration:

Q.1. What are the materials taken in the two beakers a & b ?

⇒ _____

⇒ _____

Q. 2. What do you observe in the beaker 'a' when light was being thrown on the beakers from one side?

⇒ _____

Q.3. At the same time, what do you observe in the beaker 'b'?

⇒ _____

Q.4. What type of mixture is the CuSO_4 solution?

⇒ _____

Q.5. What kind of mixture is the water-milk mixture?

⇒ _____

Suggestive Remediation

1. Students may see scattering of light in beakers if the solution of CuSO_4 contains any impurity.
2. If the class has more than 40 students it may be difficult for all of them to observe the scattering of light together. They may be asked to see the demonstration in small groups.
3. Scattering of light may not be visible if the room is well-lit and it may be desirable to darken the room by use of curtains or pasting newspaper on window panes.



Is Matter Around Us Pure?

Chapter-2

Assessment Technique

Numerical Based Worksheet

Objectives: To enable the students to—

- learn that amount of solute present in a given amount of solution is called the concentration of the solution.
- calculate concentration in terms of mass by mass percentage.
- calculate the concentration of a solution in terms of mass by volume percentage of solution.
- enhance numerical skills

Task:

Individual worksheet

Procedures: The following information may be given to the students-

- Amount of solute present in a given amount (mass or volume) of solution or solvent is called the concentration of a solution.

$$\text{Concentration of solution} = \frac{\text{Amount of solute}}{\text{Amount of solution}}$$

OR

$$\frac{\text{Amount of solute}}{\text{Amount of solvent}}$$

- Concentration of solution is expressed in terms of mass by mass percentage of a solution

$$= \frac{\text{Mass of solute} \times 100}{\text{Mass of solution}}$$

- Concentration of solution may be expressed in terms of mass by volume percentage of a solution

$$\frac{\text{Mass of solute} \times 100}{\text{Volume of solution (mL)}}$$

Assesment Parameter –

Assesment Area	Value Points
Mass of solute and solvent or mass of solute and volume of solution	0.5 + 0.5
Mass of solution formula or 1 litre = 1000 mL	0.5
Calculation of mass of solution or volume of solution	1
Formula of mass to mass percentage of solution or mass to volume percentage of solution	1
Substitution of values	1
Calculation and answer	0.5



Atoms And Molecules

Chapter -3

Assessment Technique

Data Based Worksheet

Objectives: To enable the learners to–

- Understand that atoms of different elements chemically combine together in a definite proportion by their mass to form molecules of a compound.
- Write the chemical formula of compound (molecule of a compound) if the elements present in a molecule and their simplest ratio is known
- Find out the number of atoms of an element present in a compound if the number of atoms of other element and the simplest ratio between the two is given.

Procedure:

The following information may be given to the students in the class-

- Atoms of different elements join together chemically in a definite proportion by their mass to form molecules of a compound
- If elements present in a molecule of a compound and their ratio by mass is known then the simplest ratio of elements (by numbers) can be calculated and chemical formula of the molecule can be written.
- Students may practise writing chemical formula of few compounds whose elements' ratio by mass and simplest ratio is given.

Assessment parameters: one mark for every correct answer.

Student Worksheet

Time: 10 minutes

Instructions : Observe the data given below carefully

Compound	Combining Elements	Ratio By Mass	Simplest Ratio
Water	Hydrogen, Oxygen	1:8	2:1
Ammonia	Nitrogen, Hydrogen	14:3	1:3
Carbon dioxide	Carbon, Oxygen	3:8	1:2
Magnesium sulphide	Magnesium, Sulphur	3:4	1:1

On the basis of above data answer the following questions.-

Q.1. What is the ratio by number of atoms for a water molecule?

⇒ **H:O** = _____

Q.2. Ammonia is formed by chemically combining _____ and _____ elements.



- Q.3. The chemical formulae of carbon dioxide would be _____ .
- Q.4. Constituting elements of magnesium sulphide are _____ and _____ .
- Q.5. What will be the number of hydrogen atom in one molecule of ammonia if number of nitrogen atom in ammonia is one
- ⇒ _____

Suggestive Remediation

- ▲ Few students may not be able to understand the relation between ratio by mass and ratio by number. This may be clarified.
- ▲ Few students may not remember the symbol of the elements. They may be asked to do the same.
- ▲ Few students may not recall the correct notation of writing chemical formula particularly
 - (a) First letter of symbol of an element is written in capital and second in small letter.
 - (b) Number of atom of an element should be written as subscript (O_2)

Atoms And Molecules

Chapter-3

Assessment Technique

Role Play

Objectives: To enable the students to—

- understand the formation of a compound.
- write the chemical formula of a compound if valencies are known.

Task: **Individual work**

Procedure:

- You may divide the class in groups of two, three or four.
- Each group will be assigned the role of one metal or a non metal or a polyatomic ion.
- The element will be asked to group with other element to form a compound.
- If required, the element or ion may be carrying their valency with their symbols on a play card. Students may be asked to write the formula on the black board also.

Assessment Parameters:

Correct symbol	1
Correct valency	1
Correct formula of the compound	2
Effective presentation	1



Illustration:

Magnesium goes and makes a chemical formula of compound with two chlorines.

If the student is knowing the valency of magnesium and chlorine, they can form the compound.

They may indicate their valency on their chest.

They may hold other atoms or ions if necessary.

**Suggestive Remediation**

- Some students may not be able to understand the correspondence between valency and chemical formula. This may be explained like hands -2 of yours 8 of octopus and to complete octet, the atoms of an element have to combine with other atom and form a compound.

Atoms And Molecules**Chapter 3****Assessment technique****Demonstration based worksheet**

Objectives: To enable the learners to—

- Observe and understand that the total mass of products and reactants in a chemical reaction is the same.
- Draw inference/appreciate that mass doesn't change in a chemical reaction
- Understand the law of conservation of mass i.e. the mass can neither be created nor destroyed.

Procedure:

- You may demonstrate activity No.3.1 on page 31 in Class-IX NCERT Science Textbook using set (ii) i.e. barium chloride and radium sulphate.
- The students may be asked to observe the demonstration carefully.
- Questions may be asked to help the students arrive at the desired conclusion of law of conservation of mass.

Assessment parameters: One mark for every correct answer.

Student Worksheet

Time : 15 minutes

Instructions :

Answer the following questions on the basis of observation made during demonstration.

Q. 1. What is the colour of BaCl_2 solution ?

Q. 2. What change did you see after the two solutions were mixed in the conical flask?



Q. 3. What was the mass of the flask and its contents before the two reactants were mixed?

Q. 4. Did the mass of the flask and its contents change after the reaction?

Q.5. What conclusion can be drawn from these observations?

Suggestive Remediation

- ▲ Some students may not be able to relate the observations made during the demonstration and the desired conclusion. They may be helped by giving proper explanation.
- ▲ Students may not understand why the mass doesn't change in a chemical reaction. Proper explanation maybe given for the same alongwith proper reasons.

Atoms And Molecules

Chapter-3

Assessment Technique

Numerical based worksheet

Objectives: To enable the learners to–

- Understand that a mole is group of 6.022×10^{23} particles
- Learn that 6.022×10^{23} is called Avogadro number
- Realize that mass of 1 mole of a particular substance is fixed.
- The molar mass of any element is same as its atomic mass but unit is changed from 'u' to 'g' (gram)
- Calculate the 'molar mass'
- Calculate the number of moles and number of particles in a given mass of a substance

Task : Individual worksheet

Procedure-

Following information may be given to the students in the class-

- A group of 6.022×10^{23} particles (atoms, molecules or ions) is called 1 mole of a substance
- A mole = 6.022×10^{23} particles (in number) of anything



This number is called Avogadro number

- One mole of any species (atoms, molecules, ions) is that quantity in number having a mass equal to its atomic or molecular mass in grams.
- Numerical value of molar mass of the atom of an element is equal to the atomic mass of that atom but unit changes from 'u' to 'g')
- Molar mass of an atom is also known as gram atomic mass
- The molar mass of a particular substance is fixed.
- Number of moles in given mass of any element or compound is given by-

$$\begin{aligned} \text{The number of moles (n)} &= \frac{\text{given mass (m)}}{\text{Molar mass (M)}} \\ &= \frac{\text{given number of particles (N)}}{\text{Avogadro number (N}_0\text{)}} \end{aligned}$$

Number of particles present in any given mass of element or molecule can be given by

$$\text{The number of atoms or molecules (N)} = \frac{\text{given number of particles (N)}}{\text{Avogadro number (N}_0\text{)}}$$

Assessment parameters:

Parameters	Value Points
Calculation of molar mass	1+1
Formulae	1
Substitution of values in the formulae	1
Answer	1

Student Worksheet

Time: 10 minutes

Given that:

Molar Mass of C-12 g, O-16 g, Avagadro's No. 6.022×10^{23}

Solve the given numericals on the basis of the above information.

Q.1 Calculate the mass of 0.5 mole of CO_2 (5)



Q.2 Calculate the no. of particles in 8 g of oxygen molecules. (5)

Suggestive Remediation

- ▲ A few students may not be able to calculate the molar mass of the compound
- ▲ A few students may not be able to apply the correct formula to calculate the number of moles or number of particles.
- ▲ Some students may not be able to understand the difference between atomic mass and molar mass or may use incorrect unit

In all such cases, more practice may be given to the students to understand the basic concepts and enhance numerical skills.

Atoms And Molecules

Assessment Technique

Objectives: To help the learners to –

- understand that atoms are the building blocks of any matter
- learn that a group of atoms held together by chemical bond is called a molecule
- know that when elements combine chemically in fixed ratio of their mass, they form a compound.
- charged atom or group of atoms is called an ion
- letter or letters that abbreviates an element's name is called chemical symbol
- chemical formula represents the number of atoms of each element present in one molecule of a compound
- a group of 6.022×10^{23} particles is called a mole.
- relative mass of an atom is obtained by comparison with $1/12^{\text{th}}$ of the super script mass of one C-12 atom.

Chapter3

Crossword Puzzle



Down

1. An abbreviation that shows how many atoms are present in one molecule of a compound (8,7) (two words)
3. Mass of one mole of a substance (5,4) (two words)
4. Letter or Letters that abbreviate an element name (8, 6) (two words)
6. The relative mass of an atom is obtained by comparison with the mass of an isotope of _____ atom (6)
7. In a pure chemical compound elements are always present in a definite proportion by their _____ (4)

Across

2. The basic building block of matter (4)
4. A substance that is made up of two or more elements that are chemically combined (8)
5. A group of two or more elements held together by a chemical bond (8)
8. Simplest compounds made up of two different elements (5)
9. Charged atom or group of atoms is called _____ (3)

Suggestive Remediation

- ▲ The task aims at providing fundamental knowledge about an atom, a molecule, an element and a compound. Some students may not be able to clearly distinguish between various terms. They may be helped to have clear understanding by giving more examples.
- ▲ In order to ensure better understanding, students may be encouraged to design their own crossword puzzles in groups.

Atoms And Molecules**Assessment technique**

Objectives: To enable the learners to—

- Recall writing molecular formula of an element if its atomicity is known.
- Learn correlation between a mole and number of particles.
- Appreciate that mass of one mole of any species/particles is fixed and it is numerically equal to the relative atomic mass expressed in grams.
- Correlate that mole, mass and number of an atom, molecule or ion are related to each other.

Chapter- 3**Mapping Worksheet****Task****Individual worksheet****Procedure:**

The following information may be revised with the students before they start working on the worksheet.

- One mole of any substance contains 6.022×10^{23} number of the particles. As one dozen of any material would contain 12 numbers of the some kind.
- Mass of one mole of an atom is equal to its gram atomic mass i.e., relative atomic mass expressed in grams.
- Mass of one mole of molecules would be equal to gram molecular mass, i.e. molecular mass expressed in grams.
- Mass of one mole of molecules would be equal to gram molecular mass, i.e. molecular mass expressed in grams.
- Information related to relative atomic mass and atomicity of sulphur is given to the student. They may be asked to complete the given concept map

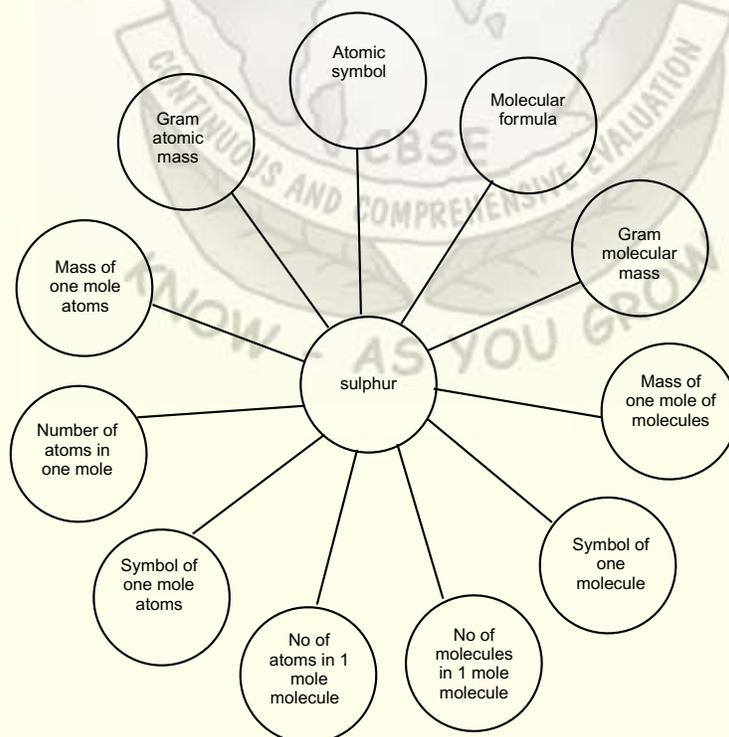
Assessment Parameters:

1 mark for every part $1 \times 10 = 10$ marks.

Student Worksheet

Time : 10 Minutes

One atom of sulphur has a relative atomic mass 32u. Its molecule has eight sulphur atoms bonded together to form a puckered ring structure. Use this information to complete the following map.



Suggestive Remediation

- ▲ A few students may find it difficult to understand the difference in number of atoms in one mole of atoms and one mole of molecules. They may be helped to understand the same by taking different simple examples like hydrogen.
- ▲ More examples may be taken to reinforce the concept.



Structure Of The Atom

Chapter-4

Assessment Technique

Role Play

Objectives: To enable the learners to–

- get familiarized with atomic number of different elements.
- State the number of protons, neutrons and electrons, number of shells, valency etc. of an atom of a given element.
- draw the structure of atoms of elements having different atomic numbers..

Task

Individual

Approximate time: 2-3 minutes to every student

Procedure: You may assign the role of an element (atomic numbers 1 to 18 only) in the sequence of their roll numbers roll numbers to every student one day in advance.

Every student may be asked to collect detailed information about this element like number of protons, neutrons, electrons present in its atom. The information about total number of shells in its atom, valency and some important properties of this element may also be collected.

Every students may be asked to share this information in the class and be given 2-3 minutes time for the presentation.

The student may also be asked to draw the structure of the atom showing electronic configuration in the notebook or the blackboard.

Assessment parameters

- | | |
|--|---|
| • Correct number of protons, electrons and neutrons in an atom of the element. | 1 |
| • Correct structure of the atom of given element showing different shells and distribution of electrons. | 2 |
| • One or two main properties of the element | 1 |
| • Effective presentation and any additional information. | 1 |

Total = 05

Suggestive Remediation

- ▲ A few students may not be able to understand the correspondence between number of electrons in the outermost orbit and valency. The Teacher may explain it to them in clear terms. Some students may not be able to draw the structure of atom particularly the electronic configuration of electrons correctly. They may be helped to understand the procedure for drawing the same.



- ▲ Since it is an exercise for promotion of self-learning, encouragement may be given to those who take more time to understand.

An Illustration

- Hello Friends, I am Hydrogen.
- My atomic number is one.
- I have one electron and one proton
- I have no neutrons in my nucleus.
- I have only one shell 'K' with one electron.
- My valancy is one.
- I can either give or take one electron or else I can share one electron to complete my octate.
- I am a non-metal.
- I am the lightest element.

Structure Of The Atom

Chapter-4

Assessment technique

Individual worksheet

Objectives: To enable the students to–

- recognize the purpose of conducting Rutherford's experiment.
- list the main observations made during conduct of Rutherford's alpha-scattering experiment.
- understand the conclusions drawn from the observations made during the conduct of experiment
- realise the historical significance of Rutherford's alpha-particles scattering experiment about structure of an atom.

Procedure:

- You may explain Rutherford's' alpha-particle scattering experiment using a Chart or a diagram on the Block Board.
- The major observations made during the actual conduct of the experiment and conclusions drawn from these observations may be highlighted
- The historical significance of the experiment in relation to the structure of atom may also be highlighted.

Approximate time: 15 minutes

Assessment parameters: one mark for every correct answer.



Student Worksheet

Instructions: Read the following questions carefully and tick mark the best correct answer:

- Q.1. Thin layer of which metal was used in Rutherford's alpha-particle scattering experiment-
- (a) Aluminium (b) Gold
(c) Silver (d) Zinc
- Q.2. In Rutherford's experiment, most of the alpha-particles were observed to
- (a) pass undeflected (b) be deflected
(c) be thrown back (d) be absorbed
- Q.3. Rutherford's experiment on scattering of alpha-particles showed for the first time that the atom has
- (a) Electrons (b) Protons
(c) Nucleus (d) Neutrons
- Q.4. When alpha-particles are sent through a thin metal foil, most of them go straight through the foil because-
- (a) alpha-particles are much smaller than electrons.
(b) Alpha-particles are positively charged
(c) Most part of the atom is empty space
(d) Alpha-particles move with low velocity
- Q.5. Rutherford's alpha-particles scattering experiment helped in estimating the relative size of
- (a) Nucleus (b) Atoms
(c) Electrons (d) Neutrons

Suggestive Remediation

- Many students may have their queries with regard to the use of thin Gold foil or alpha-particles for conduct of this experiment. A clear explanation may be given for better understanding of the underlying concepts.
- Many students may not be able to correlate the observation and inferences drawn with regard to the structure of the atom. The correlation between observations and inferences may be highlighted.

Structure Of The Atom

Chapter-4

Assessment Technique

Individual worksheet

Objectives: To help the learners to–

- learn about the maximum number of electrons present in a shell of an atom.
- learn about maximum number of electrons which can be accommodated in the outermost shell of an atom.



- know that the shells in an atom are filled in stepwise manner.
- draw the electronic configuration of an atom of a given atomic number.

Task**Individual work**

Approximate time : 15 minutes

Procedure: The following information related to the topic may be given to the students

- (a) The total number of electrons present in an atom of an element is distributed in different shells in a systematic manner.
- (b) The maximum number of electrons present in a shell is given by the formula $2n^2$, n being the number of the orbit.
- (c) The maximum number of electrons which can be accommodated in the outermost shell is 8.
- (d) Shells are filled in a stepwise manner.
 - After having given the above information, one or two examples of electronic configuration of atoms of different atomic numbers may be given and the atomic structures for these atoms be drawn on the Board.

Student Worksheet

Instructions: Draw electronic configuration of following atoms of given atomic numbers on a sheet of paper:

- (i) Li (Lithium) with atomic number 3
- (ii) O (Oxygen) with atomic number 8
- (iii) Ne (Neon) with atomic number 10
- (iv) Na (Sodium) with atomic number 11
- (v) Ar (Argon) with atomic number 18

Assessment parameters : one mark for every part $1 \times 5 = 5$

Suggestive Remediation

- ▲ A few students may not understand the formula for maximum number of electrons which can be present in a shell as $2n^2$. They may be helped to understand the same by taking different values of n .
- ▲ Others may not remember that the maximum number of electrons present in an outermost orbit cannot be more than 8 and may use the formula $2n^2$ mechanically. They may be helped to remember and understand about the same by taking more examples.



Structure Of The Atom

Chapter 4

Assessment technique

Crossword Puzzle

Objectives: To enable the students to

- appreciate historical aspect of development of structure of an atom.
- learn that atom has sub atomic particles-electrons, protons and neutrons in it.
- learn that positively charged central part of the atom is called nucleus.
- learn that the scientist Chadwick discovered subatomic particle named neutron.
- write the electronic configuration of an atom when the atomic number is known.

Task

Individual

Procedure-

The following information may be given to the students:

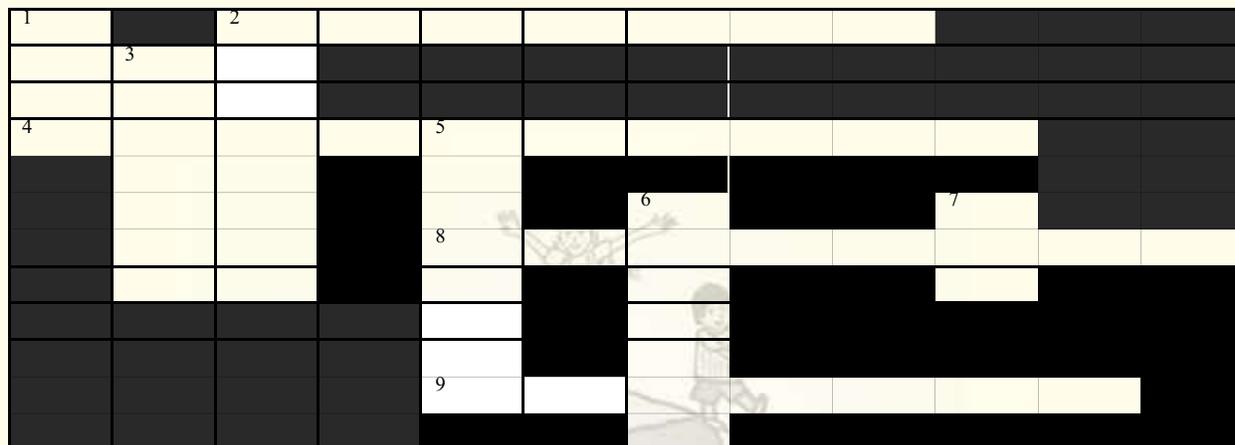
- Rutherford called the central part of the atom where the whole mass and positive charge of atom is centred as nucleus.
- The scientist named Chadwick first gave the idea of presence of neutrons in an atom.
- An atom has sub atomic particles called protons, neutrons and electrons
- Bohr proposed that electrons revolve around the nucleus are present in an atom in discrete orbits.
- If atomic number of an element is known, arrangement of electrons in its atom can be written.
- Keeping in mind that outermost shell cannot have more than 8 electrons and K shell can have a maximum of 2 electrons.
- Before filling electrons in the next shell, the previous shell should be completely filled.
- Combining capacity of an element is called valency of that element.
- Atom of the same element with same atomic number and different mass number are called isotopes.
- Atoms of different elements with same mass number and different atomic number are called isobars.

Assessment parameters: One mark for every blank.



Student Worksheet

Given below is a crossword puzzle. Fill in the blanks to form a complete word/term by using the given clues. You may fill one alphabet in every small **square**.



Down

1. Scientist who discovered that electrons are present in an atom in discrete orbits, K, L, M, N (4)
3. Neutral particle in the nucleus of an atom. (7)
4. Name of the scientist who discovered the Nucleus (10)
5. Atoms of different elements with same mass number but different atomic number. (7)
6. Number of electrons in outermost shell of the Oxygen atom (3)
7. Combining capacity of an atom. (7)

Across

2. Name of scientist who discovered neutrons (8)
8. Atoms with same number of protons but different number of neutrons. (8)
9. Negatively charged particle in an atom. (8)
10. The central part of an atom. (7)

Suggestive Remediation

- ▲ Students are likely to enjoy this activity provided they are given proper guidelines and sufficient practice.
- ▲ The beginners may find it difficult to perform the activity with care. They may be helped separately to complete the puzzle.



The Fundamental Unit Of Life

Chapter- 5

Assessment Technique

Individual Worksheet (Flow chart based)

Objectives: To enable the students to–

- Recognize the structure and location of organelles in plant cell and animal cell.
- Explain the role of cell organelles based upon their function.
- Correlate the structure and function of some organelles.

Task

Individual Work

Approximate Time: 10 Minutes

Procedure:

1. The structure, location and function of various cell organelles may be explained to the students in the previous periods.
2. The students will be given the worksheet with flowchart of cell organelles. The students will fill up the blank spaces in the flow chart to complete it.

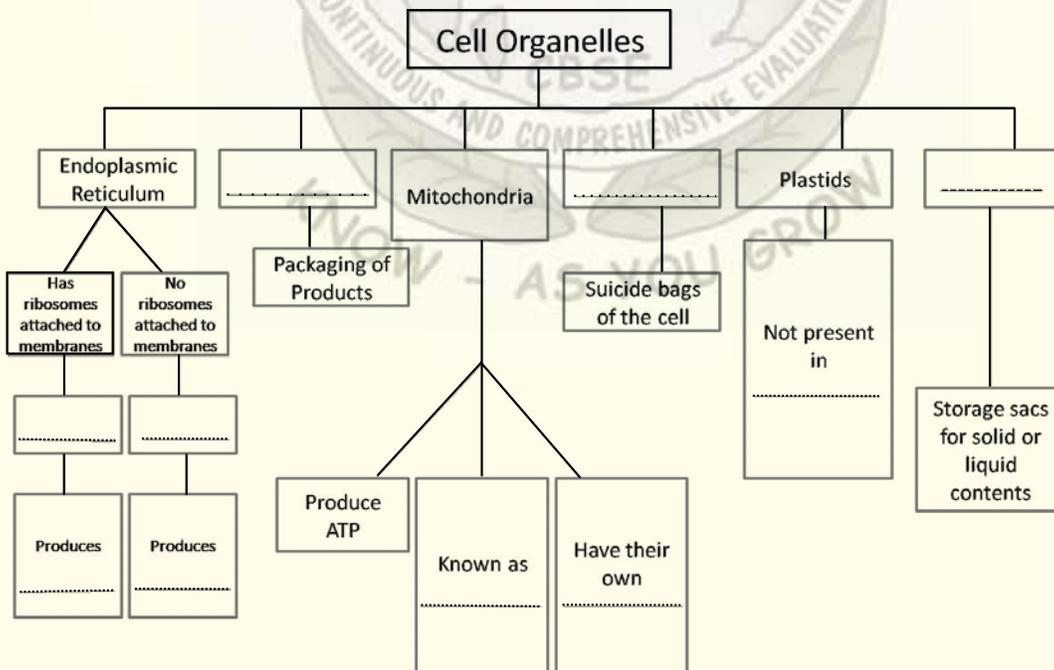
Student Worksheet

Time : 10 minutes

Instructions: Given below is an incomplete flow-chart on cell organelles.

Some boxes/ spaces in the flow-chart have been left blank.

Complete the flow-chart adding terms / names/ functions as and where required.



Criteria for Assessment : Marks for each correct answer = $\frac{1}{2}$ mark (Total Marks: $\frac{1}{2} \times 10 = 5$)

Suggestive Remediation

A few students may not be able to complete the flow-chart. They can explained the topic again and asked to do an alternate assignment where the answers are given (for example: match the following or multiple choice questions)

The Fundamental Unit Of Life

Chapter- 5

Assessment Technique

Individual Worksheet (Diagram based)

Objectives: To enable the students to—

- Learn the names of parts of plant cell and animal cell
- Identify the cell organelles based on their structure and location
- Recognize the similarities between plant and animal cell

Task

Individual Work

Approximate Time : 15 Minutes

Procedure:

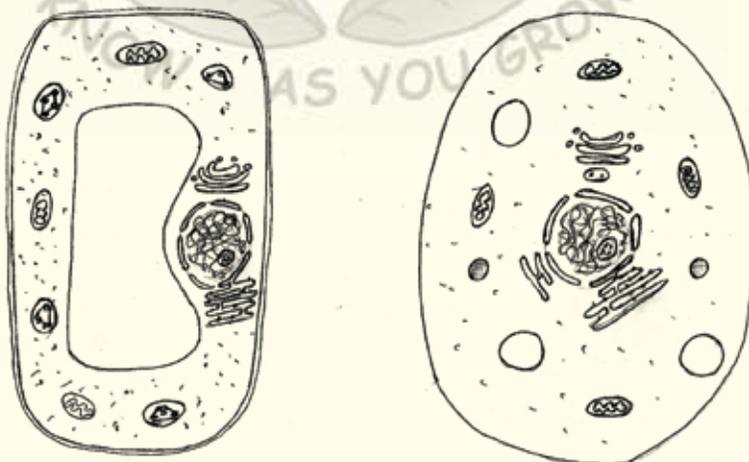
1. The worksheet with the diagram of plant and animal cell is given to the students.
2. The student may label the parts that are common in both plant and animal cell.

Student Worksheet

Time : 15 minutes

Instructions:

Given below are the diagrams representing plant cell and an animal cell. Label any five organelles common in plant cell and animal cell.



Criteria for Assessment : Marks for each correct labeling = 1

(the teacher will evaluate five labelings. In case, the student has labeled more than five, five correct labelings shall be evaluated first.)

(Total Marks: $1 \times 5 = 5$)

Suggestive Remediation

- ▲ A few students may not be able to label the required parts properly. The teacher may explain the diagram again in the class.
- ▲ If the number of students who have not labelled the parts properly is more, then the worksheet may be modified (labeling lines may be added with a blank space that the student will use to write the word.)

The Fundamental Unit Of Life

Chapter- 5

Assessment Technique

Individual Worksheet (MCQ based)

Objectives: To enable the students to—

- Identify the different types of cells
- Learn the names and functions of different organelles/ parts of the cell
- Understand the difference in structure, location and function of cell organelles
- Appreciate the relationship between structure and function of cell organelles

Task

Individual Work

Approximate Time : 20 Minute

Procedure:

The worksheet that has the multiple choice questions (MCQs) is given to the students. The students have to select the correct answer from the four different choices given for each question.

Student Worksheet

Time : 15 minutes

Instructions: Select the correct option from the four different choices given for each question.

Q.1. Gaseous exchange in cells takes place by :

- | | |
|---------------|-----------------|
| (a) Osmosis | (b) Exocytosis |
| (c) Diffusion | (d) Endocytosis |

Q.2. A cell may swell up and even burst if:

- (a) The concentration of water molecules within the cell is higher than the concentration of water molecules in the surrounding medium



- (b) The concentration of water molecules in the surrounding medium is higher than the concentration of water molecules within the cell
- (c) The concentration of water molecules is same in the cell and in the surrounding medium
- (d) It is a plant cell and surrounded by a hypotonic solution.
- Q.3. Chromosomes are made up of
- (a) DNA and Protein (b) RNA and Protein
- (c) DNA and RNA (d) Protein
- Q.4. The process of plasmolysis in plant cell may be defined as
- (a) Breakdown / bursting of plasma membrane in a hypotonic medium
- (b) Shrinkage of cytoplasm in hypertonic medium
- (c) Breakdown / bursting of plasma membrane in a hypertonic medium
- (d) Shrinkage of cytoplasm in hypotonic medium
- Q.5. Amoeba acquires its food through a process known as
- (a) Endocytosis (b) Exocytosis
- (c) Plasmolysis (d) Both Exocytosis & Endocytosis
- Q.6. Prokaryotes have an undefined nuclear region which is known as
- (a) Nucleus (b) Nucleoid
- (c) Nucleolus (d) Nucleic acid
- Q.7. A cell organelle that is not surrounded by a membrane is
- (a) Golgi apparatus (b) Ribosome
- (c) Chloroplast (d) Endoplasmic reticulum
- Q.8. Which of the following is not a function of cell wall?
- (a) Cell wall provides structural strength
- (b) Cell walls enable the cells to withstand greater changes in surrounding medium than animal cells
- (c) Cell wall permits the cells to withstand very dilute (hypotonic) external media without bursting
- (d) Cell walls enable the cells to exchange gases and minerals
- Q.9. Which of the following is a common feature of mitochondria and plastids?
- (a) Presence of DNA and Ribosomes
- (b) Ability to produce ATP
- (c) Deeply folded inner membrane
- (d) Presence of matrix called stroma



Q.10. Which cell organelle is actively involved in membrane biogenesis?

- (a) ER (b) Golgi Apparatus
(c) Lysosomes (d) Vacuoles

Criteria for Assessment : Marks for each correct answer = $\frac{1}{2}$

(Total Marks: $\frac{1}{2} \times 10 = 5$)

Suggestive Remediation

A few students may not be able to give the correct answers to a few questions. The concepts related to such questions may be explained again. The students may be asked to answer similar questions after a few days.

The Fundamental Unit Of Life

Chapter- 5

Assessment Technique

Individual Worksheet (Demonstration based)

Objectives: To enable the students to—

- Understand the process of osmosis.
- Relate this process to various events/ activities that occur in day-to-day life.
- Correlate the change in shape in certain plant parts with this process.
- Compare the change in shape with the direction of movement of water molecules.

Task

Individual Work

Approximate Time : 15 Minutes

Procedure:

1. The process of osmosis may be explained to the students. (This may be done during the previous period, if need be)
2. Prepare an experimental set up consisting of two beakers. One beaker has water to which peeled pieces of carrot have been added. In the second beaker, saturated sugar/ salt solution has been put in which peeled pieces of carrot have been added. Prepare this set-up and keep it for 6-8 hours or overnight before taking it to the class.
3. Show the experimental setup to the students explaining the content of each beaker and the time duration for which carrots were immersed in the solution.
4. Ask the students to observe the carrots in the two beakers and compare the physical state of the carrots carefully.
5. Students may be asked to answer the questions given in the worksheet.



Student Worksheet

Time : 15 minutes

1. What is the difference in the physical state of the carrots as observed in the two beakers? (1)
2. Name the process involved that has caused a change in the carrot piece in one beaker.(1)
3. Why has the above process occurred? (1)
4. Name the type of solutions in beaker A and B w.r.t. the carrot pieces. (1)
5. Name one process in your daily life which works on the same principle. (1)

Criteria for Assessment : Marks for each correct answer = 1

(Total Marks: 1 X 5 = 5)

Suggestive Remediation

- ▲ A few students may not be able to give the correct answers. They can be explained the concept again and asked to observe an alternative set up (raisins in water etc.) where they will explain the movement of water molecules based on this process.

Extended learning: (Answers to the following questions need not be evaluated)

- Would the results be different if the carrots were not peeled?
- What would be the criteria for the solution that should be used to make the carrot pieces swell up?



Tissues

Chapter- 6

Assessment Technique

Individual Worksheet (Diagram based)

Objectives: To enable the students to–

- Identify the diagram of a neuron.
- Recognise the different parts of a nerve cell (neuron)

Task

Individual Work

Approximate Time : 15 Minutes

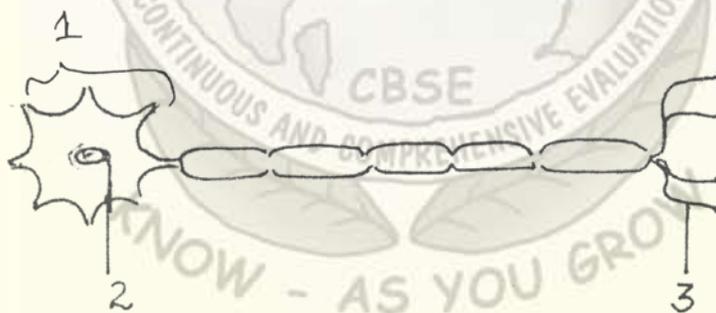
Procedure:

1. The student will be given a worksheet that has the incomplete diagram of a nerve cell in which specific parts have been labeled using numbers only.
2. The students shall read the questions given below the diagram and make additions in the diagram / answer the questions accordingly.

Student Worksheet

Time : 15 minutes

Instructions: Study the diagram given below and then answer the questions in the space provided in not more than one sentence.



Q.1. Complete the diagram by drawing the missing parts (2X1=2)

Q.2. Identify the parts numbered 1, 2 and 3

1. _____
2. _____
3. _____

(1/2 X 3 = 1 ½)



Q.3. What is the term given to the gap between two nerve cells?

(1)

Q.4. Name the part of the neuron from which the nerve impulse is transferred to the second neuron.

(1/2)

Criteria for Assessment : Marks for each correct answer - as given in worksheet

(Total Marks= 5)

Suggestive Remediation

- ▲ A few students may not be able to give the correct answers/ draw the missing parts. They can be given the worksheet as a part of homework assignment. However, the teacher should ensure that such students are given an alternative assignment as classwork after a few days

Tissues

Chapter-6

Assessment Technique

Worksheet (Match the following)

Objective: To help the students to–

- Identify the tissues based on their location and function
- Learn the functions of various tissues
- Recognize the parts of an organism where a particular tissue is present

Task

Individual Work

Time : 10 minutes

Procedure:

- The students are given a worksheet that has a table showing names of tissues, location and functions of tissues.
- The description of location and function of the tissues are not placed in the correct order with the name of the tissue.
- The students shall make connecting lines to match the correct name with the location and function of that tissue.
- One example in the table has been done for the students. (Parenchyma)



- Understand the difference in structure, location and function of tissues present in plants and animals.
- Appreciate the relationship between structure and function of tissues.

Task**Individual Work**

Approximate Time : 20 Minutes

Procedure:

The worksheet that has the multiple choice questions (MCQs) is given to the students. The students have to select the correct answer from the four different choices given for each question.

Student Worksheet

Time : 15 minutes

Instructions: Select the correct option from the four different choices given for each question.

- Q.1. Girth of the stem increases due to
- (a) Apical Meristem (b) Vertical Meristem
(c) Lateral Meristem (d) Intercalary Meristem
- Q.2. Which of the following statements is incorrect:
- (a) Some tissues in plants divide throughout the life
(b) Animals have more dead tissues as compared to plants
(c) Cell growth in animals is more uniform as compared to plants
(d) There is no demarcation of dividing and non-dividing regions in animals
- Q.3. The length of the stem increases due to :
- (a) Apical Meristem (b) Vertical Meristem
(c) Lateral Meristem (d) Intercalary Meristem
- Q.4. Which of the following are characteristic features of cells of meristematic tissue?
- (a) Actively dividing cells with dense cytoplasm, thick cell walls and prominent nuclei
(b) Actively dividing cells with dense cytoplasm, thin cell walls and no vacuoles
(c) Actively dividing cells with thin cytoplasm, thick cell walls and prominent nuclei
(d) Actively dividing cells with thin cytoplasm, thin cell walls and no vacuoles
- Q.5. Some parts of the plant are flexible due to the presence of
- (a) Parenchyma (b) Collenchyma
(c) Meristematic Tissue (d) Sclerenchyma



- Q.6. Which of the following is not a function of epidermis?
- (a) Conduction of water (b) Protection from mechanical injury
(c) Gaseous exchange (d) Transpiration
- Q.7. Which of the following parts does not have cartilage?
- (a) Nose (b) Kidney
(c) Ear (d) Trachea
- Q.8. Given below is a list of different types of muscles in human body
- (i) *Smooth* (ii) *Striated*
(iii) *Cardiac* (iv) *Skeletal*
- Which of the above mentioned muscles are termed as involuntary?
- (a) (i) & (ii) (b) (i) & (iii)
(c) (ii) & (iii) (d) (ii) & (iv)
- Q.9. Which of the following elements of xylem tissue helps in sideways conduction of water?
- (a) Xylem Tracheids (b) Xylem Parenchyma
(c) Vessels (d) Xylem Fibres
- Q.10. In the human body, fats are stored in
- (a) Areolar tissue (b) Adipose tissue
(c) Epithelial Tissue (d) Cartilage

Criteria for Assessment : Marks for each correct answer = $\frac{1}{2}$

(Total Marks: $\frac{1}{2} \times 10 = 5$)

Suggestive Remediation

A few students may not be able to give the correct answers to a few questions. The concepts related to such questions may be explained again. The students may be asked to answer similar questions after a few days.



Diversity In Living Organisms

Chapter- 7

Assessment Technique

Putting up a display on the Bulletin Board

Objectives: To enable the students to–

- Learn how to work as a team to achieve a common goal
- Distribute the work for its effective execution
- Recognize various groups of organisms based upon common features
- Appreciate the concept of diversity in the living world

Task

Group Activity

Approximate Time : 7-10 days for preparation and 2-3 hours for Display

Procedure:

1. The students in the class will be divided into 6-8 groups.
2. Topics from the chapter may be allotted to the students accordingly.
3. The time frame for completion of work and display should be decided by the teacher and then conveyed to the students.
4. The students shall collect information, pictures, photographs or any other illustrations from different sources such as old magazines/ journals/ newspapers/ internet etc.
5. The students shall then make a presentation of the same on the display board.
6. The display can include handwritten material in appropriate font size, collage, cartoons, drawings, painting or any other way.

Criteria for Assessment: Each member of the group appears for a viva conducted by the teacher to assess the level of his/ her participation. The group work will be assessed on the basis of the format given below:

Class IX Formative Assessment 2010-2011

Bulletin Board Evaluation Sheet

S.N.	Name of the student	Group	Topic	Viva (2)*	Presenta-tion (1 ½)**	Content and relevance to the topic (1 ½)***	Total (5)
1.	A						
2.	B						
3.	C						
4.	D						
5.	E						
6.	F						
Remarks if any:							

* : $\frac{1}{2} \times 4 = 2$ Sample questions: How did biodiversity come about?



Name your favourite group of organisms and mention why?

What would happen if diversity was not classified?

State two common characteristics between two groups (eg. Fish and mammals)

** : $\frac{1}{2} \times 3 = 1 \frac{1}{2}$

- Aesthetically pleasing
- Effort in collection of material
- Individual effort in collective display
- Innovation

*** : $\frac{1}{2} \times 3 = 1 \frac{1}{2}$

- Enough content
- Relevance of content
- Comprehensiveness of topic

Note:

Suggested Alternatives:

- Display of various types of plants only,
- only vertebrates,
- only invertebrates,
- Diversity of ecosystems.

Suggestive Remediation

The teacher may identify the students who have not displayed active participation in this activity. Such students may be given an alternate topic for display board or an alternative activity based on similar topic.

Diversity In Living Organisms

Chapter- 7

Assessment Technique : Individual Worksheet (Game based- 'String the Beads')

Objectives: To enable the students to—

- Learn the characteristic features of various groups of living organisms
- Identify groups based on common characters
- Recognize the organisms that belong to a particular group based on common characters.

Task

Individual Work

Approximate Time : 15 Minutes

Procedure:

1. The worksheet with outline structure of a 'Bead Necklace' and a list of characters placed in different categories is given to the students.



- Each necklace is given a name that is actually the 'term' for a group of living organisms.
- The student has to pick one character from each category and write it in the bead to list the common characters of a group.
- In this way, the student will 'string the beads' and the necklace will be complete when all the beads have been allotted characters from each category.

Student Worksheet

Time : 15 minutes

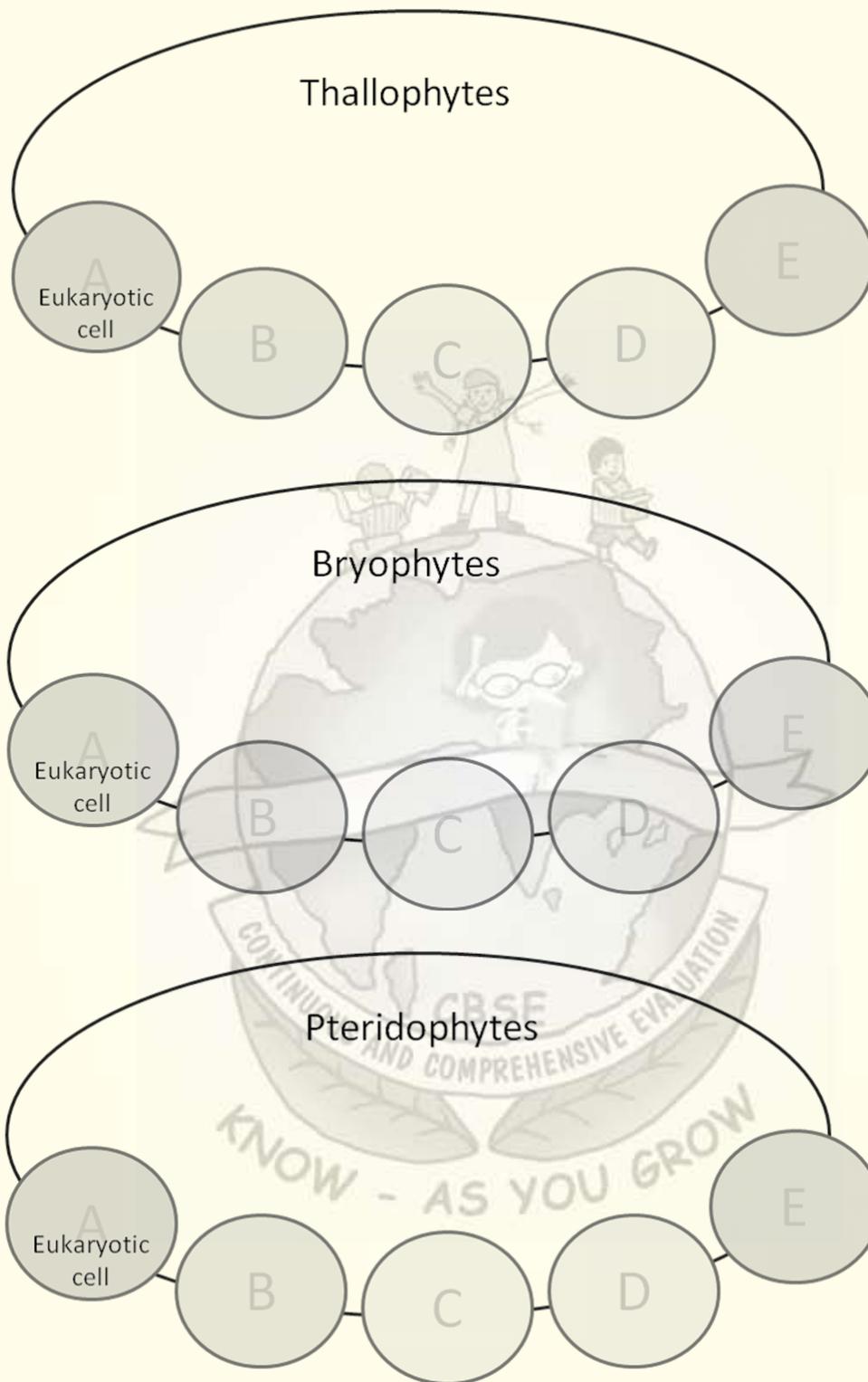
Instructions:

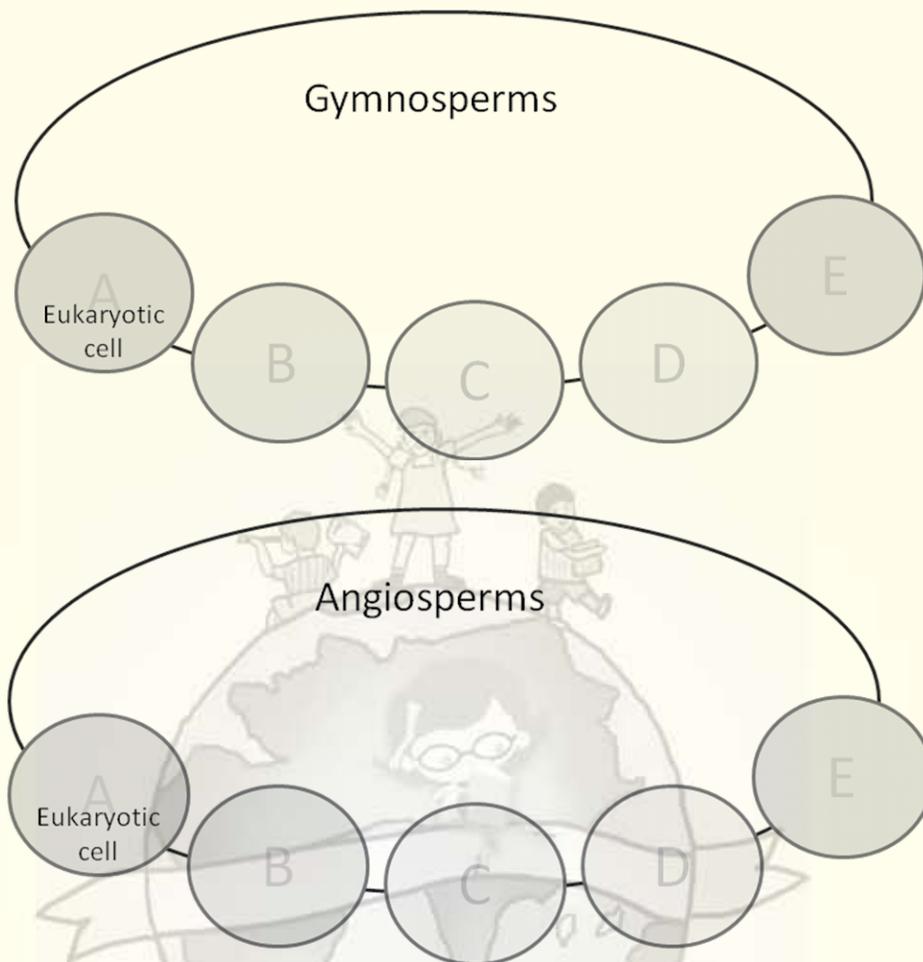
Given below are outline structures of some 'Bead Necklaces' and a list of characters placed in different categories. Each necklace is given a name that is actually the 'term' for a group of living organisms. You have to pick one character from each category to list the common characters of a group. In this way, you will 'string the beads' and the necklace will be complete when all the beads have been allotted characters from each category.

The first bead has been completed for you from category A.

Categories →	A	B	C	D	E
	Eukaryotic Cell	Unicellular	Do not have differentiated plant body	Vascular tissues absent	Reproductive organs inconspicuous & Reproduction by naked embryos called spores
	Prokaryotic cell	Multicellular	True differentiation of the plant body is not there	Vascular tissues present	Reproduction by naked seeds
		Both unicellular and multicellular	Well differentiated plant body		Reproduction by seeds that are enclosed in a fruit







Criteria for Assessment : Marks for each correct necklace = 1

($\frac{1}{4}$ marks for each bead)

(Total Marks: $1 \times 5 = 5$)

Suggestive Remediation

- ▲ A few students may not be able to give proper terms in the beads. The teacher may explain the characters again.
- ▲ If the number of students who have not put the correct terms in the beads is more, then the worksheet may be modified (a diagram based worksheet can be given where student labels the relevant parts of an organism that indicate its belongingness to a group.



Diversity In Living Organisms

Chapter- 7

Assessment Technique

Questionnaire based on Field Visit

Objectives: To enable the students to–

- Develop interest in out-of-school activities and learning
- Broaden their understanding and observation skills
- Enhance knowledge through extended learning
- Appreciate interrelation between classroom learning and natural surroundings

Task

Individual Work

Approximate Time : 3-4 Hours

Procedure:

1. The teacher may organize a trip to the zoo after suitably briefing the students.
2. Children can be encouraged to seek clarifications while making observations in their notebook. They can also be encouraged to read the information on the boards placed next to the enclosures.
3. The students must be reminded categorically not to tease or feed the animals.
4. The students would be expected to answer a questionnaire before leaving the zoo.

Student Worksheet

Name: _____ **Class & Section:** _____

Time: 15 minutes

Maximum Marks: 10

Instructions: Answer the following questions based on your observations of some of the animals you have seen in the zoo.

Questionnaire:

1. Name two reptiles that you observed. What do these reptiles eat?
2. Name the carnivores (Cat family) that you saw? What is given to them to eat?
3. How many kinds of deer did you see? What were they doing?
4. Connect the carnivore and the deer through a food chain. Complete the food chain.
5. Name two animals that have been brought to the zoo from other countries.



6. Name five animals that you enjoyed seeing the most and why?
7. Name the producers in the zoo?
8. Name three primary consumers and three secondary consumers you saw in the zoo.
9. What purpose do zoos serve? State the purposes.
10. Did you enjoy your trip to the zoo? Give reason for your response as yes or no.

Parameters for Assessment:

Response to questionnaire

Marking: $\frac{1}{2} \times 10 = 5$

No marks for incomplete answer

Suggested Alternative

The field trip can instead be to a sanctuary / reserve forest / forest / river / sea beach / garden and teacher may prepare the questionnaire accordingly.

Suggestive Remediation

- ▲ Few students may not be able to give correct answers to all questions. They may be given another questionnaire after some more time so that they can consult their observation notebook and be better prepared.

Diversity In Living Organisms

Chapter- 7

Assessment Technique

Individual Worksheet (MCQ based)

Objectives: To enable the students to—

- Understand the need and basis for classification of living organisms
- Recognise the characteristic features of organisms on the basis of which they are classified into different taxonomic categories
- Differentiate between different groups of organisms
- Appreciate diversity in the living world

Task

Individual Work

Approximate Time : 20 Minutes

Procedure:

The worksheet that has the multiple choice questions (MCQs) is given to the students. The students have to select the correct answer from the four different choices given for each question.



Student Worksheet

Time : 15 minutes

Instructions: Select the correct option from the four different choices given for each question.

- Q.1. Which of the following statements is incorrect:
- (a) Whittaker proposed the five kingdom system of classification
 - (b) Charles Darwin described the idea of evolution
 - (c) Woese divided Monera into Archaeobacteria and eubacteria
 - (d) Aristotle classified animals on the basis of nutrition(food habits)
- Q.2. The hierarchy of classification follows the following pattern
- (a) Kingdom, Phylum, Family ,Order, Class, Genus, Species
 - (b) Kingdom, Phylum, Order, Class, Family, Genus, Species
 - (c) Kingdom, Phylum, Class, Order, Family, Genus, Species
 - (d) Kingdom, Phylum, Family, Class, Order, Genus, Species
- Q.3. Which of the following a common feature of Monera and protista
- (a) Prokaryotic cell
 - (b) Autotrophic mode of nutrition
 - (c) Eukaryotic cell
 - (d) Unicellular body design
- Q.4. Which of the following criteria cannot be used to differentiate between the members of Kingdom Fungi and the members of Kingdom Plantae
- (a) Presence / absence of cell wall
 - (b) Mode of nutrition
 - (c) Composition of cell wall
 - (d) Presence/ absence of chlorophyll
- Q.5. If pteridophytes had this feature, they would be placed in the same group as gymnosperms
- (a) Seed bearing capacity
 - (b) Plant body differentiated into root, stem and leaves
 - (c) Vascular tissues
 - (d) Well differentiated reproductive tissues
- Q.6. Which of the following animals is a true fish?
- (a) Silver fish
 - (b) Jelly fish
 - (c) Star fish
 - (d) Dog fish



Q.7. A list of groups of animals are given below.

- | | |
|---------------------------|------------------------|
| (i) <i>Mollusca</i> | (ii) <i>Arthropoda</i> |
| (iii) <i>Coelenterata</i> | (iv) <i>Annelida</i> |

An open circulatory system is present in which of the above mentioned?

- | | |
|------------------|-----------------|
| (a) (i) & (ii) | (b) (i) & (iii) |
| (c) (ii) & (iii) | (d) (ii) & (iv) |

Q.8. Which of the following cannot be used as a criterion for scientific classification of living organisms?

- (a) Height of the organism
 (b) Mode of nutrition
 (c) Body design and complexity of the organism
 (d) Membrane bound nucleus and cell organelles

Q.9. A well defined nucleus is absent in

- | | |
|----------------------|-------------|
| (a) Algae | (b) Diatoms |
| (c) Blue-green algae | (d) Yeast |

Q.10. A two chambered heart is found in

- | | |
|---------------|-----------|
| (a) Rohu | (b) Snake |
| (c) Crocodile | (d) Toad |

Criteria for Assessment : Marks for each correct answer = $\frac{1}{2}$

(Total Marks: $\frac{1}{2} \times 10 = 5$)

Suggestive Remediation

A few students may not be able to give the correct answers to a few questions. The concepts related to such questions may be explained again. The students may be asked to answer similar questions after a few days.

Diversity In Living Organisms

Chapter- 7

Assessment Technique

Worksheet (Crossword Puzzle)

Objectives: To enable the students to—

- Recognize the various groups in animal kingdom based on their specific features
- Learn the names of organisms associated with various groups of animal kingdom
- Relate certain identifying features to the names of phyla/groups/groups

Task

Individual Work



Approximate Time : 15 Minutes

Procedure:

- The students may be given a worksheet that has a crossword puzzle and clues to complete the crossword.
- The students may be asked to read the given clues carefully and fill up the blocks with appropriate word / term.

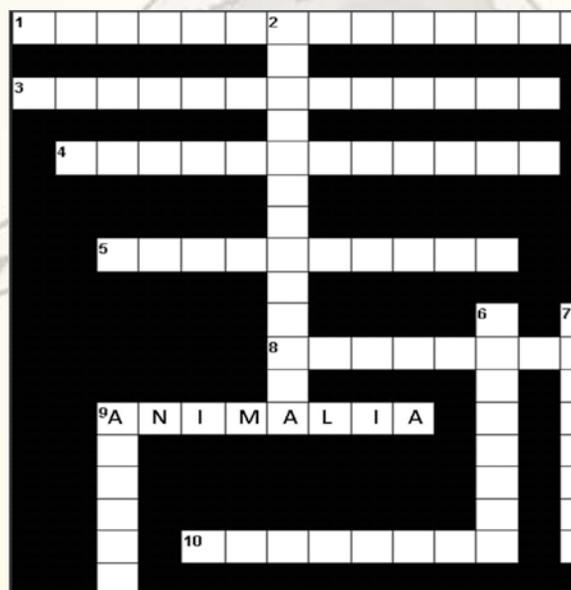
Criteria for Assessment: Marks for each correct word added in the puzzle = ½

(Total Marks: ½ X 10 = 5)

Student Worksheet

Time: 15 minutes

Instructions: Read the given clues carefully and fill up the blocks with appropriate word / term to complete the crossword puzzle given below.



The Clues

Across:

1. The group of flatworms
3. The term for triploblastic marine animals with notochord at some stage of life
4. Corals belong to this group
5. A true vertebral column and internal skeleton are the main features of this group
8. This common word for certain organisms means 'jointed legs'
9. A kingdom of eukaryotic, heterotrophic, multicellular organisms without cell walls.
10. Filarial worm belongs to this group

Down:

2. Spiny skinned animals with peculiar water-driven tube system



6. Open circulatory system, movement by a foot, kidney-like organs for excretion are the features of this group
7. This group includes animals with holes pores on their body wall.
9. The animals belonging to this group have segments lined up one after the other from head to tail

Suggestive Remediation

- ▲ Some students may not be able to complete the cross-word puzzle. They may be given an alternate assignment (MCQ based).
- ▲ The teacher may also provide pictures that can be used with clues to guess the correct term.



Motion

Chapter-8

Assessment Technique

Graph-Based Worksheet

Objectives: To enable the learners to–

- Read the given velocity-time graph correctly
- Interpret the given graph for motion of a body correctly
- Solve simple problems based on graphical representation of motion.

Task:

individual

Approximate Time: 20 minutes

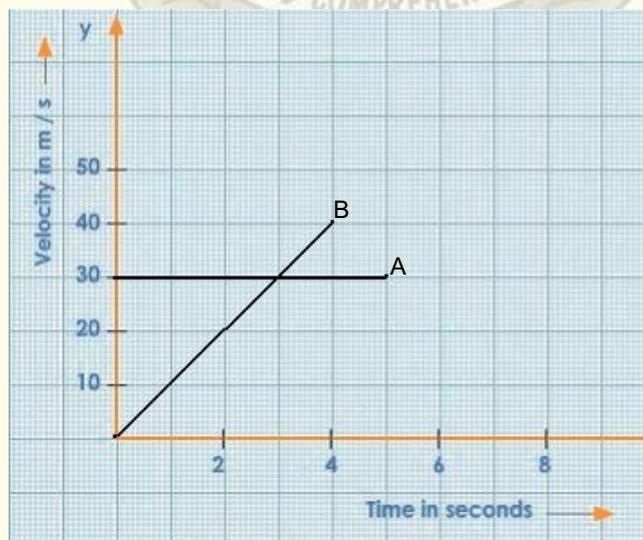
Procedure:

- The teacher may draw and explain velocity-time graph for motion of a body for
 - (i) uniformly accelerated motion
 - (ii) constant velocity motion
- Different examples and different graphs for these motions may be discussed in the classroom.
- Few related oral questions maybe asked to ensure learning of graphical representation of motion.

Assessment parameters: one mark for every correct answer.

Student Worksheet

Instruction: The velocity-time graph for motion of two bodies A and B is as shown. Read the graph carefully and answer the following questions:



1. Which of the two bodies has a higher velocity at time (a) $t = 2s$ (b) $t = 4s$? (1)
2. Which of the two bodies has (a) constant velocity (b) increasing velocity? (1)
3. At what time is the velocity of the two bodies same? (1)
4. What is the velocity of A and B at time $t = 1s$? (1)
5. What is the change in the velocity of body B over a 2 second interval? (1)

Suggestive Remediation

- ▲ Graphical representation of motion is a comparatively higher level of learning skill in Class-IX. Students' response to the given worksheet maybe analysed carefully and suitable additional inputs may be provided to help the students who are not able to understand the same.
- ▲ Physical significance of graphical representation of motion maybe given taking examples from everyday life.
- ▲ The concepts on linear equations learnt in Mathematics in Class-IX may be co-related to the examples in Physics.

Motion

Chapter-8

Assessment Technique

Graph based Worksheet

Objectives: To help the learners to—

- interpret the given graphical representation of motion of a body .
- distinguish between graphs corresponding to uniform motion and uniformly accelerated motion
- read data from a given graph .
- correctly identify graphs corresponding to, 'accelerated and retarded motions'

Task:

Individual

Approximate Time: 5-10 minutes

Procedure: The teacher may:

- give examples and draw graphs for different kinds of motion of a body.
- Explain the difference between graphs corresponding to uniform linear increase/decrease in velocity

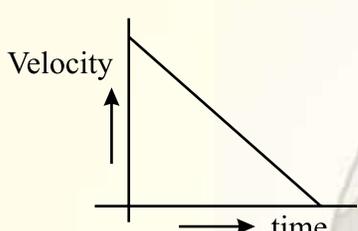
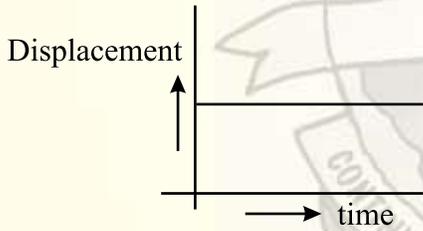
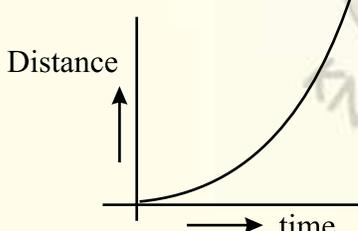
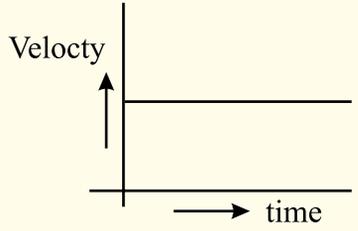


- Give examples from daily life situations corresponding to graphical representation of motion
- Give examples to help students to convert a “ given data into a graph’ and ‘Using a graph to read data’.

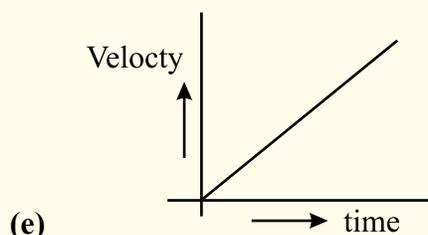
Assessment parameters: One mark for every correct answer.

Student Worksheet

Instructions: Observe the given (i) graphs and (ii) information in column I and column II respectively, and match the two:

Column I	Column II
<p>(a) </p>	<p>(i) Constant velocity</p>
<p>(b) </p>	<p>(ii) non-uniform speed</p>
<p>(c) </p>	<p>(iii) Body at rest</p>
<p>(d) </p>	<p>(iv) Uniform acceleration</p>





(v) Uniform retardation

Suggestive Remediation

- ▲ A few students may not be able to read the given graphs correctly and may fail to co-relate the two columns. They may be explained the nature of different graphs in small steps..
- ▲ The significance of a 'parallel to the time-axis' and 'on the time axis itself' graph may be clearly explained.
- ▲ Suitable simple examples/practice exercises may be given to draw graphs corresponding to given data.
- ▲ The difference in the graphs, corresponding to a linear variation and non-linear variation (straight line and curved graphs respectively) may be clearly brought out.

Motion

Chapter-8

Assessment technique:

Data based Worksheet

Objectives: To enable the students to

- Read the given data correctly
- Plot the given data graphically
- Correlate the given data to motion in real life situations
- Compute simple data-based numerical correctly
- Compute simple graph based numerical correctly.

Task:

Individual

Approximate Time: 10 minutes

Procedure:

- Write an arbitrary data on motion on blackboard and explain it to the students.
- Ask them to read it carefully and correlate it to different kinds of motion
- Help them to correlate the given data to motions in everybody life situations.

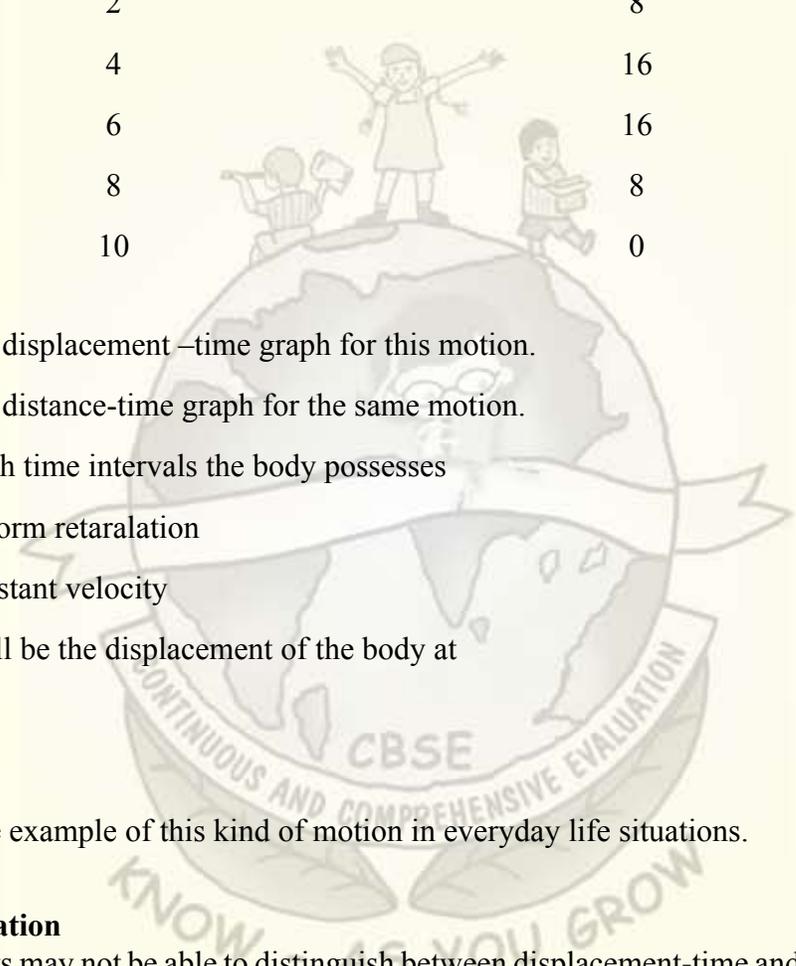
Assessment Parameters : One mark for every correct answer.



Student Worksheet

Instructions: Read the given time (t) vs. displacement (s) data carefully and answer the questions which follow:

Time (t) in seconds	Displacement (s) in metres
0	0
2	8
4	16
6	16
8	8
10	0

- 
- (i) Sketch a displacement–time graph for this motion.
- (ii) Sketch a distance-time graph for the same motion.
- (iii) For which time intervals the body possesses
- uniform retaralation
 - Constant velocity
- (iv) What will be the displacement of the body at
- $t = 35$
 - $t = 75$
- (iv) Give one example of this kind of motion in everyday life situations.

Suggestive Remediation

- ▲ Some students may not be able to distinguish between displacement-time and distance-time graphs. They may be helped to understand this difference by taking suitable examples.
- ▲ The underlying concepts may be clarified by taking different examples from everyday life.



Motion

Chapter-8

Assessment Technique

Numerical Based Worksheet

Objectives: To help the learners to–

- Convert units from one system to another correctly.
- Select and use correct formulae for desired computation
- Make calculations using correct formulae.

Task:

Individual worksheet

Procedure:

- Help the students convert units of a given physical quantity from one system to another by taking appropriate examples.
- Help the students learn different formulae for desired calculations e.g.

$$\text{Speed} = \frac{\text{distance}}{\text{time}} \quad \text{average speed} = \frac{\text{Total distance}}{\text{total time}}$$

- Provide practice for making calculations using correct formulae and units.

Approximate time: 10 minutes

Assessment Parameters

- Conversion of speed of 144 km/h into m/s 1 mark
- Writing correct expressions for time taken to go in one direction and the other direction 2 marks
- Correct formula, average speed = $\frac{\text{Total distance}}{\text{total time}}$ 1 mark
- Correct substitution and calculation of result = 48 ms⁻¹ 1 mark



Student Worksheet

Instructions: Solve the numerical given below.

An object moves from point P to point Q with an average speed of 60 m/s and immediately comes back from Q to point P with an average speed of 144 km/h . Calculate the average speed over the whole journey in m/s

Suggestive Remediation:

- ▲ Some students may not be able to convert the units from km/h to m/s. They may be helped to learn the same.
- ▲ Others may not know that the units for average speed for forward and return journey have to be in the same system. This point may be emphasized upon and clarified.
- ▲ Still others may not realize to assume the distance P and Q to be an unknown quantity and may not be able to start the solution. Sufficient explanation may be given for solving numerals based on such situations.

Motion

Chapter-8

Assesment Technique

Data Based worksheet

Objectives: To enable the students to–

- Familiarize with tabular form of data related to motion of a body.
- Read and interpret the data correctly.
- Compare different data and relate it to different forms of motion.
- Translate given data into graphical representation

Task:

Individual

Approximate Time: 10 Minutes

Procedure: The teacher may

- write the data for different kinds of motion of bodies on the blackboard.
- ask students to read the given data carefully and relate it to different kinds of motion.
- plot/sketch the data in the form of graphs
- ask further questions to clarify the related concepts.

Assessment parameters: 1 mark for every correct answer.



Student Worksheet

Instructions: The table given below shows distance (in cm) traveled by the bodies A B and C. Read this data carefully and answer the questions which follow.

Time	Distance (in cm) covered by different bodies		
	Body A	Body B	Body C
1st second	20	20	20
2 nd second	20	36	60
3 rd Second	20	24	100
4 th second	20	30	140
5 th Second	20	48	180

- (a) Which of the bodies is moving with
 - (i) Constant speed?
 - (ii) Constant acceleration?
- (b) Which of the bodies covers
 - (i) maximum distance in 3rd second?
 - (ii) Minimum distance in 3rd second?
- (c) Which of the bodies is moving with non-uniform acceleration?
- (d) Sketch a distance time graph for motion of
 - (i) body A
 - (ii) body C
- (e) How much distance is covered by body C in 5s?
- (f) How much distance is covered by body B in last three seconds?
- (g) Which of the bodies covers least distance in first three second?

Suggestive Remediation:

- ▲ Some of the students may not be able to correlate the given data to different kinds of motion. They may be helped to understand the same by giving more detailed explanation and additional examples.
- ▲ Others may not be able to translate the given data in graphical form. They may be helped to learn the same by providing additional explanation. A graph paper may also be used, if need be.



Motion

Chapter -8

Assessment Technique

Multiple choice questions worksheet

Objectives: To help the learners to–

- Understand fundamental concepts related to motion of a body
- Solve simple numericals based on equations of motion
- Understand graphical representation of motion
- Relate/connect classroom learning about motion to everyday life situations.

Task:

Individual

Approximate Time: 20 Minutes

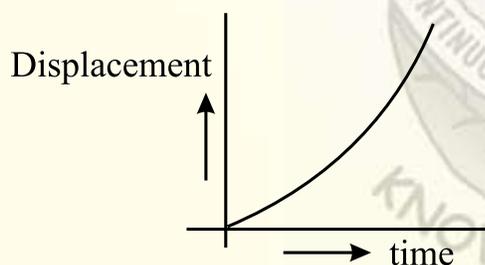
Procedure: After having taught the chapter on motion, the teacher may summarise core concepts with detailed explanation to the students in the form of a summary for reinforcement. The worksheet based on Key concepts may be given to students to assess their learning

Assessment Parameters: Two marks for every correct answer.

Student Worksheet

Instructions: Read the following questions carefully and put a tick mark (✓) on the most correct answer.

Q. 1. The given graph represents a body moving with



- (a) constant velocity
- (b) constant acceleration
- (c) constant retardation
- (d) infinite velocity

Q. 2. When the distance traveled by a body is directly proportional to time, it is travelling with

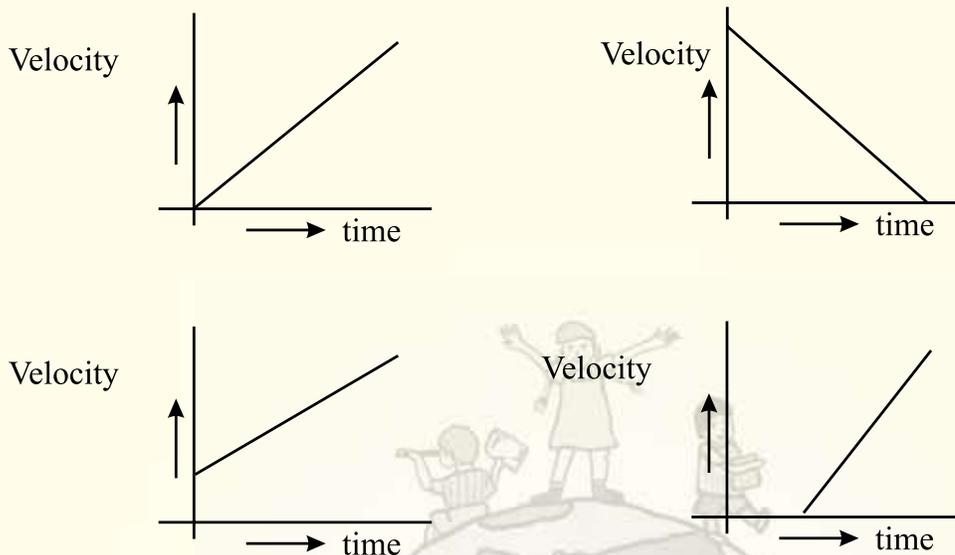
- (a) uniform acceleration
- (b) non-uniform acceleration



- (c) constant speed
- (d) variable speed
- Q. 3. The distance covered by a car moving at a speed of 30 km/hour in 15 minutes is
- (a) 0.9 Km
- (b) 9.0 Km
- (c) 90 Km
- (d) 900 Km
- Q. 4. The velocity of a body moving at an initial velocity of 20 m/s and having an acceleration of 4m/s^2 after 2s will be
- (a) 24 m/s
- (b) 28 m/s
- (c) 32 m/s
- (d) 40 m/s
- Q. 5. Which of the following equations is an equation of motion of a body
- (a) $F= ma$
- (b) $p=mv$
- (c) $v^2-u^2=2as$
- (d) $Ft=mv-mu$
- Q. 6. The slope of velocity-time graph of motion of a body represents
- (a) distance
- (b) displacement
- (c) speed
- (d) acceleration
- Q. 7. The velocity of a car increases from 36 Km/hour to 108 Km/hour in 10s. Its acceleration is
- (a) 2 m/s^2
- (b) 3m/s^2
- (c) 20m/s^2
- (d) 30m/s^2



Q. 8. When a body is moving with constant acceleration and its initial velocity is not zero, its velocity time graph is



Q. 9. A ball is gently dropped from a height of 20 m. If its velocity increases uniformly at the rate of 10m/s^2 , after what time it will strike the ground?

- 0.1 s
- 1.0 s
- 0.2 s
- 2.0 s

Q. 10. A body moving uniformly along a circular path has

- Constant velocity
- Constant speed
- Variable speed
- Same direction of motion

Force And Laws Of Motion

Chapter-9

Assessment Technique

Graph cum Numerical based worksheet

Objectives: To enable the learners to–

- Read and interpret the graph correctly
- Solve simple graph related numericals.
- Apply laws of motion and equations of motion simultaneously to solve problems.

Task:

Individual



Approximate Time: 10 minutes

Procedure: The teacher may

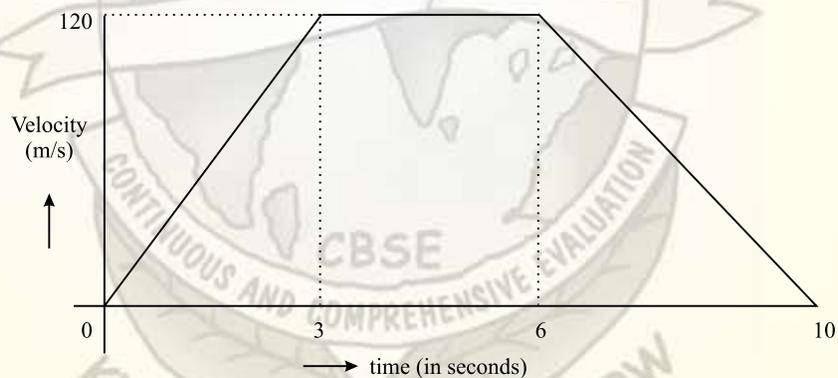
- Plot the graph on the blackboard
- Explain the graph alongwith given figures
- Ask the students to answer the given questions based on the information given in the graph

Assessment Parameters

- Calculation of acceleration and force for part (a) 2 marks
- Calculation of acceleration and force for part (b) 2 marks
- Interpretation for no force interval 1 mark

Student Worksheet

Question : The velocity-time graph of an object of mass 50 g is as shown. Observe the graph carefully and answer the following questions:



- Calculate the force on the object in the time interval 0-3s.
- Calculate the force on the object in the time interval 6-10 s
- Is there any time interval in which no force acts on the object? Justify your answer.

Suggestive Remediation:

- ▲ Few students may apply the correct formula for calculation of acceleration and force but may not use same system of units and hence get incorrect answer. This may be emphasised upon.
- ▲ The reasons for justification for correct answer in part (c) may be explained clearly.



Force & Laws Of Motion

Chapter-9

Assessment Technique: Worksheet based on 'Matching'/Co-relating.

Objectives: To enable the students to get familiar with

- Different effects of 'force'
- Co-relating these effects with 'daily-life situations'.
- The concept of force in terms of its different effects.

Procedure:

- State 'different effects' of force.
- State some 'daily-life situations' where these 'effects of force' are observed.
- Ask the students to co-relate/match the 'different effects' with their corresponding 'daily-life situations'.
- Ask the students to state some 'daily-life situation' corresponding to another effect of force, not mentioned in the list given earlier.

Assessment parameters:

½ mark for each correct matching and 2 marks for the two correct statements of 'daily-life situation'.

Student Worksheet

Instructions:

Q.1. Read the given terms/situations given in columns A and B carefully and match the two:

Column A

- (a) Push
- (b) Pull
- (c) Stretch
- (d) Acceleration
- (e) Squeeze
- (f) Change in direction

Column B

- (i) Taking out a note book from a table drawer
- (ii) Using a bow and an arrow
- (iii) A ball rolling down an incline
- (iv) Opening a door to get into a room.
- (v) Batting
- (vi) Brushing teeth

Q. 2. State one situation each from some 'daily-life situation' where a force

- (a) causes a 'slowing down'.
- (b) only tends to start motion.



Suggestive Remediation:

- ▲ Make the students realize that the concept of a 'force' is best understood in terms of its different effects.
- ▲ Give students practice in naming different
 - (a) 'daily-life situations', corresponding to different effects of force.
 - (b) Effects of force corresponding to given 'daily-life situation'.

Force & Laws Of Motion**Chapter-9****Assessment Technique****'Demonstration' Based Worksheet**

Objectives: To enable the students to–

- Get into the habit of 'careful observation'.
- State their observations
- Draw conclusions based on their observations.
- Arrive at a 'general result' based on their observations and conclusions.

Procedure:

- Arrange a card board/plyboard at some angle to the ground to a place where a long stretch of floor is 'clear'.
- Make provision for holding the board in its inclined position and for adjusting its angle of inclination.
- Make provision for fixing two different surfaces – One smooth and one rough – on the board.
- Have two different balls – say a smooth rubber ball and a used cricket/tennis ball.
- Let each ball roll down, from each of the two surfaces, for a given angle of inclination.
- Measure the distance (from the lower edge of the inclined surface) the balls travel on the floor before coming to rest.
- Write the results of your observations on the black board or notebook.

Assessment parameters:

1 mark for the three correct answers.

1 mark for a 'tabular presentation' of the observations.

1 mark for 'conclusion' – arrived at.



Student Worksheet

Instructions:

- Observe the 'demonstration' and the data written on the black board carefully and answer the following questions:
1. In each case, is the distance moved by the cricket ball less/more than that moved by the rubber ball?
 2. For which of the two surfaces does the rubber ball travel a longer distance?
 3. Why do the balls come to rest after travelling different distances?
 4. Write the written results of the demonstration in a 'tabular form'.
 5. State your 'general conclusion', if any, based on your observations.

Suggestive Remediation:

- ▲ Make the students understand the role of friction in bringing the balls to rest.
- ▲ Explain why the force of friction is different for different surfaces in contact.
- ▲ Help the students to understand how 'observations' and 'data', can be used to arrive at some 'general conclusion.'

Force & Laws Of Motion

Chapter-9

Assessment Technique:

Numerical Based Worksheet.

Objectives: To enable the students to—

- Calculate momentum value
- Realize that the 'change', in a physical quantity', is to be calculated as (final value – minus initial value)
- Understand that force equals the 'rate of change of momentum'.
- Appreciate that the negative sign, in a result has its associated physical meaning.
- Get familiarised with the SI units of momentum and force.

Procedure:

- State the information/data for doing the necessary calculations.
- Ask the students to calculate the required quantities.
- Help them to understand the SI units of momentum and force.
- Help them to understand the significance of the 'negative sign' in their result.

Assessment Parameters: One mark for every correct answer.



Student Worksheet

Instructions:

Read the given information carefully and answer the questions that follow:

A hockey ball, of mass 200 g, travelling from west to east, at 10m/s is struck by a hockey stick. As a result, the ball gets turned back and now has a speed of 5m/s. The ball and the hockey stick were in contact for 0.2s.

- (i) Calculate the initial and final momentum of the ball.
- (ii) State the direction of momentum in each case.
- (iii) Calculate the rate of change of momentum of the ball.
- (iv) What are the SI units of (a) momentum (b) rate of change of momentum?
- (v) Calculate the force exerted by the hockey stick on the ball and state its direction.

Suggestive Remediation:

- (1) Some students may write the momentum values without
 - (i) correct sign and/or
 - (ii) correct units.
 - Help them to understand that physical quantities – like momentum and force – even for a one – dimensional case, need a + or – sign to differentiate their sense of motion along their one – dimensional path.
 - Emphasize on the importance and significance of writing the correct SI units of different physical quantities.
- (2) Help the students to understand that a decrease in momentum implies that the force has acted in a direction opposite to the original direction of motion of the object.
- (3) Give the students sufficient practice in solving numerical problems to help them overcome their fear of the same.
- (4) Emphasize how ‘solving problems’ helps in better understanding of the related concepts.



Floatation

Chapter-10

Assessment Technique:

Conceptual Clarification Worksheet

Objectives: To enable the students to learn that–

- The gravitational attraction due to earth acts vertically downwards on all objects.
- The upthrust, due to a liquid acts vertically upwards on any object immersed in it.
- It is the comparative value of the density of (the material of) the object, and the density of the liquid that decides whether the object will sink or float in the liquid.

Procedure:

- Write data about the mass and volume of one object so that its density is less than that of water.
- Write data about the mass and volume of another object so that its density is more than that of water.
- Ask the students to decide which object will sink/float when put in water.

Assessment Parameters:

1 mark for each correct answer.

Student worksheet

Instructions:

Read the following statements carefully and answer the questions that follow::

- (i) A sealed waterproof packet X of mass 600g has a volume of 450 cm³.
- (ii) Another sealed waterproof packet Y of mass 200g has a volume of 300 cm³.
- (iii) The density of water equals 1gcm³.
- (iv) The two objects are put in water one by one.
 - (a) What is the density of packet X?
 - (b) Will this packet sink or float, when put in water?
 - (c) What is the density of packet Y?
 - (d) Will this packet sink or float when put in water?
 - (e) Give reason for the difference in behavior of packets X and Y.



Suggestive Remediation:

Special attention may be given to–

- ▲ density equals mass divided by volume.
- ▲ Any object, with density more than 1g/cm^3 ($= 1000 \times 10^3\text{kg/m}^3$) is denser than water.
- ▲ Any object, with density less than 1g/cm^3 ($= 1000 \times 10^3\text{kg/m}^3$) is lighter than water.
- ▲ 'denser than water' object will sink in water.
- ▲ 'lighter than water' object will float in water.

Gravitation**Chapter-10****Evaluation Technique:****Physical Interpretation of Mathematical Formulae**

Objectives: To enable the learners to–

- learn correct significance of scientific terms
- Interpret a mathematical formula correctly.
- make simple computations involving change in the value of variables in a given relation
- correlate dependence of a physical quantity and factors on which it depends.

Approximate Time: 10 minutes

Assessment Parameters: As indicated.

Student Worksheet**Instructions:**

Newton's Universal Law of Gravitation is expressed mathematically as

$$F = G \frac{m_1 m_2}{d^2}$$

Answer the following question based on this law:

- (i) What is the meaning of the word 'Universal' in this law? (1)
- (ii) This law holds good for any two bodies in the universe. Then why you or your friend sitting near each other not feel any force of attraction? (1)



- (iii) Will the force of attraction between same two bodies be same or different when these are, in turn, kept on (i) earth (ii) moon? (1)
- (iv) In what ratio will the force of attraction between same two bodies change when the distance between these is (1)
- (i) halved ?
- (ii) Tripled ?
- (v) In what ratio will the force of attraction change when mass of each of these bodies is halved ? (1)

Suggested Remediation:

Special attention may be given to–

- ▲ The meaning and significance of the word 'Universal' may be highlighted. Extremely small value of 'G' may also be brought out clearly.
- ▲ Some students may not be able to interpret the mathematical relation correctly. Changing the values of m_1 , m_2 and d and its effect on change in F may be explained very clearly to help the students solve such problems.

Gravitation**Chapter-10****Assessment Technique:****Numerical based worksheet**

Objectives: To enable the learners to–

- learn the relations $\text{density} = \frac{\text{mass}}{\text{volume}}$ and $\text{weight} = \text{mass} \times g$
- make simple calculations based on above relations.
- learn and use the relation $\text{pressure} = \frac{\text{Force}}{\text{Area}}$
- appreciate the consistency of mass of a body at different places.
- appreciate the necessity of using units of different physical quantities in the same system in a specific situation.

Approximate Time: 15 minutes

Procedure:

The teacher may

- explain the relations $\text{density} = \frac{\text{mass}}{\text{volume}}$ and $\text{weight } W = mg$.
- state and explain the units of mass, volume and density.

give illustrative examples of use of the above relations.



- explain the concept of pressure with the help of suitable illustrations.
- highlight the necessity of use of correct units of different physical quantities involved in a given situations.

Assessment Parameters:

As indicated in the worksheet.

Student Worksheet**Instructions:**

A solid cube with 10 cm edge is made of a material of density 7000 kg/m^3 . Answer the following questions based on this information:

- Calculate the volume of the cube in m^3 (2)
- calculate the mass of the cube on Earth. (2)
- What will be the mass of the cube on the surface of moon? (1)
- Calculate the weight of cube on the surface of earth. (2)
- If the cube is placed with one of the faces on a table, calculate the pressure exerted by the cube on the table in N/m^2 . (3)

Suggested Remediation:

- ▲ Some of the students may use incorrect units in calculation of volume and mass of the cube. The importance of using units of different physical quantities in the same system may be highlighted.
- ▲ It may also be explained clearly that when the value of 'g' is not given in a problem, it may be taken as 10 m/s^2 in order to simplify the calculations.
- ▲ The relation between mass, volume and density may be written in different mathematical forms and sufficient practice may be given to avoid mistakes in mathematical calculations.
- ▲ Some students may tend to write different mass of the cube on moon. The consistency of mass of a body at different places may be highlighted.

Pressure**Chapter-10****Assessment Technique:**

Worksheet on Connecting learning to real life situations

Objectives: To enable the learners–

- Differentiate between force and pressure.
- Differentiate between mass and weight.
- Realize that pressure decreases with an increase in area over which the force acts.
- Appreciate how nature has made 'adequate adjustments' for different animals.
- Compare the pressure exerted, on the ground, by a human being and an elephant/ camel.



Procedure:

- Help the students to understand the (i) meaning of (ii) difference between force and pressure.
- Guide the students to collect data about the mass/weight and foot size of animals like the elephant and the camel.
- Help them to estimate the area covered by all the feet of these animals.
- Guide them to estimate the pressure exerted by the elephant / camel on the ground.
- Help them to do a similar estimation for an average human being.
- Make them appreciate the significance of the broad feet of the elephant / camel.

Assessment Parameters:

Two marks each for the first three steps and one mark each for the last four steps.

Student Worksheet

Instructions:

Do the following:

- Obtain / collect data about the average mass (in kg) of the elephant / camel.
- Obtain / collect data about the average area (in m^2) covered by each foot of the elephant/ camel. Hence calculate the total area covered by all its feet.
- Obtain / collect the above two items of data for the average human being.
- Calculate the approximate weight (in N) of the elephant / camel / human being by multiplying their respective masses with 10 (approximate value of 'g')
- Estimate the pressure (in N / m^2) exerted by the elephant / camel, on the ground by dividing its weight by the area covered by all its feet.
- Estimate the pressure (in N / m^2) exerted by an average human being, on the ground, by dividing the weight (of an average human being) by the area covered by all the feet (of an average human being)
- Compare the pressure value for the elephant / camel and that for the average human being.

Suggestive Remediation:

- ▲ Some students may find it difficult to obtain / collect the relevant data. Help / guide them in 'surfing the net, Visiting libraries and talking to the peers in the field.
- ▲ Some students may find it difficult to calculate the pressure values in N/m^2 . Help / guide them in doing the necessary calculations.
- ▲ Make students appreciate the role of nature in ensuring that the huge weight of the elephant/ camel does not cause it to 'sink into the ground.



Work And Energy

Chapter-11

Assessment Tool

Matching Type worksheet

Objectives: To enable the students to–

- learn that energy exists in different forms
- understand that energy gets transformed from one form to another.

Task:

Individual

Approximate Time: 15 minutes

Procedure: The teacher may

- explain that energy exist in different forms in nature and that it gets transformed from one form to another in different situations.
- give examples of
 - Objects possessing different forms of energy
 - Change of energy from one from to another

Assessment parameters: ½ mark for every correct answer

Student Worksheet

Instructions:

Given below in column I are different physical situations in everyday life. Read the first column carefully and write the corresponding energy transformation in Column-II. One example has been done for you.

Column I

- Lighting of torch bulb
- Rotating of an electric fan
- Paddling of a bicycle
- Moving of a car
- Weight lifting exercise
- Release of an arrow from a bow
- Stretching or compressing of a spring
- Use of a solar cell

Column –II

- Chemical energy-Electrical Energy-
Light/heat energy



- Climbing up a staircase
- Going up in lift
- Kicking of a football

Suggestive Remediation:

- ▲ The assessment tool aims at helping the students to connect classroom learning to life outside the school. It is important and essential to give more examples of energy transformation in daily life.
- ▲ In some physical situations, the energy transformation can be of more than one type. Proper explanation may be provided to help the students understand these situations clearly



Sound

Chapter-12

Assessment Technique Worksheet on connecting classroom learning to real life situations

Objectives: To enable the students to—

- learn the meaning of the term 'reverberation'
- understand why excessive 'reverberation' is undesirable.
- Know about the materials that can reduce 'reverberation'.
- Make a 'first hand survey' of some well known auditoriums.

Task: Individual or group

Approximate Time: one week

Procedure:

- Explain the meaning of the term 'reverberation'.
- Make the students understand the kind of disturbance / problems that are likely to be caused by excessive 'reverberation'.
- Co-relate 'reverberation effects' with the phenomenon of reflection and absorption of sound.
- Explain how reducing 'reflection' and increasing 'absorption' will lead to a decrease in 'reverberation effects'.

Assessment Parameters: 1 mark each for the first four steps and 6 marks for the fifth steps.

Student Worksheet

Instructions:

Answer the following questions and also carry out the other steps.

- How do 'repeated reflection' of sound lead to the phenomenon of 'reverberation'?
- What basic steps are taken to reduce reverberation?
- Why is excessive reverberation undesirable?
- Collect information about few well known auditoriums and make a list of their names and locations.
- Also get information about different materials used on their seats, walls and ceilings and reasons for the same.

Make a brief report of collected information.



Suggestive Remediation:

- ▲ Help the students to understand how excessive reverberation can lead to difficulties.
- ▲ Help the students to understand that different materials have different reflective and absorption powers with respect to sound.
- ▲ Guide the students about the
 - Sources of desired information
 - Different absorptive and reflective powers of different substances used in walls and ceilings.
- ▲ Explain why, it is important to 'strike a balance' between 'reflection and absorption' of sound in real world practical situations.

Sound**Chapter-12****Assessment Technique****Numerical based Worksheet**

Objectives: To enable the students to–

- Read the graphical representation of sound waves correctly.
- Learn the relationship between velocity, frequency and wavelength of a sound wave.
- Solve simple numericals based on relation between velocity, frequency and time period

Approximate Time: 15 Minutes

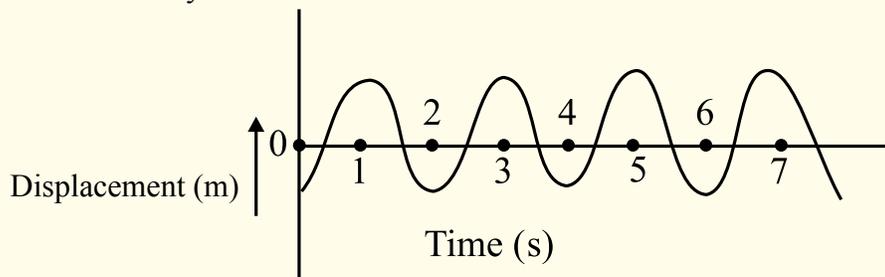
Procedure: The teacher may

- Explain the terms frequency, time period and wavelength of a sound wave.
- Give graphical representation of sound waves.
- Explain the meaning of terms frequency, time period and wavelength from graphical representation.
- Explain the relationship between velocity, frequency and wavelength of a wave.

Assessment Parameters: 1 mark for each part. Total: 05 marks

Student Worksheet

Q.1 The given graph shows the displacement verses time relation for a disturbance travelling with a velocity of 1500 ms^{-1} .



Calculate the

- (i) Time period
- (ii) Frequency
- (iii) Wavelength of the wave.

Q.2 The velocity of sound in air is 340 m/s. compute

- (i) Its wavelength when the frequency is 250 Hz.
- (ii) Its frequency when the wavelength is 85 cm.

Suggestive Remediation:

- ▲ Some students may not understand the meaning of frequency, wavelength and time period from graphical representation. They may be helped in the same by giving different examples.
- ▲ Sufficient practice may be given to students to solve variety of numericals based on the mathematical relations.

Sound

Chapter-12

Assessment Technique

Individual Worksheet

Objectives: To enable the students to–

- Learn basic definition and non-audible nature of 'ultra sounds'.
- Learn range of frequencies of 'ultra sounds' and the names of instruments / devices used to produce them.
- Understand application of 'ultrasound' in industries.
- Learn application of 'ultra sounds' for medical purposes;
- Appreciate use of 'ultra sounds' by animals / birds like dogs and bats and by fishes, like the dolphin.

Approximate Time: 15 Minutes

Procedure: The teacher may–

- Explain the meaning of the term 'ultrasound'.
- Let the students know the range of frequencies of ultra sounds.
- Make the students aware about the applications of ultra sounds in industries and for 'medical purposes'
- Make the students understand basic details of the use of ultra sounds by animals and birds like dogs and bats, and by fishes like the 'dolphin.'

Assessment Parameters: 1 mark for every correct answer.



Student Worksheet

Instructions:

Answer the following questions:

- (i) Write the (approximate) range of frequencies of ultra sounds'
- (ii) State one important use of 'ultra sounds' in industries.
- (iii) State two important uses of 'ultrasound' for medical purposes.
- (iv) Explain, in brief, how 'bats' make use of 'ultrasounds' in their daily life.
- (v) Is there any link between the intelligence of dolphins and their ability to 'hear' ultra sounds.

Suggestive Remediation:

- ▲ The topic can be made interesting by relating it to number of examples in daily life.
- ▲ Make students aware of the range of frequencies of the 'ultrasounds'.
- ▲ Provide students with information / diagrams / pictures / photographs of applications of 'ultrasounds' in industries and medical field.
- ▲ Make students aware of how
 - (i) bats use 'ultrasounds' for 'finding their way'.
 - (ii) dolphin's use 'ultrasounds' to show their remarkable skills and intelligence.

Sound

Chapter-12

Assessment Technique

Individual Worksheet

Objectives: To enable the students to–

- Understand The full form of the term 'SONAR' and the meaning of this term.
- Learn basic details of use of SONAR for finding the distance, direction and speed of underwater devices.
- Do numerical calculations associated with 'SONAR'.

Approximate Time: 15 Minutes

Procedure: The Teacher may–

- Explain the meaning of the term 'Navigation' and 'Ranging' in the full form of the term 'SONAR'.
- Discuss why it is preferable to use 'ultra sounds', rather than audible sounds, in 'SONARS'.
- Do simple numerical calculations to explain the use of 'SONAR' for finding the distance and speed of on underwater objects.

Assessment Parameters: 1 mark for every correct answer.



Student Worksheet

Instructions: Read the following information carefully and answers the questions that follow:

- A 'SONAR' sends out ultra sounds, of frequency 60 kHz, towards an under water sub marine, at time $t = 0$ s.
 - The reflected signal, from the sub-marine is received at $t = 2$ s.
 - The speed of the ultra sounds in sea water is 1530 m/s
- (i) What is the full form of the term 'SONAR'?
 - (ii) What is the meaning of the term 'Navigation'?
 - (iii) What is the meaning of the term 'Ranging'?
 - (iv) What is the depth of the sub-marine?
 - (v) Can we use SONAR for finding the speed of the sub-marine if it were moving underwater?

Suggestive Remediation:

- ▲ Some students may find it difficult to understand the meaning of the terms 'Navigation' and 'Ranging': Explain in general terms the broad meaning of these two terms.
- ▲ Explain by taking some suitable example why the distance of the underwater object is given by the relation. Distance = (speed in water) \times half of the time between the 'sending' and the 'receipt' of the under water signal.

Class Work/Home Work Assessment

Assessment Technique

Class work/Homework assignment

Objectives: To help the learners to–

- Take active part and interest in classwork/homework assignment
- Inculcate the habit of regularity and neatness in doing assigned tasks.
- Reinforce learning through additional tasks
- Inculcate the habit of self learning and extended learning

General guidelines about Class work

The class work includes the tasks assigned by the teacher to the students in the class during the lesson or at the end of teaching period and may include:

- Worksheet to be completed for recapitulation of the topic
- Practice of formulae, chemical equations, numericals, diagrams etc.



- Oral questions being asked from individual students during the lesson.
- Practice of graphs, diagrams, ray diagrams, circuit diagrams, data etc.
- Any group work/activity

Parameters of Assessment may include:

- Correctness of the task performed
- Time taken/regularity of the task performed
- Neatness of work

Detailed record of students' response and achievement in class work may be maintained in a register for assessment purpose.

Homework

The homework includes the tasks/assignments to be done by the students at home and may include:

- Practice questions meant for reinforcement of learning. (These questions may be designed in such a way that students are not able to copy answers directly from the prescribed textbooks).
- Questions based on application of classroom learning to real life situations.
- Questions based on enhancement of skills related to drawing diagrams, solving numericals, writing of formulae and chemical equations etc.
- Tasks related to rectification of mistakes/errors

Areas of Assessment may include:

- Regularity in submission of homework
- Completeness and neatness of homework
- Overall quality of answers

The notebooks of the students may be corrected once or twice in each of the two terms and the detailed records be maintained. The marks allocation to different parameters of assessment may be decided by individual schools/teachers

Field Visit

Assessment Technique

Questionnaire

Objectives: To enable the students to–

- develop interest in out-of-school activities and learning
- broaden their understanding of science concepts and principles



- enhance knowledge through extended learning
- appreciate interrelation between classroom learning and everyday life applications
- connect classroom learning to life outside the school.

Approximate Time: 5-6 Hours

Procedure: Suggestive steps to be followed

Before the Visit: The teacher may

- Plan the visit well in advance. The plan may be discussed with school authorities, authorities of the place of visit, parents and students. Some of the suggested places for visit may include Science park/Centre, Zoological park, Science Museum, a factory, a laboratory etc.
- brief the children on where they would be going.
- clearly spell out the do's and don'ts to be followed during the trip.
- Instruct students to carry notebook, pen, crayons and any other item necessary for the trip.
- keep teacher pupil ratio of 1:20 during the trip for better learning.
- visit the place beforehand
- prepare a questionnaire in advance to assess the students after the trip.
- inform the students that they will be assessed on the basis of a questionnaire following the trip.

During the visit:

Students should be encouraged to take notes, sketch pictures, ask questions or make collections of material that would help them later..

After the visit:

One day after the visit, the students may be given the questionnaire in the classroom. Their responses may be analysed and appreciated. Assessment may be carried out on the basis of response to the items included in the questionnaire. The questionnaire may be designed in advance.

Suggested Field visit

Visit to a Thermal Power Plant

The said activity may be organized to visit a Thermal Power Plant. The authorities of the plant maybe contacted in advance and details of the visit may be discussed and decided. A guided visit will certainly help the students know and learn more.

The students will understand about how electricity is generated in the plant and what resources are used for this purpose. Different sections of the plant and working of different sections/parts of plant



may be explained by personnel working in the organization. Students may also be encouraged to think about the other ways of producing electricity and the kind of natural resources used in other plants.

Questionnaire

Name: _____

Class Section: _____

Time : 20 minutes

Max. Marks 10

Instructions: Answer the following questions on the basis of your observations and understanding during the visit.

1. Name the power plant you visited, Where is it located?
2. Name the natural resource used for generation of energy in this plant.
3. What kind of energy transformations take place in this power plant?
4. How is the turbine made to rotate in this power plant?
5. What kind of waste is generated in this power plant?
6. How is this waste disposed off?
7. What is the power generation capacity of this plant?
8. State one advantage of power generation by this method.
9. State one disadvantage of power generation by this method.
10. Name any one other kind of Power Plant in which another kind of natural resource is used.

Assessment Criterion: 1 mark for every correct answer.

Popular Science Book Review

Assessment Technique

Book review report

Objectives: To help the learners to –

- inculcate the habit of book reading
- develop interest in popular Science Literature
- enhance knowledge through extended learning
- relate learning of Science to everyday life.
- strengthen science concepts through simple explanations
- appreciate interrelationship between Science Technology and Society
- develop a scientific and objective attitude



Approximate Time: 15-20 days

Procedure: Students may be asked to read a popular science book preferably during vacations and write a book review on the same.

A suggestive list of popular Science books related to different fields may be given to students. Some of the popular Science book publishers may include Vigyan Prasar, National Book Trust (NBT), NCERT, National Institute of Science Communication and information Resources (NISCAIR) and Homi Bhabha Centre for Science Education (HBCSE).

- suggestive format of book review report may also be given to students in advance.

Assessment Parameters

- | | |
|-----------------------------|---------|
| • Language used | 2 marks |
| • Clarity of thought | 2 marks |
| • Content | 2 marks |
| • Quality of Presentation | 2 marks |
| • Overall quality of report | 2 marks |

Suggestive Format of Book Review

- General: This section may include name of the book, author, publisher, price and number of pages etc.
- Brief introduction: It may focus on title of the book (interesting or not) purpose of the books, concept/subconcepts covered, overall conceptualisation.
- Progression of the chapters: It may highlight logical sequence, clarity of concepts, richness of contents and suitability of content.
- Presentation: It may include language used (reader friendly or not) use of examples, data, co-relation with daily life situations, illustrations, coverage (its attractiveness) and overall simplicity or otherwise of the approach followed in the book
- Printing: It may focus on quality of paper used, colours used, illustrations/diagrams/ photographs, font size and font type.
- Overall impression: This section may highlight whether the book
 - provides enrichment and basic understanding of the topics/contents discussed in it
 - is inspirational in nature.
 - reading was an enjoyable experience
 - helps to get a scientific/logical explanation of some 'myth' or 'superstition'
 - relates to applications in everyday life.
 - deserves to be recommended to others.



The above suggested format may be changed or modified depending upon the need or requirement.

Few suggested Science Popular Books

- | | |
|--|--|
| • Inventions that made history | - Publication Division, Govt. of India |
| • Science and Everyday life | - Vigyan Prasar |
| • Artificial Intelligence | - NISCAIR |
| • Seeing is not always believing | - Vigyan Prasar |
| • Life: From cell to cell | - NISCAIR |
| • Inventors who revolutionized our lives | - NBT |
| • The Human Machine | - NBT |
| • You and your health | - NBT |
| • Heart disease and the layman | - NBT |
| • Kyon Aur Kaise | - Vigyan Prasar |

SI Units

Assessment Tool

Individual Worksheet

Objectives: To help the students to—

- learn SI units of different physical quantities
- understand how SI units of different physical quantities are obtained from their definitions
- recognise that one SI unit may represent more than one physical quantity

Task:

Individual

Approximate Time : 10 minutes

Procedure : The teacher may

- familiarize the students with SI units of different physical quantities
- explain how the SI units of different physical quantities are obtained from their definitions.
- provide sufficient practice to students to correlate given SI units with their corresponding physical quantities.
- give examples to explain that the same SI unit can represent more than one physical Quantity

Assessment Parameters: One mark for every correct answer.



Student Worksheet

Instructions : Fill in the blanks in the following

1. The SI unit of acceleration is _____
 2. The SI unit of buoyant force is _____
 3. The SI unit of power is _____
 4. The SI unit of impulse is _____
 5. The SI unit of frequency is _____
 6. Kgms^{-1} is the SI unit of _____
 7. Joule is the SI unit of _____
 8. An example of physical quantity having no unit is _____
-
9. Nm^{-2} is the SI unit of _____
 10. Two physical quantities having metre as their SI unit are _____ and _____.

Suggestive Remediation:

- ▲ Knowledge and proper understanding of units of physical quantities is an important aspect of learning of Science. If some students are not able to learn the same, they may be helped to do the same by repeated practice.
- ▲ Derivation of units from fundamental definitions of different quantities may be explained clearly.

Mathematical Formulae

Assessment Technique:

Individual Worksheet

Objectives: To enable the learners to–

- learn mathematical formulae for different physical quantities
- relate different physical quantities through mathematical expressions
- understand and appreciate the use of formula in learning of Science.

Task:

Individual Worksheet

Approximate time: 10 Minutes

Procedure: The teacher may



- state the fundamental SI units
- explain the use of basic defining formula in arriving at the SI units of different physical quantities
- explain the use of formula like velocity = Frequency · wavelength

or force = $\frac{\text{change in momentum}}{\text{time}}$

- highlight that a formula is a mathematical expression of physical definitions or statements
- cite examples of different mathematical expressions relating different physical quantities

Student Worksheet

Instructions:

Column I given below lists few physical quantities. Column II gives mathematical formulae for different quantities. However, the physical quantity and its formulae are not written opposite to each other.

Read the two columns carefully and match the two by putting arrows.

Column-I

- Kinetic Energy
- Potential Energy
- Weight
- Pressure
- Velocity
- Power
- Force
- Frequency
- Gravitational Force
- Linear Momentum

Column-II

- mv
- $\frac{w}{t}$
- $\frac{GMm}{R^2}$
- $\frac{1}{T}$
- F/A
- mgh
- $\frac{1}{2} mv^2$
- mg
- ma

Suggestive Remediation:

- ▲ It is of utmost importance to know formula for different physical quantities. Special attention may be given to ensure that all students are fully aware of the same.
- ▲ In order to help students better to learn these formulae, sufficient practice may be provided in use of these formulae in solving numerical.



Why Do We Fall Ill

Chapter-13

Assessment Technique

Role Play

Objectives: To help the students to –

- Name and explain the factors that lead to a disease
- Differentiate between the factors that cause a disease and those that help in the spread of a disease
- Identify the symptoms and preventive measures of diseases
- Understand the role of a doctor in controlling a disease

Task

Group Work

Approximate time given to each group: 4-5 minutes

Procedure:

1. The class is divided into groups of five students each. Each group is allotted a topic/ name of disease.
2. The students may enact the roles of –
 - main presenter,
 - microbe,
 - patient,
 - Vector,
 - Doctor and
 - any other role if required.
3. Each group may make a presentation in about five minutes.
4. **Any of the following diseases can be given as topics to students:** Malaria, Dengue, Cholera, AIDS, Rabies, Kala-azar, Sleeping Sickness, Typhoid, Tuberculosis, Common Cold, Hepatitis.



Illustration:**Name of the disease: Malaria**

Main Presenter: Good morning everyone. With the onset of monsoons come a number of guests, uninvited, who play havoc with our lives. These guests make their presence felt in a big way when they cause fever, we shiver because of the microbe that these guests deliver...

You guessed it right, I am talking about Malaria.

So let us meet Mr. Plasmodium

Plasmodium: A protozoan by origin, a pathogen by function, I cause Malaria, I make the humans shiver, when I give them fever. Where is my carriage....

Female Anopheles Mosquito: Here I am, So where do you want to go Mr. Plasmodium?

Plasmodium: Carry me from this sick patient to the healthy one, bite him so I may enter. Then your job is over, till I need to move again.

Female Anopheles Mosquito: I need human blood because it will nourish my eggs.

Patient: Help, I am feeling cold, I just cannot stop shivering, give me a blanket, just a few moments ago I was sweating, and now this, HEEEEELP....

Doctor to the Patient: What is wrong with you? (he checks the pulse and temperature). You need to get some blood tests done before I can decide on the mode of treatment. Meanwhile take this medicine to control your fever (He scribbles the name of medicine on paper). Sleep under a mosquito net so that mosquitoes don't bite you.

Patient: But I am already infected. How will it matter whether a mosquito bites me or not.

Doctor: When the female anopheles mosquito will bite you and then a healthy person, the healthy person may get infected too. Tell the others in your family too to use a mosquito net, mosquito-repellant creams and keep their body parts covered at all times.

The main presenter: Also, do not allow water to collect in your colony/housing complex. It becomes the breeding ground of mosquitoes.

Female Anopheles Mosquito: I love stagnant water. I can lay eggs in it. Let me grow and reproduce, (points at the main presenter) do not listen to him.

The whole group comes together.

Main Presenter: Malaria is a communicable disease. It is caused by a protozoan- *Plasmodium*, that is carried by the Female *Anopheles* Mosquito from an infected person to a healthy person. We can control its spread by controlling the mosquito population.

Remember: Prevention is better than cure.

Note to the teacher: The teacher may help the students to prepare effective presentations by providing guidelines and facilitating the availability of the reference material.



Criteria for Assessment:

- Effectiveness of the presentation * (2)
- Justification of the role **(2)
- Creativity *** (1)

Sample record Sheet for Assessment:

S.N.	Name of the student	Disease/ Topic	Role	Effectiveness of the presentation * (2)	Justification of the role **(2)	Creativity *** (1)	Total (5)

*	May include communication skills, confidence, clarity of thought etc.
**	May include content of role play and reasoning
***	Something extra done by the student that is relevant to the role and improves effectiveness of the Role play.

Suggestive Remediation:

- ▲ Some students may not be able to perform the 'Role Play' activity properly.
- ▲ The teacher may guide them by helping them to collect the relevant material and dividing the roles for a particular disease.
- ▲ The teacher may also provide an alternative assignment (worksheet, wall magazine) to such students.

Why Do We Fall Ill**Chapter- 13****Assessment Technique****Individual Worksheet(MCQ based)**

Objectives: To enable the students to–

- Identify the factors important for good health
- Differentiate between chronic and acute diseases
- Differentiate between infectious and non-infectious diseases
- Understand the mode of spread of different diseases



- Explain the principles of prevention and the principles of treatment of different diseases

Task : **Individual Work**

Approximate Time: 20 Minutes

Procedure:

The worksheet that has the multiple choice questions (MCQs) is given to the students. The students have to select the correct answer from the four different choices given for each question.

Student Worksheet

Time : 15 minutes

Instructions:

Select the correct option from the four different choices given for each question.

Q. 1. Which of the following diseases is caused by a protozoan?

- | | |
|-------------|-----------------|
| (a) Malaria | (b) Common Cold |
| (c) AIDS | (d) Typhoid |

Q. 2. It is difficult to make anti-viral drugs because

- (a) Viruses use the host-cell machinery to grow and divide
- (b) Viruses are surrounded by a protein coat
- (c) Viruses are on the borderline of living and nonliving
- (d) Viruses are very small in size

Q. 3. Listed below are a few disease?

- (i) Tuberculosis
- (ii) Cancer
- (iii) Common cold
- (iv) Viral fever

Which of the above mentioned diseases are classified as acute diseases?

- | | |
|------------------|------------------|
| (a) (i) & (ii) | (b) (ii) & (iii) |
| (c) (iii) & (iv) | (d) (i) & (iv) |

Q. 4. Which of the following is not important for individual health?

- (a) Living in a large and well-furnished home
- (b) Social equality and harmony
- (c) Living in a clean, pollution free environment
- (d) Good economic condition



- Q. 5. The AIDS virus cannot be transmitted by:
- (a) Breast Feeding (b) Blood transfusion
(c) Sexual contact (d) Hugs and hand shake
- Q. 6. Mosquitoes should not be allowed to breed in the surroundings because:
- (a) They cause a number of diseases
(b) They divide fast and cause pollution
(c) Mosquitoes multiply and cause pollution
(d) They are vectors for many diseases
- Q. 7. Which of the following statements is incorrect?
- (a) AIDS can be prevented from spreading
(b) Prevention is better than cure
(c) Vaccination provides protection against specific disease
(d) Treatment is better than prevention
- Q. 8. Which one of the following diseases has been eradicated?
- (a) Polio (b) Sleeping sickness
(c) Small Pox (d) Kala-azar
- Q. 9. A person is living in an overcrowded, poorly ventilated house. He is most likely to suffer from:
- (a) Water-borne disease (b) Cancer
(c) Air-borne disease (d) AIDS
- Q. 10. The antibiotic works on the following principle:
- (a) It makes the immune system of the patient strong so that he/she may not be infected
(b) It removes the vector of a disease
(c) It contains vitamins important to fight against the disease.
(d) It blocks the biochemical pathway important for the growth of the pathogen

Criteria for Assessment : Marks for each correct answer = $\frac{1}{2}$

Total Marks: $\frac{1}{2} \times 10 = 5$

Suggestive Remediation:

A few students may not be able to give the correct answers to a few questions. The concepts related to such questions may be explained again. The students may be asked to answer similar questions after a few days.



Why Do We Fall Ill

Chapter- 13

Assessment Technique

Individual Worksheet (Flow-chart based)

Objectives: To enable the students to–

- Learn the common methods of transmission of diseases.
- Identify the various modes by which a disease may spread from an infected person to a healthy person
- Understand how some diseases may be prevented

Task

Individual Work

Approximate Time : 20 Minutes

Feedback and Follow-up:

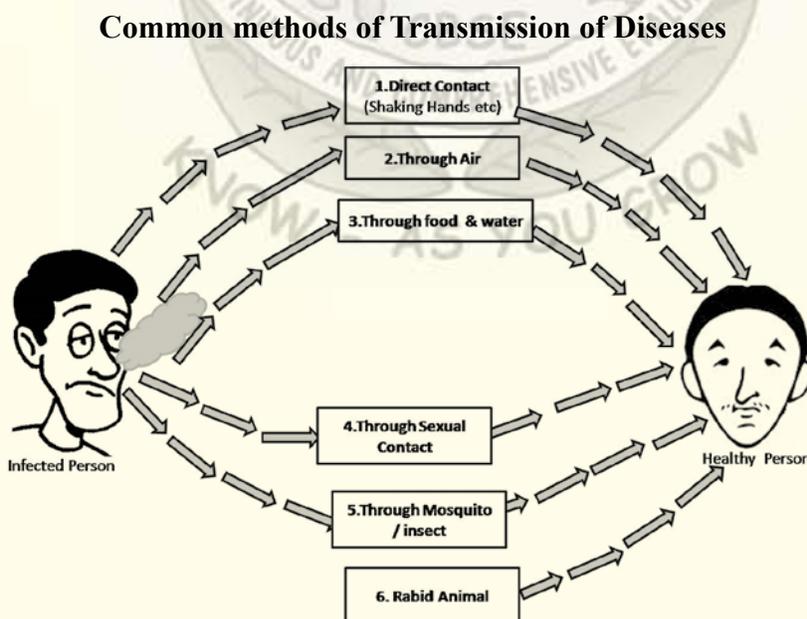
1. The worksheet with a **Flow chart of Common methods of Transmission of Diseases** is given to the students.
2. The student answers the questions after observing the Flow chart.

Student Worksheet

Time : 20 minutes

Instructions:

Given below is a **Flow chart of Common methods of Transmission of Diseases** . Six modes of transmission of diseases have been mentioned and numbered. Answer the questions given below after observing the flow chart.



Answer the following questions:

1. Name one disease spread by mode -1.
2. How can you protect yourself from this disease?
3. How could a person transmit disease causing organisms through air?
4. Name a bacterial disease spread by mode-3.
5. Name a disease that may be spread by a rabid animal.
6. Name a disease that can be spread by animals.
7. Name one disease spread by mode-4.
8. How mosquitoes can spread a disease from an infected person to a healthy person.
9. Name a disease spread by mosquitoes. (other than malaria)
10. Can you protect yourself from diseases that are transmitted through air?

Criteria for Assessment : Marks for each correct answer = $\frac{1}{2}$

Total Marks: $\frac{1}{2} \times 10 = 5$

Suggestive Remediation:

- ▲ A few students may not be able to answer the questions. The teacher may explain the topic again or provide pictures that can be used as hints , for students.
- ▲ If the number of students who have not answered the questions is more, then the worksheet may be modified by adding more pictures and situations.

Why Do We Fall Ill?

Chapter- 13

Assessment Technique:

Comprehension/ information based worksheet

Objective: To enable the students to—

- Find out the relationship between cause, prevention and control of a disease
- Understand the importance of preventive measures like immunisation
- Realise how and why a disease, at times , is classified as an epidemic
- Differentiate between organisms/ factors that cause a disease and organisms/ factors that spread a disease

Task:

Individual

Time : 20 minutes

Procedure:

1. Contents of the chapter may be discussed in the class before this worksheet is given to the students.



2. The students will be asked to read the passages given in the worksheet and answer the questions asked in the passage with the help of the clues provided.

Student Worksheet

Passage 1

Ramu was suffering from measles. Two of his brothers and his sister decided that their youngest brother Shyam should look after Ramu. There could be two possible reasons for them to have taken such a decision. Use the clues given below to think of the two reasons.

Clues:

Immune, infected by microbe, vaccination, public health programme

Passage 2

A disease assumes epidemic proportions when a large number of individuals of a population get the disease. Cholera became an epidemic in Delhi, once when river Yamuna was flooded. Use the following words to explain why.

Clues:

Water borne, Safe drinking water, Disease

Passage 3

Mary had her blood examined and the doctor diagnosed the ailment as malaria. Use the words/phrases to explain in two sentences how Mary got malaria.

Clues:

Man infected with malarial parasite, infected blood, mosquito

Criteria for Assessment:

Questions from passage 1	2 marks
Questions from passage 2	1 mark
Questions from passage 3	2 marks
Total marks for worksheet	5 marks

Suggestive Remediation:

- ▲ Some students may not be able to answer the questions. They may be explained the concept again.
- ▲ An alternate worksheet may be given to the students in which the answers are written and some key words are missing (Fill in the blanks)



Natural Resources

Chapter- 14

Assessment Technique

Individual Worksheet (MCQ based)

Objectives: To enable the students to–

- List the natural resources available to human beings
- Understand the concepts given in the chapter (Pollution, soil formation, weather and climate, biogeochemical cycles etc.)
- Appreciate the significance of natural resources in our life.

Task:

Individual Work

Approximate Time : 15 Minutes

Procedure:

The worksheet that has the multiple choice questions (MCQs) is given to the students. The students have to select the correct answer from the four different choices given for each question.

Student Worksheet

Time : 15 minutes

- Q. 1. What would happen if all the oxygen present in the environment is converted to ozone?
- (a) We will have greater protection from UV rays of Sun
(b) It will become poisonous and kill living forms
(c) Ozone is not stable so it will be converted back to oxygen
(d) Harmful radiations from the sun will reach the earth and damage many life forms.
- Q. 2. Which one of the following factors does not lead to soil formation in nature
- (a) Sun (b) Water
(c) Wind (d) Polythene bags
- Q. 3. Which of the following processes is not involved in carbon cycle?
- (a) Photosynthesis (b) Burning of fossil fuels
(c) Transpiration (d) Respiration
- Q. 4. The main biological process that returns oxygen to the atmosphere is
- (a) Burning of fossil fuel (b) Photosynthesis
(c) Respiration (d) Rainfall



- Q. 5. Which of the following is not an important factor for the growth of plants
- (a) Nutrient content of soil
 - (b) Distance of water body from the soil
 - (c) Amount of humus present in the soil
 - (d) Depth of soil
- Q. 6. Soil erosion can be prevented by
- (a) Raising forests
 - (b) Excessive use of fertilizer
 - (c) Deforestation
 - (d) Overgrazing by animals
- Q. 7. Rainfall depends upon
- (a) The underground water table
 - (b) The density pattern of human population in area
 - (c) The number of water bodies in an area
 - (d) The prevailing season in an area
- Q. 8. One of the following processes is not a step involved in the water cycle operating in nature.
- (a) Evaporation
 - (b) Snowfall and rain
 - (c) Transpiration
 - (d) Photosynthesis
- Q. 9. The factor responsible for depletion of the ozone layer is
- (a) Excessive use of automobiles
 - (b) Excessive use of man-made compounds containing both fluorine and chlorine
 - (c) Excessive formation of industrial units
 - (d) Excessive deforestation
- Q. 10. Which of the following acids fall on land with rain during lightening?
- (a) Nitric acid and Nitrous acid
 - (b) Hydrochloric acid and Sulphuric acid
 - (c) Sulphuric acid and Nitrous acid
 - (d) Hydrochloric acid and Nitrous acid

Criteria for Assessment : Marks for each correct answer = $\frac{1}{2}$

Total Marks: $\frac{1}{2} \times 10 = 5$

Suggestive Remediation:

A few students may not be able to give the correct answers to some questions. The concepts related to such questions may be explained again. The students may be asked to answer similar questions after a few days.



Natural Resources

Chapter- 14

Assessment Technique

Individual Worksheet(Diagram based)

Objectives: To enable the students to–

- Understand the role of plants in biogeochemical cycles
- Identify the processes in biogeochemical cycles that involve plants.

Task:

Individual Work

Approximate Time : 15 Minutes

Procedure:

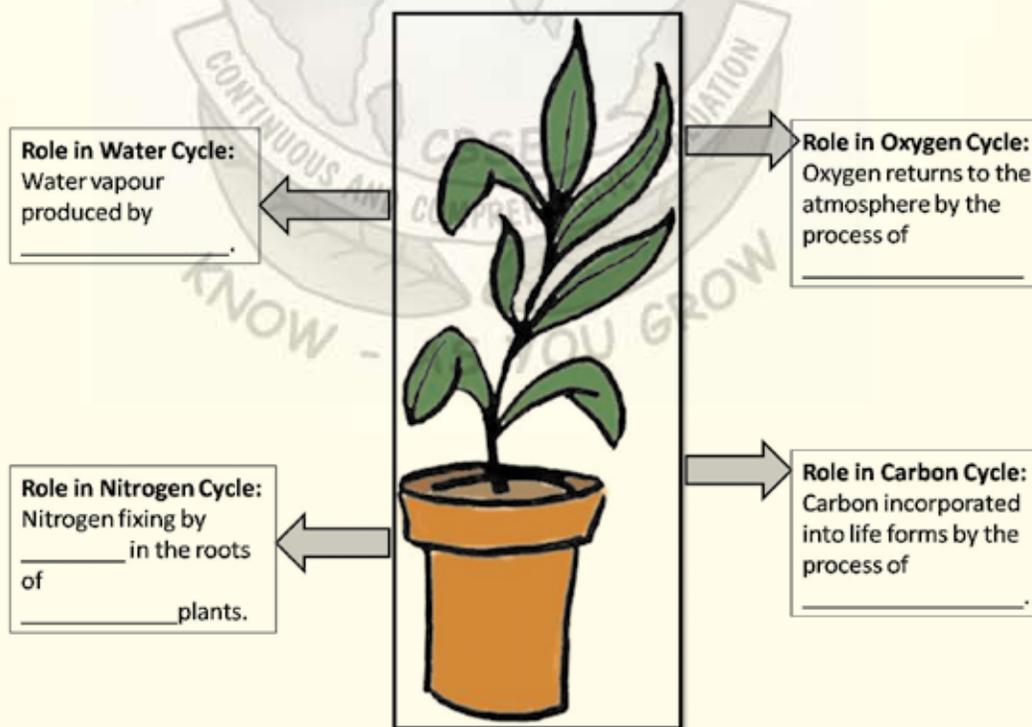
1. The topic of biogeochemical cycles may be explained to the students before giving the worksheet.
2. The student may fill up the blank spaces in the columns for each biogeochemical cycle to highlight the role of plants.

Student Worksheet

Time : 15 minutes

Instructions:

Fill up the blank spaces in the columns for each biogeochemical cycle to highlight the role of plants.



Criteria for Assessment : Marks for each correct answer=1

Total Marks: 1 X 5 = 5

Suggestive Remediation:

- ▲ A few students may not be able to complete the worksheet. They may be explained the topic- Biogeochemical cycles again and then an alternate worksheet may be given to them.
- ▲ If the number of students who have not completed the worksheet is more, then the worksheet may be modified (some more pictures may be added in the worksheet that may be used as 'hints' by the students).

Natural Resources

Chapter- 14

Assessment Technique

Seminar

Objectives: To enable the students to—

- Learn some topics by self-study and collaboration
- Understand how to collect and present data
- Develop confidence to present a topic before an audience

Task:

Group Work

Approximate Time : 3-4 days for preparation and 10 minutes for presentation by each group

Procedure:

A Seminar can be conducted in the class to cover a chapter. The chapter to be taught can be divided into different sections. The class will be divided into groups of students. Each group will be allotted a topic and each student within a group will be assigned a subtopic.

For example: The Chapter 'Natural Resources' will be divided into 8 topics including introduction and recapitulation. The teacher may divide a class of 40 students into 8 groups. Each group will be allotted a topic as under:

Group	Topic
A	Air-The Breath of Life, Role of Atmosphere in Climate Control
B	The Movement of Air: Winds and Air Pollution
C	Water – The Elixir of Life, Water Pollution
D	Mineral Riches in the Soil
E	Water Cycle and Rain
F	The Carbon Cycle and Green house Effect
G	Nitrogen Cycle and Nitrogen Fixation
H	Oxygen Cycle and the Ozone Layer

The teacher will divide each topic into 4-8 subtopics depending upon its complexity and each subtopic will be assigned to a student of every group. The student in the group may get any other



specific task to be performed in preparing the presentation. Necessary guidance will be given to every group for making the presentations. The areas of assessment would be shared with the students beforehand.

The teacher could choose a coordinator from each group who would facilitate the working in each group ensuring that there is contribution from each participant. A maximum of 10 minutes may be given to every group to make a presentation.

The whole class can participate in this seminar.

Student Activity:

- Study the topic allotted to you.
- Prepare the topic by using charts / diagrams / Blackboard or make a PowerPoint Presentation (if facilities are available)
- After the presentation, the student presenter will have to answer two questions put to him by the audience.

Time Allotted: 4-5 periods, 3 hours to 4 hours (including assessment by the teacher)

Criteria for Assessment :

The criteria for assessment will be shared with the students before the seminar begins. The students will be assessed on the basis of the format given below:

S.N.	Name of the Student	Group	Individual Performance (1)	Viva *(1)	Presentation ** $(1\frac{1}{2})$	Content and relevance to the topic *** $(1\frac{1}{2})$	Total (5)
1.	A						
2.	B						
3.	C						
4.	D						
5.	E						
6.	F						
Remarks if any							

*	-Response to Teacher's Question= $\frac{1}{2}$ mark -Response to audience question= $\frac{1}{2}$ mark
**	-Innovative Introduction = $\frac{1}{2}$ mark -Clarity and articulation or delivery= $\frac{1}{2}$ mark -Use of Visuals = $\frac{1}{2}$ mark
***	Comprehension of concept= $\frac{1}{2}$ mark -Integration of different points into a proper sequence (Holistic Approach) = $\frac{1}{2}$ mark -Conclusion= $\frac{1}{2}$ mark



Suggestive Remediation:

- ▲ A few students may not perform well during the presentation. The teacher should identify the reason and guide the students accordingly.
- ▲ The students may also be given an alternate activity (Questionnaire based on the presentation made by other groups)



Improvement In Food Resources

Chapter-15

Assessment Technique

Individual Worksheet(Picture based)

Objectives: To enable the students to–

- Learn various terms related to food production (mariculture, multiple cropping etc.)
- Find out the relationship between a picture and its relevant term
- Recognize the pictures related to various sources of food and steps in food production

Task:

Individual Work

Approximate Time : 15 Minutes

Procedure:

1. The worksheet with the relevant pictures related to Food Production is given to the students.
2. The student may provide a title for the picture and state one desirable characteristic advantage of each.

Student Worksheet

Time : 15 minutes

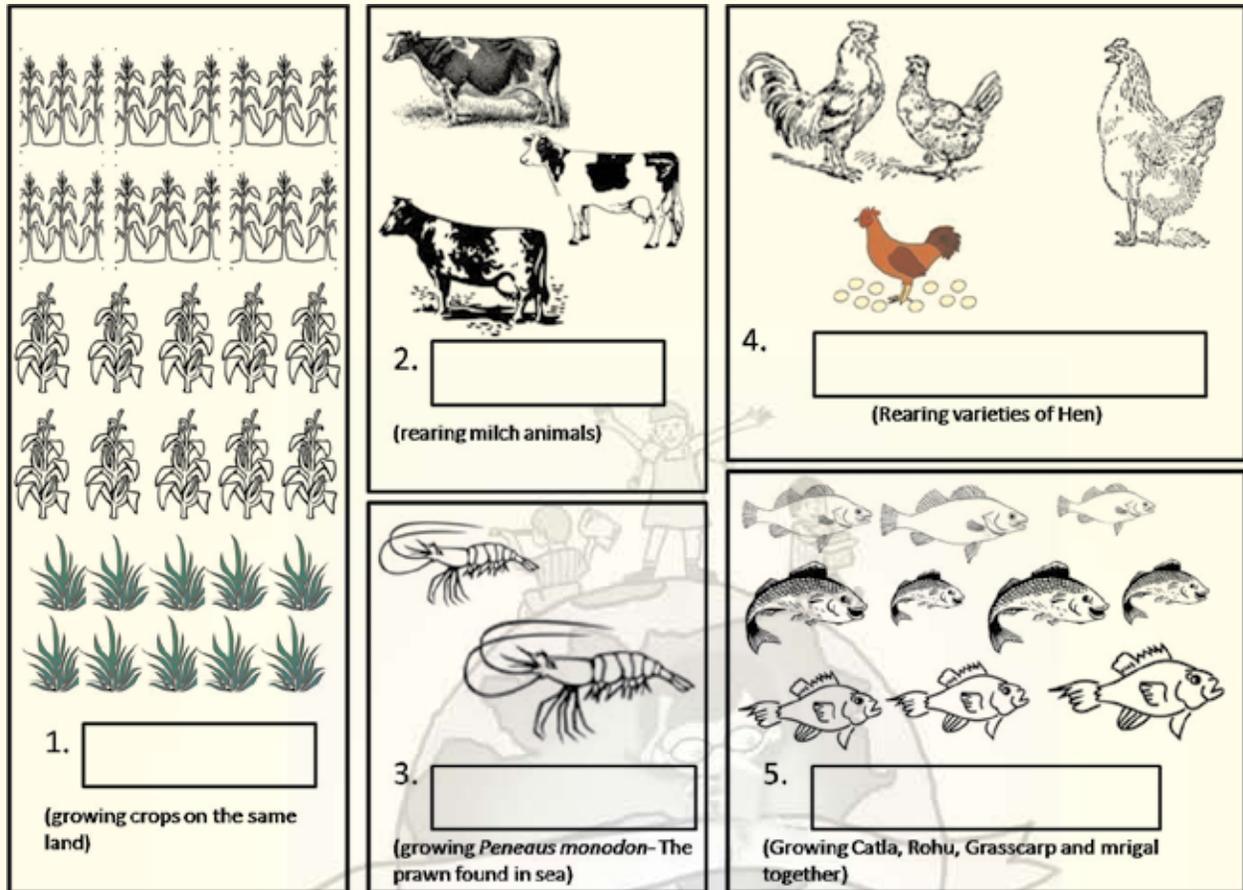
Instructions:

- Given below are five pictures related to Food Production.
- Provide a title for these pictures from the terms given here, in the space provided.

Mariculture, Multiple Cropping, Composite Fish Culture, Poultry, Livestock Farming
--

- State one desirable characteristic or advantage of each of these.
- These may be written on a separate sheet.





Criteria for Assessment :

Title for each picture: ½ mark

Characteristic / advantage: ½ mark

Suggestive Remediation:

- ▲ A few students may not be able to provide the correct title or write the relevant characteristic / advantage. The teacher may explain the concepts again to these students
- ▲ If the number of students who have not labeled the parts properly is more, then the worksheet may be modified (a crossword puzzle where the pictures are used as hints)

Improvement In Food Resources

Chapter- 15

Assessment Technique

Paper Presentation

Objectives: To enable the students to–

- Identify the various steps involved in Improvement of Food Resources
- Appreciate the role of some ancient techniques in improving productivity
- Solve problems based on the knowledge / concepts based on this chapter
- Analyze the hypothetical problems given by the teacher and do ‘Research work’ to find out a possible solution



Task : Group Work

Approximate Time : 3-4 Minutes for each group

Procedure:

1. The class may be divided into groups of 3-4 students.
2. The Problems related to food production from plants and animals that are faced by a farmer, may be written on slips of paper.
3. Each group shall pick up a slip and then try to find out the reason, factors responsible and solution to the problem assigned to their group.
4. Each group may be given 2-3 days time to prepare a presentation about the problem/ situation. They may present this paper in class.

Problems/ Situations that may be given to the student:

- The farmer cannot afford to purchase fertilizers for his farm. He wants to improve the production of wheat in his farm. The soil is low on nutrients.
- The farmer has noticed that inspite of using the best fertilizers and irrigation methods on his farm, the yield is still low.
- The cattle on the farm are not healthy and the milk yield is very low.
- The farmer has spent a lot of money on installation of artificial beehives on the farm. But the yield of honey is becoming less over the years.
- The poultry birds on the farm are not healthy. The mortality rate of the birds is high.
- The farmer visited a friend in New Zealand. He found that the exotic varieties of cattle were giving a good yield of milk. He was impressed and decided to import these animals to his country. However, the animals did not continue to thrive in his country. Infact they frequently fell ill and some of them died.

Criteria for Assessment :

- Identification of problem: 2 marks
- Suggesting a solution: 2 marks
- Overall presentation: 1 mark

Suggestive Remediation:

- ▲ Some students may face difficulty in identifying the problem or they may not be able to suggest the right solution. The teacher may guide these students by giving them hints or suggesting resources (books, websites) that may be used.
- ▲ In case, a group is not performing well , they can be given an alternate assignment (worksheet, MCQ etc.)



Improvement In Food Production

Chapter- 15

Assessment Technique

Individual Worksheet (MCQ based)

Objectives: To enable the students to–

- Identify the reasons for an increase in food production
- Understand the concepts given in the chapter (biotic and abiotic factors, Hybridization, nutrient management etc.)
- Appreciate the significance of need of increase in food production.

Task:

Individual Work

Approximate Time : 20 Minutes

Procedure:

The worksheet that has the multiple choice questions (MCQs) is given to the students. The students have to select the correct answer from the four different choices given for each question.

Student Worksheet

Time : 15 minutes

- Q. 1. To solve the food problem of the country, which among the following is important?
- Easy access of people to the food grain
 - People should have money to purchase the grains
 - Increased production and storage of food grains
 - All of the above
- Q. 2. Which of the following statements are correct?
- Hybridization means crossing between genetically dissimilar plants.
 - Cross between two varieties is called as inter specific hybridization
 - Introducing genes of desired character into a plant gives genetically modified crop.
 - Cross between plants of two species is called as inert-varietal hybridization.
- (i) & (iii)
 - (iii) & (iv)
 - (ii) & (iv)
 - (ii) & (iii)
- Q. 3. Which of the following is incorrect about manure?
- Manures contain large quantities of organic matter and small quantities of nutrients
 - In clayey soils, help in drainage and in avoiding water logging.
 - Manures increase the water holding capacity in sandy soil.
 - Green manure is also known as vermin-compost.



- Q. 4. Poultry farming is undertaken for
- (a) Egg and feather production (b) Feather and chicken meat
(c) Egg and chicken meat (d) Milk and egg
- Q. 5. Which of the following is not a weed?
- (a) Cowpea (b) *Parthenium*
(c) motha (d) *Xanthium*
- Q. 6. Which of the following is not a cropping pattern useful in increasing food production?
- (a) Mixed cropping (b) Hybridization
(c) Intercropping (d) Crop Rotation
- Q. 7. Milk production from cows and buffaloes depends on which of the following factors?
- (i) Lactation period
(ii) Type of food given to the animal
(iii) The country in which the animal is present
(iv) The breed of the cattle
- (a) (i), (ii) and (iii) (b) (i), (ii) and (iv)
(c) (i), (iii) and (iv) (d) (ii), (iii) and (iv)
- Q. 8. Which of the following is an Italian bee variety
- (a) *Apis cerana indica* (b) *Apis mellifera*
(c) *Apis dorsata* (d) *Apis florae*
- Q. 9. Which of the following combinations are most suitable for composite fish culture
- (a) Surface feeders and bottom feeders
(b) Surface feeders, middle zone feeders and bottom feeders
(c) Middle zone feeders and bottom feeders
(d) Surface feeders only
- Q. 10. Which of the following contain macro-nutrients only?
- (a) Calcium, sulphur and zinc
(b) Nitrogen, phosphorous and potassium
(c) Calcium, magnesium and copper
(d) Nitrogen, iron and chlorine

Criteria for Assessment : Marks for each correct answer = $\frac{1}{2}$
(Total Marks: $\frac{1}{2} \times 10 = 5$)



Suggestive Remediation:

- ▲ A few students may not be able to give the correct answers to a few questions. The concepts related to such questions may be explained again. The students may be asked to answer similar questions after a few days.

Improvement In Food Production**Chapter- 15****Assessment Technique****Individual Worksheet (Flow-chart based)**

Objectives: To enable the students to–

- Identify the steps involved in Improvement in Food Production in plants
- Understand the importance of various steps at different stages in agriculture
- Realise that food production depends on a number of factors and a disturbance in any one of them can lead to low produce/ loss in productivity.

Task:**Individual Work**

Approximate Time : 15 Minutes

Procedure:

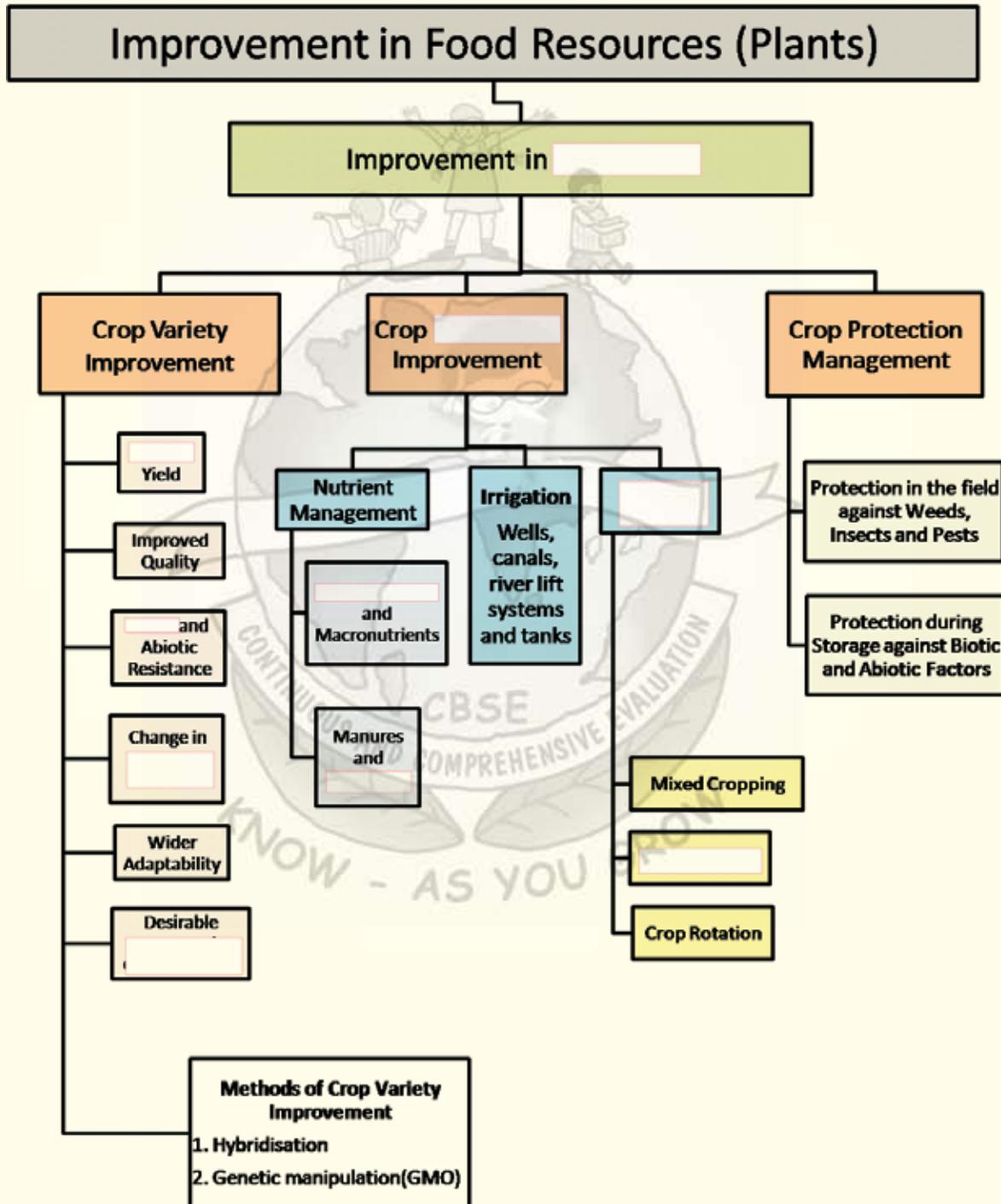
1. The worksheet with the flowchart of various steps involved in Improvement in Food Production in Plants may be given to the students.
2. Some steps/ processes/ examples may be left blank.
3. The student shall identify the missing steps/ processes/ examples and write them in space provided in the worksheet.



Student Worksheet

Time required: 15 minutes

Instructions: Identify the missing steps/ processes/ examples in the flowchart given below and complete it using the appropriate words.



Criteria for Assessment : Marks for each correct labeling = $\frac{1}{2}$
(Total Marks: $\frac{1}{2} \times 10 = 5$)

Suggestive Remediation:

- ▲ A few students may not be able to identify the steps/ processes/ examples. The teacher may explain the concepts again the class.
- ▲ If the number of students who have not identified the steps/ processes/ examples is more, then the worksheet may be modified by giving some hints for each blank space

Improvement In Food Resources

Chapter- 15

Assessment Technique **Individual Worksheet (Game based on -‘String the Beads’)**

Objectives: To enable the students to–

- Learn the factors that are important for improvement for Food Production in plants and animals
- Identify the ways in which we can ensure better quality and quantity of food from plants and animals.

Task :

Individual Work

Approximate Time: 15 Minutes

Procedure:

1. The worksheet with outline structure of a ‘Bead Necklace’ and a list of features placed in different categories is given to the students.
2. Each necklace is given a name that is actually a ‘term’ important for Food Production.
3. The student has to pick one character from each category and write it in the bead to list the common characters of a group.
4. In this way, the student will ‘string the beads’ and the necklace will be complete when all the beads have been allotted characters from each category.

Student Worksheet

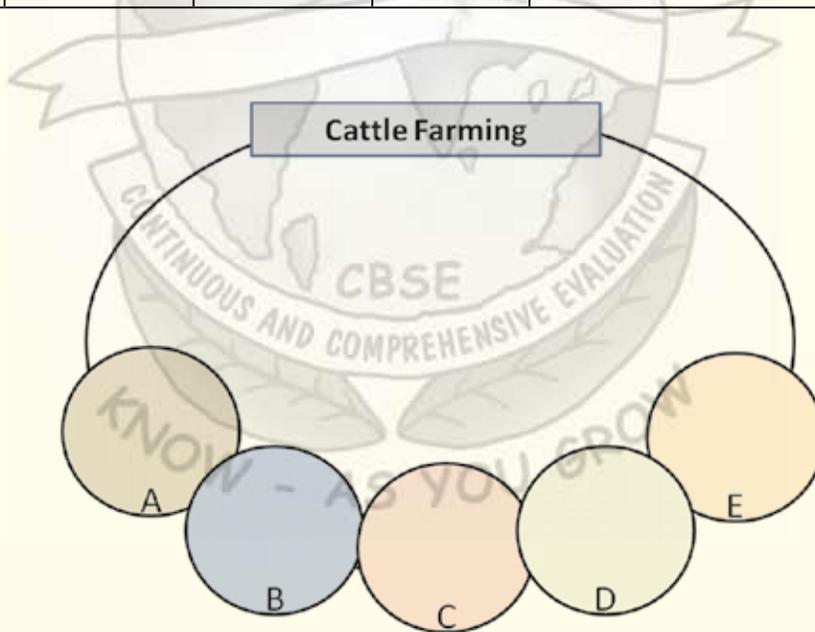
Time : 15 minutes

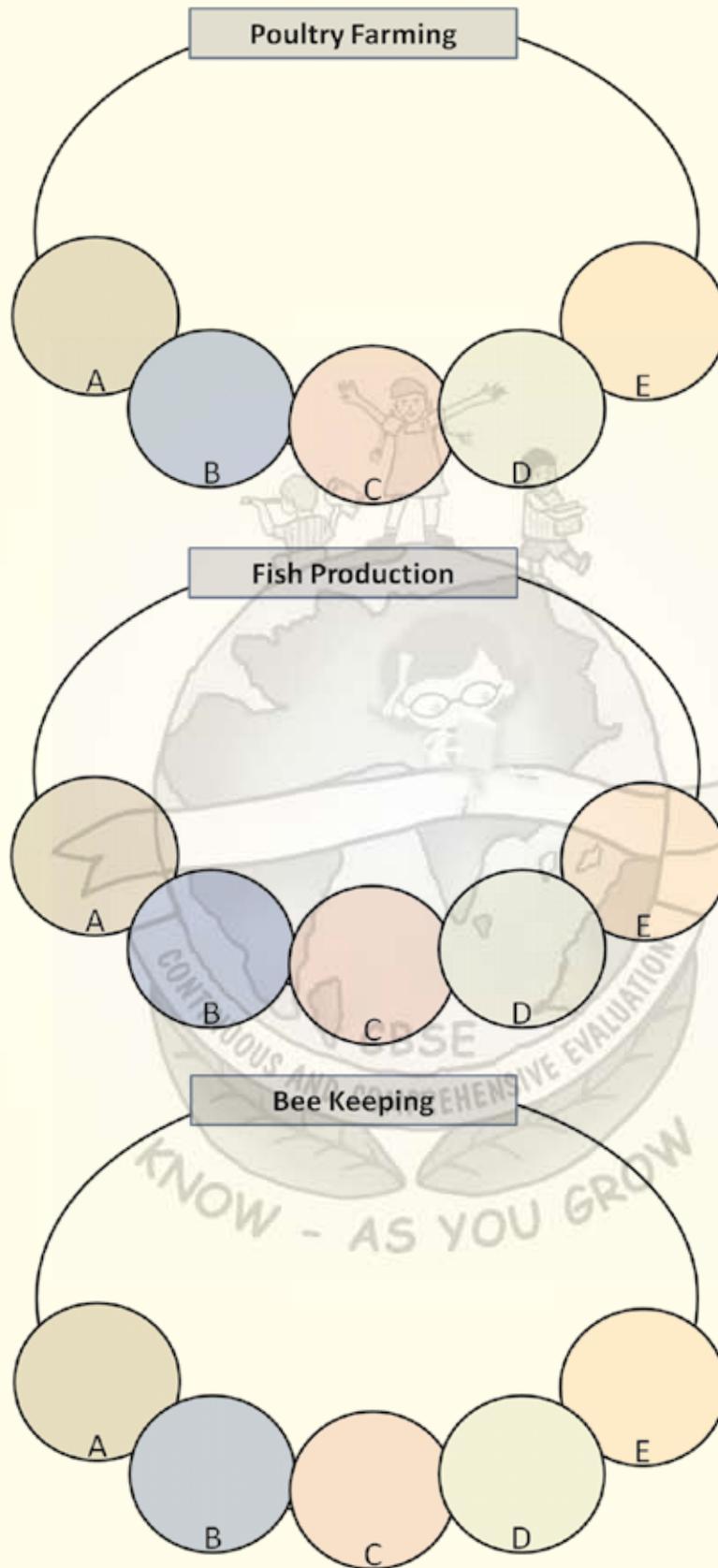
Instructions:

1. Given below are outline structures of some ‘Bead Necklaces’ and a list of characters placed in different categories. Each necklace is given a name that is actually a ‘term’ important for Food Production. You have to pick one character from each category to list the features of a group. In this way, you will ‘string the beads’ and the necklace will be complete when all the beads have been allotted characters from each category.



Categories	A	B	C	D	E
	For Milk and Drought labour	Layers and broilers	Fowl	Dwarf parent preferred for commercial chick production	Mullets and Bhetki
	For egg production and chicken meat	Marine and fresh water varieties	<i>Peneaus monodon</i>	Lactation period is important while selecting the right breed	Aseel and Leghorn
	Cheap source of animal protein obtained from water	Dairy and draught animals	<i>Apis dorsata</i> , <i>Apis mellifera</i>	Large schools are located in open sea using satellites and eco-sounders; Capture and culture methods are also used	Jersey, Red Sindhi
	For production Honey	Local and Italian variety	<i>Bos indicus</i> and <i>Bos bubalis</i>	Value or quality of product depends upon pasturage	Rock bee and little bee





Criteria for Assessment: Marks for each correct necklace = 2 ½
 (½ marks for each bead)
 (Total Marks: 2 ½ X 4 = 10)

Suggestive Remediation:

- ▲ A few students may not be able to give proper terms in the beads. The teacher may explain the terms again.
- ▲ If the number of students who have not written the correct features is more, the worksheet can be simplified by adding a hint in each bead. The teacher may also prepare a crossword puzzle giving appropriate hints for the terms.

A Snake And A Ladder

(The following activity can be done on one chapter or more than one chapters may be included)

Assessment Technique

Game based Quiz-group and individual activity

Objectives: To enable the students to–

- Revise the concepts given in a chapter
- Answer questions based on the content of the chapter
- Learn how to collaborate and find the solution to a problem/ answer to a question

Task :

Group Work

Approximate Time: 40 Minutes



Procedure:

1. A question bank of about 50 questions may be prepared. Each question is written on a chit or a small card (discarded visiting cards may be used). A snake and a ladder with hundred steps may be drawn on the board. The snake and the ladder may be drawn on a smaller board and fixed on the board in the classroom.
2. The class is then divided into four groups. Each group is given a colour. The teacher has board pins / bindis / stickers of the same colour.
3. The game may be conducted by the teacher. A stop watch may be used to limit/record the time for response.
4. One by one, each group picks up a question chit and gives the answer after consulting other members of the group.
5. A correct answer takes the group five steps up the ladder. A wrong answer takes the group into the mouth of the snake and reaches its tail. The next correct answer brings back the group to the base of the ladder.
6. The group that reaches the top of the ladder first, wins.
7. The scores on the ladder are indicated by the board pins with coloured heads or coloured bindies or coloured stickers.
8. From time to time, individual students may be asked to pick up a chit/ card. The student's response may be marked on the board in manner described above.
9. Effort should be made that every student gets to answer a question.

Criteria for assessment: Five points for the correct answer and negative marking is also there. The points may be converted to marks that will be common for all students belonging to one group. However, every student may be asked another question as viva to include an individual level of assessment too, in the activity.

Suggestive Remediation:

- ▲ Some students may not perform well in this activity or may not be active participants. They may be guided by the teacher by giving them some questions for homework, the answers for which may be spoken aloud in the class by the student.
- ▲ The teacher may also develop remedial worksheets for such students.

