UNIT 4  EVALUATION OF LEARNERS’ PROGRESS

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4.1 INTRODUCTION

After deciding what should one teach in Science i.e. the Content (facts, concepts, theories, principles, laws, formulae and processes etc.), and 'how should one teach', i.e. the method, the next step in the teaching-learning process is 'how to know that children have learned what we have taught them' i.e. the evaluation process.

It is a general feeling that ‘evaluation’ is examination. One cannot deny the use of examination. But let us look at our examination system. If we analyse the examination questions, we find that mostly knowledge-based questions are asked, and very little emphasis is given to comprehension-based, application-based, analysis-based, synthesis-based, and evaluation-based questions. Our examination questions should test all the objectives — cognitive, affective as well as psychomotor.

Clearly defined objectives help us in effective and objective evaluation. Therefore we should identify our objectives before hand and state them very clearly. If our objective is just knowledge, we should not ask comprehension, application or skill-based questions, and if our objectives are knowledge, comprehension, application and skill, we should test all the objectives and not just the knowledge, as is usually the case. For example, If our objective is 'to develop the skill of reading a thermometer', our test should be 'give a thermometer to the student and ask him to read', instead of 'how will you read a thermometer, explain with the help of a diagram'. Though we identify several objectives, they are just on paper.

We try to achieve only those objectives which are usually tested in examination. So our examination system has a major effective, objective, continuous and comprehensive evaluation, which may have a great impact on quality science education to our children.

But 'evaluation' is not just examination. It is much more than the examination alone.

Evaluation is an integral part of the teaching-learning process. In practice, evaluation is used to pass judgements about student’s achievement, though it can also be used for improving student’s
learning. Evaluation is not only the measurement of student's learning; it should also be used for enhancement of student's achievement. For this it is important that the evaluation be treated as an inseparable part of the teaching-learning process, and evaluation data be used as a diagnostic device so that proper remedial instruction could be undertaken to improve the student's learning.

4.2 OBJECTIVES

After completing this unit, you will be able to:

- distinguish between evaluation and assessment,
- identify the importance of evaluation and assessment,
- clarify the concepts of evaluation and assessment,
- identify the purposes of evaluation and assessment in science,
- identify and perform the teacher's activities for assessment of pupils in science,
- identify and use the techniques of assessment in science in both theory and practicals,
- identify and use the prescribed steps in test construction,
- identify and use the criteria of a good test,
- set a science question paper with the help of objectives, design and the blueprint,
- conduct a science practical examination, after setting science practical examination paper with (i) list of apparatus and chemicals, (ii) general instructions for examiners, and (iii) key to the question paper,
- monitor the learners' progress, and
- identify the weaknesses of the slow learners or the slow average students by diagnostic tests in science, and provide the necessary remedial measures.

4.3 CONCEPT AND IMPORTANCE OF EVALUATION AND ASSESSMENT

Practically, all our school evaluation activities are limited to the area of scholastic attainment rather than the total growth of the child. This is just a part of the evaluation process, which is called 'assessmen'

Assessment

Assessment is an attempt to measure not the pupil as a whole, nor his 'worth' but some particular abilities like knowledge of some science content, skill of handling the apparatus, setting up the experiments, performing the experiments, collecting and analysing the data (observations) and concluding etc. Assessment declares the students merely as pass, fail or categorises them into 1st, 2nd or 3rd divisions. It is very important and also very useful if done objectively. Divisions and percentage of marks help students to get admission in higher classes, if there are no admission tests and to get jobs if there can be no recruitment test or interviews.

Evaluation

Evaluation on the other hand, carries a very wide meaning compared to assessment. The term 'Evaluation' stands for assessment in all the educational outcomes and outputs that are brought about as a result of the teaching learning process. Evaluation is used to assess the change in the total behaviour of the child related with all the three domains (cognitive, affective and psychomotor). Evaluation also assesses the child's progress in science curriculum as well as co-curricular activities like science projects, innovative experiments, science excursions and science fairs etc.).

Evaluation has its own importance as compared to assessment. Evaluation may be considered as a comprehensive and continuous system of assessment that may help in knowing whether the extent to which the identified objectives have been achieved, and the expected behavioural changes have taken place in the learners in order to set them on the right path of learning. This evaluation may help science teachers to assess their methods of teaching, and the school principals in bringing desirable reforms in the overall educational and administrative setup.
Evaluation, thus may work as a bridge connecting the objectives of teaching science and the ways and means of achieving objectives in the forms of learning experiences, teaching methods and learning environment (availability of all science material needed for experiments and demonstrations and its use, use of environmental and local resources, school science clubs, the freedom to work on various science projects, frequent science excursions etc.).

4.3.1 Evaluation and Assessment in Science

Evaluation in Science

Evaluation in science assesses all the teaching-learning outcomes in terms of overall behavioural changes related to science content (facts, concepts, laws, principles, theories, formulas etc.), and science processes (observing, classifying using numbers, measuring, using space-time relationships, communicating, predicting, inferring, defining operationally, formulating hypotheses, interpreting data, controlling variables and experimenting). Not only does evaluation assess the desired science knowledge, but it also assesses its comprehension, application, analysis, synthesis and evaluation.

Evaluation not just assesses the cognitive domain objectives, but it also assesses affective domain objectives - receiving (attending), responding, valuing, organisation, and characterization by a value or value complex. Evaluation not just assesses the curricular abilities in science, but it also assesses science based co-curricular abilities in the child. Evaluation, thus has made the process of testing and assessment as continuous and comprehensive. The purposes of evaluation is therefore, to assess the overall development of the child.

Assessment in Science

Assessment usually measures how much science content (concepts and skill) has been achieved by a child out of the identified content he/she was supposed to achieve in a particular class. This content is generally knowledge, but state education boards in class X and XII examination, and the progressive schools also in other classes have also started including comprehension (understanding) and application oriented content as well. The assessment will be more objective and useful if emphasis is given to the following purposes to be achieved:

1. providing feedback to each pupil about his/her progress in science.
2. giving feedback to the teacher about the effectiveness of his/her science teaching.
3. providing information to prepare individuals for further science education and employment opportunities.
4. motivating children to develop interest in science.

4.3.2 Teacher Activities for Assessment

Observing students when they are involved in some science activities, and Questioning (oral or written) are two important teacher’s activities for assessment.

When teaching science in the class, the teacher’s questioning is mostly oral. S/he asks some questions before starting the science lesson. These questions assess the previous knowledge of the students, which the teacher presumes that the children will already possess. S/he asks some questions during the lesson. S/he also allows students to ask questions while teaching. These questions assess whether or not the children are understanding what s/he is teaching. S/he also asks some questions after the lesson. These questions assess whether the students have understood what has been taught in the lesson. Remembering the sequencing of these questions i.e. before, during and after the lesson questions is very important. Questioning and its sequencing will also be based on whether the teacher is just lecturing in the class, or s/he is also demonstrating some experiments when teaching science. When students are working in science labs (Physics, Chemistry, Biology), the teachers’ questioning and its sequencing may again be different.

When teaching in the classroom or in science labs, observing the students involved in various science activities, may help you as a teacher to assess how far the students are successful in achieving the goals and objectives set by you in the affective domain. During observation you will see whether the students:

Receiving (Attending)

1. are aware of scientific activities in the class, school or outside the school,
2. are willing to take part in scientific activities, and
3. attend activities arranged by science labs.

Responding
4. respond to the questions asked by the teacher,
5. raise hands to answer questions every time a question is asked by the teacher,
6. feel happy after answering the question correctly, and
7. take pleasure in explaining scientific phenomena to others.

Valuing
8. have faith in the power of reasoning methods of experimentation and discussion.

Organization
9. develop a plan for doing some scientific activities and school work at home.

Characterization by a Value or Value Complex
10. develop a code of behaviour based on scientific attitude or scientific temper.

To assess the children in cognitive domain, you as a teacher will set written tests (papers), administer them to the students and analyse the results.

These tests may be weekly, monthly, termwise or annual or also from State Education Boards for classes X and XII. These questions should cover almost the entire science course, having all types of questions:

1. Long Answer (LA) of 5 marks each
2. Short Answer (SA) of 3 or 2 marks each
3. Very Short Answer (VSA) of 1 marks each

[You as a teacher should also have practice to construct objective type questions like multiple choice]. These questions should cover not only the knowledge but also comprehension, application and skill.

Check Your Progress

Notes: a) Write your answers in the space given below.
   b) Compare your answers with those given at the end of the unit.

1. Generally, examination is treated as being equivalent to evaluation. Is this justified?

2. How does evaluation act as a connecting bridge between content and method?

3. How are clearly defined objectives important for evaluation?

4. What is the difference between assessment and evaluation?
A good assessment programme depends upon the appropriate and accurate evidence that we get about pupil's growth. This is possible through the use of various types of quality instruments of assessment. There are a number of tools (instruments) and techniques which can be employed for assessment of pupils in science theory and practical.

An 'assessment tool' is an instrument or any device which facilitates assessment work. An 'assessment tool' may be a question paper (science theory or practical), a unit test, or an oral test (viva in science practical). An 'assessment technique' is a process of gathering information or evidence in which one or more than one assessment tools may be used. For example, examination is a technique in which a question paper (in science theory) and a question papercum-viva (in science practical) are used as tools for collecting information.

4.4.1 Theory

As a science teacher you are to learn some skills of constructing a good science theory question paper. As a paper setter you should note the following points in order to frame a good question paper.

1. The question paper should cover, as far as possible, the whole range of topics mentioned in the prescribed syllabus. The coverage should not only be comprehensive but also well balanced by spreading questions on all significant topics and sub-topics prescribed for study.

2. No question or part of question should be set which is outside the syllabus.

3. About half of the questions should be set to test higher abilities such as comprehension, application of knowledge and development of skills (numericals and diagrams). For this purpose, the questions should be in the context of new situations rather than to ask routine or stereotype questions.

4. Wherever possible, the maximum length of expected answers should be prescribed. Terms like

   'Write short notes on .............'
   'Discuss .............' or
   'What do you know about .............'

should be avoided, as they do not provide clear direction to the students regarding the scope and length of the answers.

5. The language of the questions should be simple and within easy grasp of the students. It should also be clear-cut and specific in regard to what is required of the student. The wording of a question or any part of it must not admit of more than one possible answer.

4.4.2 Practicals

Techniques of assessment in science practicals are a bit different than those in science theory. Usually in classes IX, X, XI and XII, students are assessed in science (Physics, Chemistry Biology) in practical skills. Here out of several experiments (according to syllabus) done by the students, they are asked to perform only few (1, 2 or 3) in each subject (Physics, Chemistry Biology). For details see section 4.5.3. Oral questions are also asked on the experiments they are doing. But the practical skills in the remaining experiments (not given in the practical examination) are to be assessed by the practical note book of the students, in which they have recorded all the experiments done by them during the year. Generally IX, X and XI science practical examinations are internal (X class marks in science practical examinations are to be sent by the schools to State Education Boards). In class XII, science (Physics, Chemistry Biology) practical skills are to be assessed by the external examiners appointed by the State Education Boards. So you, as a science teacher (internal or external examiner) are to assess Science (Physics, Chemistry Biology) practical skills of the students in classes IX, X, XI & XII. Therefore it is essential for you to learn techniques of assessment in science practicals.
While conducting science practical examination, assessment is done by:—

- Observing the students’ skills in performing practicals;
- Asking oral questions (viva) to assess the knowledge of students on theory of experiments and construction and working of apparatus;
- Examining students’ practical notebook to assess their ability to record and process data.

Check Your Progress

Notes: a) Write your answers in the space given below.
    
    b) Compare your answers with those given at the end of the unit.

5. What is the difference between assessment tools and assessment techniques?

6. Write the main points, in brief, to be considered when setting a good science theory paper.

4.5 CONSTRUCTION AND ADMINISTRATION OF TEST

As a teacher you are to construct and administer tests. Then you are to mark the tests and analyse the data (marks obtained by the students). When administering the tests, care should be taken to avoid copying by students. For this, invigilators have to be strong and tactful. Another way to reduce copying is to use objective type items and change the order of questions in every paper.

In 4.4.1 you learned the qualities of a good question paper. Taking these into consideration, when you set a science theory question paper, follow the correct steps in test construction and use the criteria of a good test.

4.5.1 Theory

When setting a science Theory Question Paper you should follow the following steps in test construction, and the criteria of a good test.

(a) Steps in Test Construction

1. Designing of Test
   
   1) Identify the content (unit and sub-unit) to be tested. Give weightage (marks) to each unit or sub-unit.
ii) Identify abilities [Knowledge (K), Comprehension (C), Application (A), Skill (S), Analysis (An), and Synthesis (Sn)] and decide weightage (marks) for each ability.

iii) Identify various types of test items [very short answer (VSA), Objective (O), Short Answer (SA) and Long Answer (LA)] decide number of items of each type and weightage (marks) to each type of test items.

2. Blueprinting the Test:

The blueprint is a table which depicts the Design.

i) Allocation of marks by content areas.

ii) Allocation of marks by abilities to be tested.

iii) Allocation of marks to question types.

Examples

3 Samples are given for guidance. Find out content area in each sample and the design (i, ii, iii above). Also find number of questions for each – (i), (ii) & (iii).

BLUEPRINT - PHYSICS

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<td>1  2 5</td>
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<td>Sound</td>
<td>1  1 - -</td>
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<td>Heat</td>
<td>1  1 2 5</td>
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<td>Light</td>
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VSA = 1 M, O = 1 M, SA = 2 M, LA = 5 M
## BLUEPRINT – CHEMISTRY

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<td>S</td>
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<td>1 - 1</td>
<td>1 - 1</td>
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<td>- -</td>
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<td>5 - 1</td>
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<td>- -</td>
<td>2 - 2</td>
<td>- -</td>
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<td>- - -</td>
<td>- - -</td>
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<td>Hydrogen, Water, Oxygen and Sulphur</td>
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<td>- 1 1</td>
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<td>1 1 2</td>
<td>1 - 5</td>
<td>- - -</td>
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<td>- - -</td>
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<td>1 1 -</td>
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VSA = 1 M, O = 1 M, SA = 2 M, LA = 5 M
Study the three Sample Blueprints

Set up a question paper with the help of any one of these samples. This will give you some practice in setting up a Question Paper. You will also learn how a Blueprint facilities you to set up a balanced Question Paper.

3. Framing Questions: The Blueprint is the guide for framing questions. It involves the technical competence of the teacher as indicated in the Blueprint. Each question should be framed to test a particular objective (content to be tested is translated in objectives, desirably in terms of behavioural objectives) using the relevant content of the unit or sub-unit.

Some Sample Questions in Physics, Chemistry and Biology are given below for your guidance.

Physics

1. (VSA) What is the value of the absolute zero of temperature on a Celsius Scale?
2. (O) An object located 15.0 cm from a converging lens of focal length 10.0 cm produces?
   a) Real image 5.0 cm from the lens.
   b) Real image 30.0 cm from the lens.
c) virtual image 25.0 cm from the lens.
d) virtual image at infinity.

3. (SA) Why does an egg sink in water but float in saturated salt solution?

4. (LA) How will you find out the velocity of sound by resonance apparatus?

Chemistry

1. (VSA) Name two chemicals which cause hardness in water

2. (O) Fill in the blanks with suitable words:
   i) When elements are arranged in increasing order of their atomic numbers, the repetition in the chemical properties is termed as ..........................................
   ii) The horizontal rows in the periodic table are called ..........................................
   iii) In a group, the size of the atom ........................................... as we move downwards.
   iv) The valency of elements depends upon their ............................................. present in their atoms.

3. (SA) In an experiment the following data were obtained for a definite mass of oxygen at 300K.

<table>
<thead>
<tr>
<th>P(mm) of mercury</th>
<th>100.0</th>
<th>200.0</th>
<th>300.0</th>
<th>400.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>V(Litres)</td>
<td>12.0</td>
<td>6.0</td>
<td>4.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

From the results of the above experiment, state the relationship between pressure and volume.

4. (LA) How would you prepare H₂S in laboratory? Write down its physical and chemical properties.

Biology

1. (VSA) Name the part of the leaf through which most transpiration takes place.

2. (O) Which of the following organs is derived from ectoderm?
   a) Brain
   b) Kidney
   c) Liver
   d) Heart

3. (SA) Give three differences between aerobic and anaerobic respiration.

4. (LA) Plants make their own food in sunlight. Name and explain the phenomena. Describe an experiment with the help of a neat diagram to demonstrate this phenomenon.

4. Assembling the Questions: Questions so formed should be grouped together according to their types. Very short answer (VSA) questions may be kept at one place, objective type (O) at another place, short answer type (SA) at the third place and long answer type (LA) separately. Their arrangement may be content wise, ability wise, question typewise, as shown in sample Blueprints.

For practice assemble the above 12 questions. This may be a form of a science question paper.

Make a Blueprint of this Science Paper

5. Preparing Instructions: Instructions which go as a part of the Question Paper are meant for directing the students to attempt the question in a particular manner. For example, like (for the above paper).
   i) You have to attempt all questions.
   ii) Questions 1-3, and 4-6, (O) carry 1 Mark each.
   iii) Questions 7-9, (SA) carry 2 Marks each.
   iv) Questions 10-12 (LA) carry 5 Marks each.
(b) Criteria of Test

When framing a test (question paper) the following criteria of a test should be taken into consideration:

1. **Validity**: A test is said to be valid if it actually tests what it intend to test.

2. **Acceptability**: The test should be acceptable to the candidates, because a task which is not acceptable is unlikely to evoke the most helpful and informative responses from the candidates.

3. **Reliability**: A test is said to be reliable when even on administering several times, the same result would be given by a particular pupil or a group of pupils.

You will construct a good test (question paper) if you take these criteria (validity, acceptability and reliability) into consideration.

In 4.5.1 (a), in section 4 ‘Assembling the questions’ you were asked to assemble the 12 questions given in section 3 ‘Framing Questions’, and you got a small science theory paper. Administer this test on pupils and find out whether it has all the three criteria of a test: validity, acceptability and reliability.

4.5.2 Test Construction: Some Samples

In 4.1 you learned 5 steps in test construction. What are these steps? What are the advantages of these steps? Twelve sample questions of four different types (VSA, O, SA, LA) were also given, from which you were asked to make a science theory paper. You were also asked to see whether this 12 questions test paper fulfils all the three criteria of a good test (Validity, acceptability and reliability). In this 12 questions test there were only 3 objective type test items which may be of different types True-False, Fill in the blank, Matching and Multiple Choice. Out of these ‘Multiple Choice Test Items’ are most difficult to construct, if objectively made.

‘Multiple Choice Test Items’ are widely used in Admission & Recruitment Tests. These test items are helpful in discriminating the able examinees from the less able. In writing these test items you, as a teacher will have to develop the test material in such a way so that the items demand thought from the examinees, rather than the mere production of test items which have trivial, rote-recall answers. Now for your guidance some SAMPLE MULTIPLE CHOICE TEST ITEMS are given here in Physics, Chemistry and Biology for all the Six Cognitive Domain objectives (Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation).

**Sample Multiple Choice Test Items**

1. **Knowledge**

   **Physics**

   (1) A ray of white light is broken up into a spectrum by a prism of colourless glass because:
   
   a) the angle of incidence exceeds the critical angle.
   b) white light from an incandescent solid produces a continuous spectrum.
   c) the amount of refraction differs for light of different wave lengths.
   d) the glass absorbs certain frequencies and not others.
   e) white light is made of photons.

   **Chemistry**

   (2) Organic compounds which contain oxygen include all the following EXCEPT:
   
   a) acetic acid
   b) formaldehyde
   c) methane
   d) acetone
   e) ethanol

   **Biology**

   (3) The organ of the human body that secretes a hormone as well as digestive enzymes for fats, protein and starch is:
   
   a) liver
   b) gallbladder
Physics

(4) Newton's Laws of Gravitation is expressed by the equation \( F = \frac{G m_1 m_2}{d^2} \), where \( F \) represents force, \( m_1 \) and \( m_2 \) are two masses, \( G \) is a constant, and \( d \) is the distance between the masses.

If all other factors remain constant, which of the following graphs shows the relationship between \( F \) and \( d \)?

\[ \text{Graphs (a), (b), and (c) show the relationship between } F \text{ and } d. \]

Chemistry

(5) \( \text{CaCO}_3 + \text{heat} \rightarrow \text{CaO} + \text{CO}_2 \)

The above equation indicates that:

a) When \( \text{CaCO}_3 \) is converted to \( \text{CaO} \) and \( \text{CO}_2 \), heat is evolved.

b) When 1.0 mole of \( \text{CaCO}_3 \) is decomposed, 0.5 mole of \( \text{CaO} \) and 0.5 mole of \( \text{CO}_2 \) are formed.

c) The combined weight of \( \text{CaO} \) and \( \text{CO}_2 \) produced is less than the weight of \( \text{CaCO}_3 \).

d) 22.4 litres of \( \text{CO}_2 \) at STP is formed from 1.0 mole of \( \text{CaCO}_3 \).

e) At STP, 22.4 litres of \( \text{CaCO}_3 \) will form 44.8 litres of combined products.

Biology

(6) The growth of Bacteria at 37°C.
The time when the number of bacteria is increasing at the greatest occurs:

a) the first two hours  
b) between the II and IV hours  
c) between the IV and VI hours  
d) between VI and XII hours  
e) between X and XVI hours

III Application

Physics

(7) A cylindrical glass rod is held horizontally above a line of printing. The distance from the page to the rod is less than its focal length, and the distance from the eye to the rod is greater than its focal length of the rod. One would observe through the rod an image most closely resembling that produced by a:

a) double convex lens  
b) prism  
c) convex mirror  
d) concave lens  
e) plano - concave lens

Chemistry

(8) the following question consists of Assertion (statement) in the left hand column and a Reason in the right hand column. Select

a) if both assertion and reason are true statements and the reason is a correct explanation of the assertion.  
b) if both assertion and reason are true statements, and the reason is a wrong explanation of the assertion.  
c) if the assertion is true, but the reason is a false statement.  
d) if assertion is false, but the reason is a true statement.  
e) if both assertion and reason are false statements.

<table>
<thead>
<tr>
<th>Assertion</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>The electrolysis of a concentrated solution of sodium chloride produces chlorine</td>
<td>Because Sodium Chloride is an unstable compound</td>
</tr>
</tbody>
</table>

Biology

(9) An animal breeder crossed a black and white guinea pig and a litter of three black offsprings resulted. The breeder concluded that the black parent could not have been heterozygous (hybrid) for coat colour because he thought that any cross between a black heterozygous guinea pig and white guinea pig would yield a ratio of one black to one white offspring. His conclusion was unsound because he failed to realize that:

a) a black parent may have been a male  
b) mutations in coat colour frequently occur  
c) coat colour in guinea pig is not inherited  
d) black coat colour is dominant over white in guinea pigs  
e) genetic ratios are realizable only for large numbers of offsprings.

IV Analysis

Physics

(10) Galileo investigated the problem of the acceleration of falling bodies by rolling balls down
very smooth planes inclined at increasing angles. From the data obtained he extrapolated for the case of free fall. Which of the following is an assumption implicit in the extrapolation?

a) air resistance is negligible in free fall
b) objects fall with constant accelerations
c) the planes used were frictionless
d) the acceleration observed with inclined planes is the same type that is involved in free fall
e) a vertical plane and one which is nearly vertical have about the same effect on the fall.

**Chemistry**

(11) The apparatus shown in the diagram is assembled

![Flask](image)

Copper pellets are placed in the flask. When dilute HNO₃ is dropped into the copper, the gas in the flask becomes light brown in colour and remains that colour while a large amount of colourless gas is collected in the bottle. When concentrated HNO₃ is dropped into the copper, the gas in the flask becomes deep brown in colour, and only a small amount of colourless gas is collected in the bottle.

In both experiments, if air is mixed with the colourless gas in the bottle, the gas turns brown. A reasonable explanation for the absence of brown gas in the bottle is that the gas:

a) diffuses very slowly
b) is very soluble in water
c) is too dense to be collected over water
d) is so cooled by the water in the bottle that it becomes a liquid
e) can be formed only in the presence of copper

**Biology**

(12) In an experiment in which an empty tube of semipermeable membrane sealed at both ends, was filled with iodine solution and placed for 30 minutes in a beaker of starch solution that is normally white in colour. The iodine solution inside the membrane remained reddish brown, the starch solution in the beaker turned blue black.

Which of the following can be best inferred from the result of the experiment?

a) iodine is a disinfectant
b) starch molecules are bigger than iodine molecules
c) iodine is necessary for starch digestion
d) starch turns blue on adding iodine
A student is given a box as shown in the Fig. 4.4 (a), which has two identical torch bulbs A and B, and two switches, 1 and 2. When switch 1 is on both bulbs light, when switch 2 is on, only bulb A lights. Which of the five circuit diagrams given below is correct for this experiment?

V Synthesis

Physics

(13) A student is given a box as shown in the Fig. 4.4 (a), which has two identical torch bulbs A and B, and two switches, 1 and 2. When switch 1 is on both bulbs light, when switch 2 is on, only bulb A lights. Which of the five circuit diagrams given below is correct for this experiment?
Instructional Planning and Evaluation in Science

Chemistry

(14) A student made the following observations in the laboratory:

i) clean copper metal did not react with 1 molar \( \text{Pb(NO}_3\text{)}_2 \)

ii) clean lead metal dissolved in 1 molar \( \text{AgNO}_3 \) solution and crystals of silver metal appeared.

iii) clean silver metal did not react with 1 molar \( \text{Cu(NO}_3\text{)}_2 \) solution.

The order of decreasing strength as reducing agents of the three metals is shown to be:

- a) \( \text{Cu} \) \( \text{Pb} \) \( \text{Ag} \)
- b) \( \text{Cu} \) \( \text{Ag} \) \( \text{Pb} \)
- c) \( \text{Pb} \) \( \text{Ag} \) \( \text{Cu} \)
- d) \( \text{Pb} \) \( \text{Cu} \) \( \text{Ag} \)
- e) \( \text{Ag} \) \( \text{Pb} \) \( \text{Cu} \)

Biology

(15) You are to conduct an experiment to determine whether the rate of photosynthesis in aquatic plants is affected by the addition of small amounts of carbon dioxide to the water in which the plants are growing. You have the relevant apparatus and healthy hydrilla plants with you.

If the addition of carbon dioxide were to have an observable effect on the rate of photosynthesis in aquatic plants, almost immediately after increasing the amount of this gas in the water you would expect to observe a noticeable change in the:

- a) growth of the plants
- b) temperature of the water
- c) colouring of the plant leaves
- d) rate of bubbles produced by the plants
- e) amount of oxygen consumed by leaf respiration

VI Evaluation

Physics

16) If a rocket is moving away from the surface of the earth fast enough its speed would offset the pull of gravity and a mass in the rocket would feel weightless. This statement is:

- a) accurate since two forces are involved in this situation and two forces can offset one another
- b) accurate since the weight of an object decreases rapidly as the distance from the centre of the earth increases
- c) inaccurate since the floor of the man's compartment will be pushing up as the rocket rises, and the push will give a feeling of increased rather than decreased weight
- d) inaccurate since the chance that the force on the man due to the rocket moving up and the force of gravity pulling the man down will be equal, is extremely minute
- e) inaccurate since no object within the gravitational field of the earth can be weightless and so cannot secure weightlessness.

Chemistry

(17) Analysis by weight of a certain compound shows that it contains 14.4% hydrogen, and 86.6% carbon. Which of the following is the most informative statement that can properly be made about the compound on the basis of the data?

- a) It is a hydrocarbon
- b) It's empirical formula is \( \text{CH}_2 \)
- c) It's molecular formula is \( \text{C}_2\text{H}_4 \)

74
d) It's molecular weight is 28

e) It contains a triple bond

**Biology**

(18) Which of the following procedures would give the most convincing results as a test of whether or not a new drug would be effective in curing cancer in mice?

a) Injecting the drug into a large number of mice with cancer & comparing the number of mice who are cured without any treatment.

b) Injecting several mice with cancer and reporting how many of these mice are cured of cancer.

c) Injecting the drug into mice with cancer and reporting how many of these mice are cured of cancer.

d) Injecting the drug into a large number of mice with cancer and injecting the same amount of distilled water into an other large number of mice in each group who die of cancer.

e) Injecting different doses of the drug into a large number of mice with cancer and reporting the number of mice that are cured in each group.

Find out the answers of the aforementioned 18 sample questions, and see how far you are right. Check it from the following **KEY**:

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<tbody>
<tr>
<td>1-c</td>
<td>2-c</td>
<td>3-b</td>
<td>4-b</td>
<td>5-d</td>
<td>6-c</td>
</tr>
<tr>
<td>7-a</td>
<td>8-c</td>
<td>9-e</td>
<td>10-d</td>
<td>11-b</td>
<td>12-b</td>
</tr>
<tr>
<td>13-c</td>
<td>14-d</td>
<td>15-d</td>
<td>16-c</td>
<td>17-b</td>
<td>18-d</td>
</tr>
</tbody>
</table>

You can change these multiple choice test items into other types of objective test items as well as into VSA, SA & LA. It will be a good practice. Also try to construct such multiple choice type items on various topics of Physics, Chemistry and Biology for different class levels. If you have enough practice in constructing such test items such items may also be used in assessing your science students.

4.5.3 **Practical**

(a)** Science Practical Examination

Science subjects (Physics, Chemistry and Biology) have two parts - Theory and practical. So far we have discussed Test construction in Theory. Usually in science examination some practical exercises are also given to be completed in the time allotted. The teacher (or the external examiners) observe the students when they do these exercises; they also ask some viva questions when desired by the Education Boards. Some marks are also allotted for laboratory records.

Some Education Boards also set papers for practical examination. These papers also accompany: (i) list of apparatus and chemicals required in Science Practical, and (ii) general instructions for Examiners. This helps external and internal examiners for smoothly conducting the practical examination and evaluating the students on their practical skills.

As a science teacher you will also be involved in conducting practical examination. You may also work as an internal or an external examiner. You may also be assigned the work of paper setting for a science practical examination. For your guidance the following material (As Sample) is given here.

a) Test paper;

b) List of Apparatus and Chemicals required in Science Practical;

c) General instructions for examiners in Science Practical; and

d) Key to the question paper in Science Practical.

**Note:** This material is for Secondary School (IX-X) Examination in Science Practical (Physics, Chemistry and Biology). Similar material can be prepared for Senior Secondary (XI-XII) Examination in Physics/Chemistry/Biology Practical.
TEST PAPER — SCIENCE PRACTICAL
(To be opened one day before the examination)

Time allowed: 3 hours

Section — Physics

M.M. 15

Note: Attempt any one of the following experiments.

1. Take a metre scale. Find its centre of gravity. Place the metre scale on a sharp edge with its centre of gravity on the wedge. Hang two weights on one side of the metre scale at different distances. Hang the third weight on the other side of the metre scale. Adjust the three weights till the metre scale is horizontal. Calculate the moment of each weight. Find the relation between these moments.

2. Take a cardboard. Draw a square on it. Cut it. Draw the diagonals to meet at a point P. Find its centre of gravity. Is it the same as P or not?

3. Take a body which sinks in water. Weigh it first in air, then in water. Find the difference. Find the volume of the body with the help of a measuring cylinder. Find the relation between the difference in weight and volume of the body.

4. Find the focal length of a concave mirror by candle and screen or two pins.

5. With the help of a plane mirror strip draw incident ray, normal and reflected ray. Measure angles of incidence and reflection. Repeat your experiment for two more incident rays. Find the relation between angles of incidence and reflection.

6. For a glass slab draw incident ray, refracted ray and the normal. Measure angles of incidence and refraction. Repeat your experiment for two more incident rays. Find the relation between them if any.

7. For a glass prism draw incident ray, refracted ray and emergent ray. Measure angle of deviation. Repeat your experiment for two more incident rays.

8. Find out focal length of a convex lens by candle and screen or two pins.

9. Take a resistance wire. Connect it in series with a rheostat, an ammeter, a battery and a key. Connect a voltmeter in parallel with the resistance wire. Record current I and the voltage V for different setting of the rheostat. Find the relation between V and I.

10. Take three cells. Measure the voltage of each by a voltmeter. Connect them in series. Measure the voltage of the series battery. Find the relation between the voltage of series battery and the voltages of individual cells.

Section — Chemistry

1. Use the given apparatus for the preparation of any one of the following gases:
   a) Ammonia
   b) Chlorine
   c) Hydrogen sulphide
   d) Hydrogen chloride.

Prepare the gas.
Collect it in two jars and demonstrate the following to the examiner
a) One physical property of the gas other than its colour and odour.
   b) One chemical property of the gas

Write the chemical equation pertaining to the chemical property of the gas.
   or

Use the given apparatus for the preparation of any one of the following gases:
   a) Ammonia
   b) Hydrogen sulphide
c) Chlorine
d) Hydrogen chloride.

Collect one jar of the gas and demonstrate to the examiner that it is full of the gas.

Before starting your experimental work, draw a labelled sketch of the apparatus to be set up. Write the names of the substance you will use for the preparation of the gas on a separate sheet of paper provided to you.

2. You are provided a powdered mixture of common salt and sand. Write on a separate sheet of paper how you would separate the common salt from it. Return the paper to the examiner. Separate the sand and show it to the examiner.

3. Show experimentally that one of the test-tubes provided to you contains solution of a sulphide and the other of an iodide. Record your observation and results.

4. Two test-tubes labelled C and D are provided to you. One test-tube contains the solution of an iron (II) (ferrous) salt, other a solution of iron (III) (ferric) salt. Identify the substances dissolved in test-tubes C and D by using suitable laboratory reagents. Record your results and show to the examiner.

5. Of the two test-tubes provided to you one contains a solution of an organic acid. Before starting your experimental work, write on a separate sheet of paper how you would identify it. Identify which test-tubes contains the acid. Record your observation and results.

6. Show experimentally which one of the test-tubes contains solution of a bromide salt and the other solution of a chloride salt. Record your observations and results.

7. Record of Laboratory work.

Section — Life Science

1. Prepare a stained glycerine mount of the material provided. Draw a neat labelled sketch and with its help identify the specimen.

2. Study the experimental set-up placed before you. Make a labelled sketch and describe its objectives and precautions.

3. Identify the specimens A, B, C. List their characteristics features and reasons for identification.

4. Laboratory Record-book.

LIST OF APPARATUS AND CHEMICALS REQUIRED IN SCIENCE PRACTICAL

(To be opened one day before the examination.)

List of apparatus required:

Section — Chemistry

1. The following apparatus along with assembled apparatus for gas preparation should be provided at each seat:
   - Test tubes on stand 6; boiling tube 1; beaker (10 ml) 1; funnel 1; thistle funnel 1; wire gauze 1; spatula 1; test tube holder 1; gas jar with lids 2; tripod stand 1; measuring cylinder (100 ml) 1; wash bottle 1; delivery tube piece 1; cork borer set; iron stand with clamp.

2. Labelled test tubes, four per candidate taking the examination.

3. Labelled Winchester (2 litre) bottles.

4. Common laboratory reagents required for testing the properties of different gases and for testing inorganic and organic substances prescribed in the syllabus.

5. Powdered common salt and sand.

Section — Life Science

List of instruments and articles required:

1. Dissecting and compound microscopes.

2. Watch glasses, petri-dishes and beakers etc.
4. Reagents, chemicals for physiology experiment in syllabus.
5. Needles, forceps, plain slides, cover slips.
6. Permanent slides covering practical course.
7. Museum specimens.
8. Flowers, green plants with root.
10. Apparatus for photosynthesis, transpiration and
11. Pollinated stigma of wheat or any other plant, Cockroaches, Volvox, Spirogya, Hydrilla plants.

**Section — Physics**

List of instruments required in Science Practicals.
1. Metre scale
2. Cardboard
3. Concave and convex lens
4. Plane Mirror
5. Glass slab
6. Glass prism
7. Needles
8. Resistance wire
9. Voltmeter
10. Ammeter
11. Rheostat
12. Battery and Cells
13. Measuring Cylinder

**GENERAL INSTRUCTIONS FOR EXAMINATION IN SCIENCE PRACTICAL**

(To be opened one day before the examination)

**Section — Physics**

**A. Instructions to be given to Candidates:**

1. Observations should be recorded in ink and diagrams should be drawn in pencil. Calculations should be done in ink. If some observation is wrongly recorded it should be struck out then rewritten. Do not overwrite or erase observation.

2. One principal observation must be shown to the examiner, otherwise the experiment will be treated as incomplete.

3. Draw diagrams and graphs whenever necessary.

4. Candidates allotted electricity experiments must draw the circuit diagrams and get them checked by the examiner before starting the experiment.

**B. Instructions for Examiners:**

1. The above instructions for the candidates should be written on a blackboard or announced to the candidates before the start of the examination.

2. One day before the examination, the examiners should take a number of answer-books-atleast two more than the number of candidates to be examined in the batch. On each answer-book the examiners should paste one exercise cut out from the question paper. These exercises may also be pasted on cards, and these cards may be used in different batches. When necessary some exercises may be repeated.

3. At the time of the examination each candidate should be asked to pick-up one answer-book.
or card from the lot (which is randomly arranged) S/he should perform the experiment shown on the answer-book or card.

4. The examiner must check and sign at least one observation of each candidate.

5. The distribution of marks will be:

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>For setting the apparatus</td>
<td>3</td>
</tr>
<tr>
<td>(including drawing of diagrams wherever necessary)</td>
<td></td>
</tr>
<tr>
<td>Observation</td>
<td>4</td>
</tr>
<tr>
<td>Calculations</td>
<td>3</td>
</tr>
<tr>
<td>Result</td>
<td>2</td>
</tr>
<tr>
<td>Laboratory Record</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

6. The examiner must check that all apparatus for the experiments to be allotted next day is available and is in satisfactory conditions.

**Section — Chemistry**

1. The examination exercises for any group of candidates will be written on a black board or exercises may be written on first page of the answer-book.

2. The choice of a gas jar for gas exercise will be made by the examiner for a particular group of candidates from the alternatives provided in the question paper.

3. The examiner will also make a choice of the chemical/physical property to be demonstrated.

4. Any two exercises amongst exercises 1 to 6 may be given for each batch of candidates.

5. As soon as the candidates gather for the examination, they will be asked to deposit their record books and the same should then be cancelled after evaluation. All preliminary writing should be finished within the first ten minutes on a separate sheet of paper. The time for this should be included in the time assigned for examination.

6. As far as possible, all the materials needed by the candidates should be provided on their seats.

7. Distribution of marks shall be as follows:

**Exercise 1**
- Preparation and collection of gas: 2 marks
- Demonstration of physical property: 1.5 marks
- Demonstration of chemical property (with chemical equation): 2.5 marks

**Exercise 2**
- Dissolving and filtering: 2 marks
- Method of separation: 2 marks
- Submission of separated sand: 2 marks

**Exercise 3, 4, 6**
- Performance of experiment: 2 marks
- Recording of observations and inferences: 2 marks
- Correct identification: 2 marks

**Exercise 5**
- Performance of experiment: 2 marks
- Method of identification: 1 mark
- Record of observations: 1 mark
- Identification: 2 marks
Section — Life Science

(Special instructions of examiners for Life-Science Practical Examination)

1. There is only one question-paper common for all the batches, which should be written on the blackboard. The key to the question-paper is also common for all the days of examination.

2. Each question contains a set of number of exercises. To every batch different sets of exercises of experiments may be given by the Examiners (regardless of serial order).

3. A separate key (based on the actual items set by the Examiners) should be prepared for each batch of candidates working on a particular set. The key should be sent to the board with the packet containing the answer-scripts of those candidates.

4. The set of items selected must be changed as frequently as possible.

5. Distribution of marks will be as follows:
   i) Mounting, staining, sketch, identification.
      \[1 + 1 + 1 + 0.5 = 3.5\text{marks}\]
   ii) Labelled drawing, description of objective.
      \[2 + 2 = 4\text{marks}\]
   iii) Labelled drawing, identification, comments of specimens A, B, C.
      \[0.5 + 0.5 + 0.5 = 1.5\text{marks}\]
      For correct description of tests in answer-script.
      \[1 + 1 + 1 = 3\text{marks}\]

6. Items in Q. No. 3 shall be arranged on separate table and each candidate shall be given separate sheet of paper which he or she shall hand over to the Examiner after completing this question. Time to be given for each item shall be three minutes. The sheet for this question, after evaluation is to be attached to the main answer-book for this part, by the examiners.

KEY TO THE QUESTION PAPER IN SCIENCE PRACTICAL

(To be opened one day before the Examination)

Section — Chemistry

1. Material and assembled apparatus for the preparation of one of the following gases:
   \[\text{NH}_3, \text{Cl}_2, \text{H}_2\text{S}, \text{HCl}\]

2. Packets containing a mixture of powdered common salt and sand.

3. Pair sets of test-tubes. In each pair, one test tube will contain a solution of sodium iodide and the other test-tube a solution of potassium iodide.

4. Pair sets of test tubes. In each pair, one test tube will contain solution of ferrous salt and the other a solution of ferric salt.

5. Pair sets of test-tubes. In each pair, one test-tube will contain a solution of 5% oxalic acid and other test-tube distilled water.

6. Pair sets of test-tubes. In each pair one-test tube will contain a solution of sodium sulphide and the other a solution of sodium chloride.

Section — Life Science

1. a) Onion/lily Leaf
   b) Pollinated stigma
   c) Mycelium of Mucor
   d) Spirogyra filaments
   e) Cheek tissue
   f) Blood Smear
   g) Tomato pieces
h) Volvox Colonies  
i) Potato piece (starch grains in cells).

2.  
a) Experiment to show that light is essential for photo-synthesis.  
b) Experimental set-up for showing that water is transpired through leaves.  
c) Experiment to demonstrate the evolution of O₂ during photosynthesis.  
d) Osmosis set-up (thistle funnel and egg membrane or potato piece with graduated tube).  
e) Test tubes showing tests for (i) simple sugars, and (ii) starch or (i) simple sugars, and  
	(ii) proteins.  
f) Experiment showing transpirational pull.

3.  
a) Bud graft of Rose — Aquarium — Amoeba (slide)  
b) Xylem (slide) — Hydra — Bony fish  
c) Housefly — Epithelial layer of Frog — Onion bulb  
d) Cuscuta with host — Metaphase in mitosis (slide) — bat  
e) Xylem (slide) — Cactus — Flying Lizard  
f) Pollen grains (slide) — Bud graft of Rose — Amoeba (slide).  
(Examiners will arrange any one of the above sets consisting of three specimens each.)

Check Your Progress

Notes:  
a) Write your answers in the space given below.  
b) Compare your answers with those given at the end of the unit.

7.  
What is the use of multiple choice question in science examination?

8.  
Write 5 steps in test construction.

9.  
Write 3 criteria of a good test.

10.  
What are the materials required for conducting practical examinations?

11.  
Why do you assess the practical notebooks of students in a science practical exam?

4.6 MONITORING OF LEARNERS’ PROGRESS

When you teach science theory in the class and practicals in science laboratory or in the field, you  
monitor the learners using the following techniques:

1. Teacher – Learner Interaction

2. Teacher – Material (individual aids used during teaching) interaction.

3. Learner – Teacher interaction, and
4. Learner – Material interaction.

You categorise the learners into above average, average and below average. If you interact most with below average, they can become average and then above average. If you interact more with average, they can become above average. If you just encourage the above average, they will do self learning and become outstanding. Thus everyone (below average, average and above average) will progress. Thus monitoring is a very strong tool of learners progress. If you do not monitor them, the learners will remain as they are, with no progress.

You also monitor the learner’s progress by written tests and practical examination as well as their practical record in their practical notebook. Written tests may be unit tests, weekly tests, monthly tests and terminal tests. Assessment of all such tests will facilitate you in monitoring learners’ progress. Home work, Project work and Field work may also help you in monitoring learners progress. By monitoring you will know where the learners are weak and when you will apply different techniques, you will remove their weakness and they will progress.

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<tr>
<th>Check Your Progress</th>
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<tr>
<td>Notes: (a) Write your answers in the space given below.</td>
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<tr>
<td>(b) Compare your answers with those given at the end of the unit.</td>
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<tr>
<td>12 How will you recognise below average, average and above average learners by monitoring? How will this help in learner progress?</td>
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4.7 DIAGNOSTIC TESTS AND REMEDIAL MEASURES IN SCIENCE

When you teach science in a class, you ask some questions before you introduce the topics. These questions test previous knowledge for the lesson. Unless children have this previous knowledge, they will not understand what will be taught in the lesson. Thus, Questioning is a type of Verbal Diagnostic Test before the lesson. This test assesses what the children do not know. So before starting the lesson, the teacher teaches some precursor material so that children will be able to answer the unanswered questions. After this he starts lesson, and children do not have too many problems in understanding the lesson. Teaching of this precursor material is a type of Remedial Measuring. So teachers always do diagnostic testing and remedial measuring when they teach science in the class.

But it is not always possible to do justice to the lesson by simple informal questioning. The teacher needs structured evidence. Tests (Verbal or Written) are given to the children. This Test is called Diagnostic Test. Analysing the responses of the children on the test, the teacher knows where the children are lacking. For that he takes necessary Remedial Measures.

For example when children come to the class IX after passing class VIII, the science teacher has to know whether his students have the previous knowledge for class IX, which the children learned in science in middle or upper primary classes (VI, VII, VIII). To find this out, the class IX children should be given a diagnostic Test, which covers the previous knowledge for IX-X science classes, which was to be learned in VI-VIII science classes. This will help IX and X class science teachers to take some remedial measures.
Similar is the case when children come to class VI after passing V. And so in class VI also a Diagnostic Test in Science should be given to class VI students, which should be based on the previous knowledge for classes VI-VIII, which the children must have learned in I-V science classes. This will help VI-VII class science teachers to take some remedial measures.

To give a similar Diagnostic Test in science in the beginning of each class will be ideal, and if the concerned science teachers take necessary remedial measures, the children will understand and enjoy science.

**Check Your Progress**

**Notes:**

1. Write your answers in the space given below.
2. Compare your answers with those given at the end of the unit.

13. What are diagnostic tests and remedial measures in science? Give examples.

14. How will you identify slow learners in your class, and how will you teach science to them?

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### 4.8 LET US SUM UP

After ‘content’ and ‘methods’, ‘evaluation’ is very important step in teaching science. Examination is not really evaluation, it can be clubbed under Assessment. Our examination questions should test all the objectives i.e. cognitive, affective and psychomotor. Clearly defined objectives help us in effective and objective evaluation. Our examination system has a big hand in ensuring continuous and comprehensive evaluation. Evaluation is much more than merely the examination.

Examination is assessment. Evaluation stands to assess all the educational outcomes (cognitive, affective, psychomotor, science curricular and co-curricular activities). Both ‘assessment’ and ‘evaluation’ have their own importance. Evaluation in science assesses all the teaching learning outcomes in terms of over all behavioural changes related to science content and science process. The purpose of evaluation is to assess the over all development of child. ‘Observing’ and ‘questioning’ are two main teacher activities for assessment.
A good assessment programme depends upon the appropriate and accurate evidence that we get about pupils growth. An assessment tool is an instrument which facilitates assessment work. An assessment technique is a process of gathering information or evidence in which one or more than one assessment tools may be used.

As a science teacher you should know how to set a good science theory paper, and how to conduct science practical examination. You should know the qualities of a good question paper.

When setting a science Theory question paper you should know and follow the criteria of a good test (Validity, Acceptability, Reliability), and steps in test construction (designing of the test, blueprinting of the Test, framing questions, assembling questions and preparing instructions.)

There are various types of objective tests in which multiple choice type, if constructed objectively, are very popular and useful. You should have enough practice to construct multiple type test items in science (physics, chemistry and biology) for all the abilities in cognitive domain — knowledge, comprehension, application, analysis, synthesis, and evaluation. Besides multiple choice test times you should also practice other objective tests as well very short answer (VSA), short answer (SA), and long answer (LA) questions.

You should also know how to conduct practical examination in science (physics, chemistry, biology), and prepare test paper, list of apparatus and chemicals required, general instructions for examiners, and key to question paper. You should also have enough practice for all this.

As a good science teacher you should also know and practice monitoring of learners progress as well as diagnostic tests and remedial measures in science.

As a good science teacher, you should also be a good science evaluator.

### 4.9 UNIT-END EXERCISES

1. Look at the marks sheet of any student given by a school education board. Is it assessment or evaluation of students performance? Justify your answer.

2. Which of the following is a better indicator to show evaluation of students performance?
   a) local examination progress report card.
   b) school education board marks sheet.
   Justify your answer.

3. Name 13 science processes. How will you assess that a child has learned how to use all these processes when learning science.

4. Name 6 abilities in cognitive domain. Which of them you can assess in?
   a) class X science
   b) class XII science

5. Name 5 abilities in affective domain. How will you assess a child for these abilities?

6. What are the techniques of assessment in
   a) science theory
   b) science practical
   What is the difference between the two?

7. For any class VI-XII science (physics, chemistry, biology) Set a paper after making a blueprint.

8. How will you monitor learners progress in science?

9. Make a diagnostic test in science for any of the classes-VI, IX, or XI science (physics or chemistry or biology).
4.10 ANSWERS TO CHECK YOUR PROGRESS

1. No, evaluation is a very wide term compared to examination.

2. Refer to Section 4.3.

3. Evaluation is done on the basis of objectives. It weighs the output (student outcomes) on the basis of input (methods) to see whether objectives are achieved or not.

4. Assessment is only a part of evaluation process. It is an attempt to measure some particular abilities whereas evaluation measures total behavioural change across all 3 domains of the child.

5. An assessment tool or an instrument is a device which facilitates assessment work. It may be a question paper, a unit test or oral test.

   ‘An assessment technique’ is a process of gathering information or evidence in which one or more than assessment tools may be used. Examination is a technique in which a question paper (in science theory) and a question paper-cum-viva (in science practical) are used as tools for collecting information.

6. A good theory question paper should:
   a) Cover the whole syllabus
   b) Test higher abilities from routine skills
   c) Prescribe scope and length of answer required
   d) Have unambiguous and specific language.

7. MCQ are objective, can test higher order abilities, easier in checking and coding.

8. Designing, blueprinting, framing questions, assembling questions and preparing instructions.

9. Validity, acceptability and reliability.

10. Test paper, list of apparatus and chemicals, general instruction to examiners and examinees, key to question paper.

11. To assess students’ data recording and analysing ability.

12. We will recognise them by using four techniques for monitoring of learner’s progress. We will accordingly interact with them in order to help below average to become above average and above average to become outstanding.

   We monitor the learner progress by written tests and practical examination as well as their practical record in their practical notebooks. Written tests may be unit tests, weekly tests, monthly tests and terminal tests. Assessment of all such tests will facilitate us in monitoring of learners progress. Project work and field work may also help us in monitoring of learners progress. By monitoring, we will know where the learners are weak and when we apply different techniques, we can remove their weakness and they will progress.

13. When we teach science in a class, we ask some questions before we introduce the topics. These questions test previous knowledge for the lesson. In order to find out that previous knowledge of the subject, some test (verbal or written) is given to the child. With the help of responses of the children on the test, the teacher knows, where the children are lacking, for that he takes necessary remedial measures.

   For example when children come to class IX after passing class VIII, The IX class science teacher put some questions (verbal or written) to his students to find out as to what his students have learnt in class VIII or in earlier classes in science. Remedial measures are the steps taken by the teacher to remove these deficiencies.

14. We can identify slow learners by way of conducting diagnostic tests. There are children in science classes who are not motivated to learn science, although science is compulsory up to class X. If they had a choice they would never take up science at least in IX - X classes. These unmotivated children become slow learners in science. Slow learners take more time to learn the something in science compared to average or above average children. They learn quickly and with interest if the teacher teaches them by demonstration (showing experiments) and experimentation (doing experiments with their own hands) method.
4.11 SUGGESTED READINGS


