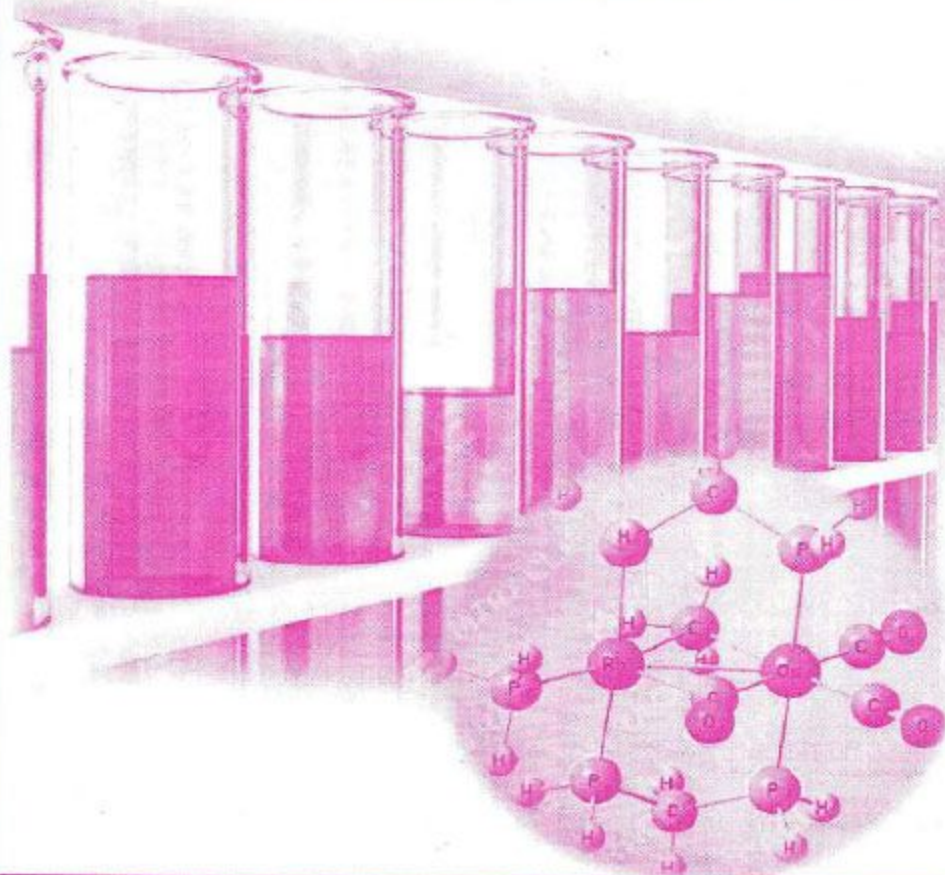


TEACHER'S
CHOICE[®]

B.Ed.

Second Year - Third Semester

**Pedagogy of
PHYSICAL SCIENCES**



Course - XI
SECOND YEAR
IIIrd Semester

**PEDAGOGY OF
PHYSICAL SCIENCES**

Authors :
Well Experienced Teacher Educators

**TEACHERS CHOICE PUBLICATIONS,
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UNIT - 1

SCIENCE CURRICULUM AND TEXT BOOKS

1. Write the concept and Meaning of curriculum ?
What are the principles of curriculum construction?

Ans. The word curriculum is derived from the latin word "currere" which means "to run" so the curriculum means a course to be run for reaching a certain goal.

"Curriculum is a tool in the hands of an artist (teacher) to mould his material (pupils) according to his ideals (aims) in his studio (school)

- Cunning ham

Curriculum as an aid in the process of adjusting the child to the environment in which he functions. From day to day and in the wide environment in which he will have to organise his activities later

- Saiyidain

Curriculum means the educational experiences that schools provide to the pupils but ofenly people says curriculum is related to syllabus. Here we are knowing the major differences between curriculum and syllabus.

Curriculum	Syllabus
It is a comprehensive and related to all subjects and other than subjects too	It is related to one subject
It relates the total experiences to the child within the school and outside the school	It gives only the subject knowledge and experience on it.
Its scope is large and related to all the activities performance by the child during the year	Its scope is limited and child performance is limited to the particular activities prescribed in the syllabus
It gives the aims and objectives of the child	It is a part of the curriculum and having limited aims and objectives.

Principles of curriculum construction

A curriculum frame worker should necessarily follow the following principles while constructing the curriculum.

1. Principle of child centeredness : The curriculum should be according to the interests, abilities needs and desires of the pupils at that particular age. This principle insists on the original impulses or native propensities of the children in education.

2. Principle of Integration: There should be logical integration of the different activities and subjects to make instruction more meaningful. The curriculum should integrate the child's needs and activities.

3. Principle of Community Centeredness : The curriculum should determine the purpose of the society and should be prepared to fulfill the needs of the community.

4. Principle of Creativity : The curriculum should include those activities which enable the child to exercise his creative and constructive powers. The objective of education is to discover and to develop special interests, tastes and aptitudes.

5. Conservative principle : The curriculum should include all the forms of knowledge, skills and values, which the society upholds and feels to preserve and transmit through the coming generations.

6. Principle of activity centeredness: There should be more emphasis on learning by doing. More provision should be made for individual laboratory work and other field experiences.

7. Forward looking principle : It should help the child in adjustment and prepare him for full and effective adult life. Curriculum should give due place to the future needs and requirements of the community. It should give the students a foundation of knowledge, feelings that will enable them to change according to the environment or change the environment when it is needed.

8. Principle of Elasticity and Variety : The curriculum should not be rigid but should be changed according to the

changing needs of different pupils It should cater for the different needs interests and abilities of the children and also to the changing conditions It should be adapted to individual differences.

9. Principle of All round development : All kinds of experiences should be provided to the students so that they may develop their all powers in body, mind and spirit.

10. Principle of Leisure : The curriculum must prepare the child for the use of leisure time leisure activities such as preparation of models participation of science club activities, collection of models and specimens should be given a prominent place in the curriculum.

11. Principle of Environmental centeredness : The curriculum must prepare basaed on the surrounding environment of the learner.

12. Principle of dignity of labour : It gives importance to dignity of aptitudes dignity of labour and dignity of ethics.

13. Principle of Life Centeredness : There should be co-existence between curriculum and life. The curriculum should be related to the life of the individual in the community. It involves the preparation of the child for vocation creation and recreation to enable him to be socially efficient, economically sufficient, intellectually alert, physically fit, professionally proficient and culturally competent.

14. Principle of Balance : The curriculum should be framed in such a way as every aspect of life i.e., economical, social, occupational , spiritual and cultural life is given due emphasis. It should also maintain proper balance between direct and indirect experiences individual and social aims and among the subjects.

2. What are the various approaches to curriculum organization?

Ans. Methods of curriculum constructions

While designing the curriculum every one should given priority to content, objectives and the student. But how can this organise? is it possible to teach all the lessons within the academic

year ? Or to extend the level of the topics with the innovative contents from time to time bases on its origin ?

For answering these, there are many methods are developed to frame the curriculum to cater the needs of the students to solve their day to day life situations in the learning situations.

1. Logical Method : In this method the contents are arranged based on the logical form. For example

- ❖ In Chemistry the classification of elements are kept first then mixtures, and then combinations.

- ❖ In Physics light, functions of light, application of light etc.

2. Concentric Method : In this method of curriculum framing, in the earlier stage of learning i.e., primary stage the level of content on a topic should be introductory, later stages it should be extended according to the learner. Hence it helps the students to extent his knowledge according his age and intelligence. For example

Class 10th

If you observe in class 8, 9 and 10 text books, the lesson Magnetism is framed according to this method.

In class 8th, the student learner Magnet, types, functions, and method of magnetism; in class 9th he learns some extent like Geo Magnetism, Magnetic field, Magnetic lines' he again learns extent about the Magnetism like Inverse theory of Magnetism, Constant point of magnetism and magnetic force etc. Most of the physical science text books are constructed based on this method.

3. Spiral Method : In this method the topics are set sequentially in easy to concrete level of difficulty and see that the contents should be connectivity with one class to other higher class. The topics don't repeat in this method at any stage.

4. Topic Method : In this method the total content divides into several topics. They kept sequential and inductive and deductive approach. The topics don't repeat in any class.

5. Historical Method : In this method the content should kept according to its origin to present status in a chronological wise.

3. Write about curriculum organisation, In terms of NCF - 2005, RTE -2009, NCFTE - 2009, APSCF - 2011

Ans : National Curriculum Frame work - 2005 :

Good Science education is true to the child, true to life and true to science. This simple observation leads to the following basic criteria of validity of a science curriculum.

- | | |
|--------------------------|------------------------|
| 1. Cognitive validity | 2. Content Validity |
| 2. Process validity | 4. Historical validity |
| 5.Environmental validity | 6. Ethical Validity |

The curriculum at different stages : Primary stage

: The child should be engaged in joyfully exploring the world around and harmonising with it. The objectives at this stage are to nurture the curiosity of the child about the world, to have the child engage in exploratory and hands on activities for acquiring the basic cognitive and psychomotor skills through observation, Inference etc; to emphasise design and estimation and measurement as a prelude to the development of technological skills at later stages and to develop basic language skills.

Upper primary stage : Scientific concepts are to be arrived at mainly from activities and experiments. Science content at this stage is not to be regarded as a diluted version of secondary school science.

Secondary Stage : Students should be engaged in learning science as a composite discipline in working with hands and tools to design more advanced technological modules than at the upper primary stage and in activities and analyses on issues concerning the environment and health, including reproductive and sexual health.

Higher Secondary Stage : Science should be introduced as separate disciplines, with emphasis on experiments.

National curriculum frame work for Teacher Education (NCFTE 2009)

According to NCF 2009 act they should be design some norms of the school level teachers.

- 1) Educational aims 2) Peace Education 3) School and

Health Education 4) Child rights 5) Educational Philosophers thoughts 6) Teacher Education Curriculum

Right to Education Act - 2009 : The Right of children to Free and compulsory Education Act or right to Education Act also known as RTE, is an Act of the Parliament of India enacted on 4 August 2009 which describes the modalities of the importance of free and compulsory education for children between 6 and 14 in India under Article 21A of the Indian Constitution.

Section 29(2) lays down the factors which need to be taken into consideration by the academic authority notified by the states preparing the curriculum and evaluation procedure namely.

a) All round development of the child b) Building up the child's knowledge, potentiality and talent c) Learning through activities, discovery and exploration in a child friendly and child centred manner.

Andhra Pradesh State Curriculum Frame Work - 2011

Nature of Science : Science is a process of constructing knowledge. The process depends on making careful observations of phenomenon and on inventing theories for making sense out of those observations.

Scientific Inquiry : Science asks three basic questions what is there ? How does it work ? How did it come to be this way ? Fundamentally, the various scientific disciplines are alike in their reliance on evidence, the use of hypothesis and theories the kinds of logic used and much more.

Primary Stage : The main objectives of science teaching at this stage are to maintain the curiosity about the world and have the child engage in exploratory and hands on activities that would lead to the development of basic cognitive and psychomotor skills.

Upper Primary Stage : Science education at this stage should provide a gradual transition from an exposure to ideas of science through environmental studies of the primary stage to elements of science including its concepts, processes and methods.

4. What are the function and characteristics of a Good physical sciences text book ?

Ans : The test book is one of the important aids in the teaching learning process and has occupied a pivotal role in educating the school children. The physical science text book should aim at aiding the pupil in the development of personality and open-mindedness, to appreciate and understand nature and to mould it to one's own ends instead of merely stuffing of facts.

Functions of the Physical Science Text Book : A good Physical science text book should be in accordance with the aims and objectives of science teaching. While emphasizing the need and importance of text books. The Kothari Commission says "The question of the text book is the most important and urgent one for our country. Energetic action on state and national basis is required to ensure the progress in the preparation of high quality school text books".

1. A good text-book should help to form correct understanding of basic concepts and principles of science.
2. It should inculcate scientific attitude in the pupils and develop open mindedness and a co-operative attitude.
3. It should acquaint the child with wide variety of the applications of the scientific knowledge through proper exercises.
4. It should provide for the development of scientific skills.
5. It should give directions for experiment and problem solving.
6. It should stimulate interest in students for investigation in the world around them.

Characteristics of A good Physical Science Text Book :

1. Well qualified and experienced persons in the field of Physical science should be allowed to write the text book.
2. Appearance of the cover should be attractive. Attractive binding, fine printing, captivating photographs and smooth pages are required to capture the minds of students and to arouse the interest.
3. The subject matter its nature and organization : i) The subject matter should be developed as far as possible in the

psychological sequence. ii) The subject matter should stand for the objectives of physical science teaching. iii) Each chapter should begin with a brief introduction and end with a summary. iv) Headings and sub-headings should be in bold type. vi) A text book should be written in lucid, simple and precise scientific language. A standard terminology for scientific and technical terms should be used. vii) It should suggest some good methods of learning. viii) It should contain helpful and practical suggestions for preparing and improving the physical science apparatus.

The UNESCO Planning Mission have given the following principles of writing text books.

- i) The facts should be modern and comprehensive.
- ii) They should feed the requirement of syllabus.
- iii) They should link science with practical life.
- iv) The whole content of text books should be aimed at shaping and integrating the modern scientific world outlook.
- v) The contents should contain not only established facts but also problems of practical life.

5. Explain the concept of Learning Resources for Physical Science.

Ans : Learning Resources are active interactions between the stimuli and the pupil learning resources is the reaction of the student to the learning situation. Created by the teacher in the form of activities.

Learning Resources bring about the following changes in the Learner. A) Development of concepts b) The thought process of learner c) Development of attitudes.

Characteristics of Learning Experiences :

✦ Science is best learnt by doing and these experiences help in creating conditions "to do science". ✦ Learning experiences help in developing skills needed to seek information and solve problems. ✦ Learning experiences help in providing hands on experience to the students

Classifications of Learning Experience : Learning experiences are classified in to three different categories.

a) Direct Experiences : These represent reality as we experience it first hand. It is the experience gained through direct contact with the success.

Direct Experience include a) Dramatised experiences b) Direct purposeful experience.

b) Indirect Experiences : This category includes the demonstration, the study trips and the exhibits. These methods are obviously more abstract than direct experiences.

The Indirect experience are a) Exhibits b) Demonstrations

c) Vicarious Experiences : They substitute direct experiences. These experiences include radio and still pictures.

The learning experiences can be incorporated into classroom teaching by ✦ Developing Interests ✦ Relating them with content

Sources of Learning Experience : There are many sources of Learning experiences, which are generally grouped under the following common heads.

School : A school is a society in miniature. It is a formal agency that provides a variety of Learning experiences. They are ✦ Exhibitions ✦ Experiments ✦ Excursions ✦ Audiovisual aids

Home : It is an informal agency. We learn sitting, talking etc.

6. Write a note on "Exploring alternative resources".

Ans : Physical Science in school education can learn by the students resources that are provided by the school management in effective manner.

Objective of utilisation of Resources : 1) Teachers can provide practical knowledge on subject rather than the theoretical knowledge in classroom. 2) Teaching materials are

collected before going to teach the lessons in the class room. 3) To encourage co-curricular activities in the class room.

Reasons for utilisation of Resources :

1) To Learn education from the society other than the school resources.

2) To educate students solve the problems. That are raised other than school environment.

3) Physical science not only ment for the practical thinks in the schools and also used for the daily life in human being.

Community resources : There are three types of community resources.

1) **Physical Resources :** Physical resources are the resources that are made by man through his abilities and skill.

2) **Living community :** Examples : Forests, Parks etc.

3) **Intellectual Resources :** Doctors, Lawyers, Teachers, Technicians, Experts in different fields of community, etc comes under this category.

UNIT - 2

INSTRUCTIONAL MATERIAL FOR PHYSICAL SCIENCES TEACHING

- 1. Explain the importance of practical work in Physics and Chemistry.**

Ans : Importance of Laboratory work : Learning by doing is one of the cardinal principles of science teaching. The achievements of modern science are mainly due to the application of experimental method. It is therefore important that the practical work should form a prominent feature in any science course. The primary objective in determining a technique of instruction is to provide for a maximum of pupil activity. Even Andhra Pradesh Primary Education Project (APPEP), District Primary Education Project (DPEP), Sarva Siksha Abhiyan (SSA), and Rashtriya Madhyamika Shiksha Abhiyan (RMSA) also given importance to the activity based teaching at the primary, Upper Primary and Secondary levels.

These are the some of important values in experimental work.

- 1) With the practical orientation, students can find the reality and they will be answer at any time.
- 2) Increases the curiosity to handle things. Develops active participation in the practical work.
- 3) Develops the scientific knowledge, attitude and interest among the students. providing an enthusiastic experimenter and discover.
- 4) Provides opportunities for training in scientific method. Students get a good deal of training in facing the problems in a scientific way.
- 5) Impose the good qualities like co-operation, initiative, self reliance, self dependence, resourcefulness etc.,
- 6) Provides opportunities to exercise reading scales and drawing diagrams and a custom pupil to use various hard tools of the scientists.

2. **Write a short note on a) Planning of organisation of science laboratories, b) Laboratory Apparties c) Registers d) Care and maintenance of Lab apparatus e) First Aid Box f) common accidents**

Ans : Planning of science Laboratories : Before constructing the laboratory the following factors should be taken into consideration at the planning stage. 1) The number of pupils working at a time. The minimum space necessary for each pupil for comfortable working 3) Number of science teachers in schools 4. Need for ancillary accommodation for storage 5) Imperative need for Economy.

Types of Science Laboratories : Keeping in view the further mentioned assume member of laboratory designs and their equipments have been suggested by different educationists. Some of the laboratories at school level which suit the conditions of our country and which have been accepted by educationists are discussed.

A. Lecture room cum Laboratory plan by Dr.R.H. Whitehouse : The plan stands approved by the Punjab Educational Department. According to this plan. We have to consider the following.

Location : It should be in ground Floor.

They Layout : It should be 45 x 25 for a class of 40 students for demonstration and 20 for practicals.

Ventilation : Ventilators should be provided with exhaust fans.

Walls : The walls may be about 1' thick.

Flooring : The floor should be cemented.

Water supply : A storage tank should be built in the roof of the science laboratory.

Heat Supply : There should be a gas generator.

Lighting : Tube lights and bulbs may be fixed for better lighting.

The Black Board : The size of black board may be $10^1 \times 4^1$.

The Demonstration Table : It should be 6×2 high.

The working table : Size of the working table should be $6 \times 3 \times 2$

Chairs : There should be 40 chairs.

Sinks : There should be three sinks altogether.

B. Lecture cum laboratory plan : Panel for science education in secondary schools (1964) has suggested the following plan.

Location : Laboratory should be located on the ground floor and on the extreme side of the school building.

Layout : It should have 825 sq.ft for 42 students working at a time.

Furnishing : The panel has suggested portable furniture.

Material for construction : The locally available material should be preferred and the material should be cheap.

All purpose science room : This type of laboratory serves the purpose of both practical as well as theoretical work.

Advantages of an all purposes science room : It is compact and flexible ♣ It is economical in cost and space ♣ It provides an environment which helps realise unity in the theory and practical work in learning science.

Science Kit : The science kit is a small box which can be easily carried to the class room a) demonstration kit b) individual kit.

The demonstration kit is meant for the teacher and the individual kit is for students use.

Advantages of science kit : ♣ It is economical ♣ It provide a training in scientific method ♣ It provides systematic knowledge.

Laboratory Apparatus :

Planning of Apparatus : A careful planning is necessary before the procurement of apparatus. The equipment required may be classified as under. 1) Apparatus for lab work 2) Apparatus for demonstration work 3) Apparatus for General use such as tools etc.

The quantity of apparatus can be determined by a

consideration of the following points. 1) budget 2) Demonstration of lab work 3) Size of the class 4) The level of the students 5) Storage accommodation.

Stock Registers : The following are the various stock registers that are usually maintained. 1) Stock registers for non breakable articles such as wood metal etc. 2) Stock registers for breakable articles such as funnels, bottles etc. 3) Stock registers for consumable articles such as cells, wires etc. 4) The order Register 5) The issue register 6) The requirement register.

Care and Maintenance of the Apparatus : The following points will help you in caring and maintaining them

✦ Apparatus should be cleaned after use. ✦ The wooden apparatus should be polished ✦ All the chemicals should be well labelled. ✦ Sinks should always be kept clean.

First - aid Box : Its Moto is "Prevention is better than cure".

Apparatus in the First - aid Box : ✦ Forceps ✦ Surgical lints ✦ Safetypins ✦ Hydrogen Peroxide ✦ Apair of Scissors.

Common accidents: Use of First aid Box. In general some of the common accidents are occur while performing the laboratory work during the pratcticals in the laboratory.

1. Fire : Small fires due to oil, sodium etc can be by extinguished by throwing some sodium bicarbonate or dry sand on them.

2. Burns : for slight burns apply burnal and Sarson oil. For small burns apply. Sterilized pad of cotton soaked in NaHCO_3 solution.

3. Eye Injuries : In case of eye injuries, preliminary treatment can be given the patient before taking him to the doctor.

4. Cuts : It is easier to know whether a vein or an artery has been cut from the flow of the blood.

5. Poisons : In case of poisoning, medical advice should at once be sought.

3. What is improvisation ? Write its characteristics, advantages and some of the improvised apparatus in physics and chemistry.

Ans : As ours is a developing country, we have limited

financial resources. Due to the financial constraints we require the production of improvised and inexpensive learning aids for imparting effective and efficient science education.

Improvisation in itself is a skill which must be learnt by every student. During improvisation, a lot of learning by thought and action processes takes place. Making improvised models and apparatus with readily available materials helps in satisfying the creative use of the students. Children are basically active by nature and they wish to use their hands for creating things and improvisation provides for achieving this end.

Simply it can be defined as "Those learning aids which are prepared from simple and readily available cheap material by students and teacher".

Characteristics of improvised Apparatus

The following are some of the characteristics of low cost improvised apparatus.

i) The raw materials are easily available either free or at low cost in the local environment. ii) The materials do not involve specialized skills and can be made by pupils, teachers or members of the community. iii) The materials can be easily and effectively used by the teachers and pupils in clarifying the set objectives. iv) The process involved in the production of the materials is simple and inexpensive. v) The material is simple, accurate and appropriate to the age level of the users. vi) The material is simple, accurate and appropriate to the age level of the users. vii) The material stimulates thinking, reading discussing, experimenting or further study. viii) The material is free from distractions, conflicts or bias. ix) The production of the material is not time-consuming.

Advantages

a) These are quite cheap and economical. It develops economic value among students. b) They have great educational value. While devising such apparatus students gain more familiarity with the underlying principles of the apparatus. c) Develops the creative and constructive instincts of the child. d) Inspires the young students and teachers to explore and invent new things. e) Develops the lower of initiative and resourcefulness

in the students. f) Develops the power of scientific thinking and scientific method of problem solving. g) Inculcates the habit of diligence in the students. h) Promotes dignity of labour. i) Utilization of leisure time. j) Develops 'learning by doing' and 'learning by living' among the students. k) Develops self-criticism, self-appraisal and self-improvement.

Some of the improvised apparatus

1. Voltmeter : Take a plastic glass and pierce two holes at its bottom. Insert two copper wires one in each hole. Fill the glass with acidulated water and invert two test tubes of water one on each wire. On connecting the wires to the two terminals of a battery, water will begin to decompose into Hydrogen and Oxygen which get collected in the two test tubes.

2. Periscope : Fix the mirrors in the box at an angle of 45° . Cut the holes on the side of the box so that you can look into the mirrors. To demonstrate the use of periscope, shine a beam of light into one mirror in a darkened room and observe how the light beam has been bent.

3. Expansion of Solids : Take a metal rod (Iron rod/ Aluminum rod) fix it at one end and the other end of the rod is placed on a graphic plate (measuring scale plate). A burner is placed at the centre to heat the rod continuously. After some time the rod expands and we observe the variance in the measuring scale plate. With this, we conclude that solids are expanding on heating.

4. Voltmeter : Take a small glass beaker and Pour some Dil. H_2SO_4 and place two plates (Cu and Zn). Connect a bulb with the end of the plates with a wire. The bulb glows with this we will be able to teach the students how chemical reaction changes into Electrical Energy.

5. Diffusion of gases : Take a broken glass test tube (it means two sides are opened). The two ends are closed with the cotton balls dipped in NH_3 and Dil. HCl respectively. After few seconds a brownish ring forms at the centre of the tube. The acids of two ends are diffuse and form the ring.

In this way, we can prepare as many as improved

apparatus for the concerned topic and teach the lesson effectively.

4. Write about ICT in teaching and laboratory activities ?

Ans: ICT is the information and communication Technologies. Worldwide research has shown that ICT can lead to improved student learning and better teaching methods. ICT has a positive impact on student achievement, especially in terms of knowledge, comprehension, practical skill and presentation skill in subject areas such as Mathematics, Science and Social study.

The ICT tools in Education can be divided into three categories. They are

1) Input sources : Visualiser / Document cameras ✦ Student Response System ✦ PC ✦ Application software ✦ slate / Tablet

Output sources : Projector, Interactive White Board, Display : Monitor, T.V. etc.

Others : Digital Camera, Switcher, Digital recorder and other technology.

Generally, the following ICT and multimedia resources can be used in teaching Physical Sciences:

✦ Virtual Learning Environment ✦ Interactive White Boards
✦ You tube videos ✦ Internet ✦ Websites / Blogspots / Chatroony
✦ Video Conferences ✦ Voice Projection Systems ✦ Cameras - Digital / still / Mobile phone ✦ Projector ✦ Multimedia players etc

5. Write about computer based simulated laboratory activities in physical sciences

Ans : Simulations are "representations of situations or processes by means of something analogous."

What is needed to use simulations ? (Requirements of Simulations)

Interpretations simulations into the traditional Classroom practice does not require sophisticated equipment. The basic equipment consists of a computer, a LCD projector, and availability of an internet connection, though this is not necessary if the simulations are in a CD-ROM. Students can also access simulations individually in a computer lab or in a laptop

environment. The most common requirements for using simulations are free plug-ins like flash, shockwave and quicktime. Browser must support 'Java'.

Some ideas about using simulations

- ✦ **Letters** : To help students visualize abstract concepts
- ✦ **Interactive Demonstrations** : Simulations can be used to ask students to make predictions and then discuss the observations made.
- ✦ **Prelab exercises** : Simulations can serve to introduce the ideas and equipment of the lab experiment allowing the students to work through the laboratory faster and with less confusion.
- ✦ **Cooperative Group problem solving** : Simulations can be given to a student group to solve challenging problems that require multiple steps.
- ✦ **Virtual labs** : Virtual labs can provide the student with an accurate idea of a particular experiment by manipulating variables, collecting data, calculatory, graphing & drawing conclusions.

Advantages of simulations

- ✦ It can help students translate among multiple representations.
- ✦ It can help students build mental models of physical, chemical or biological systems.
- ✦ It can give students engaging, hands on active learning experiences.

6. Write in detail about Self Learning Material.

Ans : The Materials which are designed in such a way to have the teacher built into facilitate the learning process are called as self learning material.

The learning materials in various forms - Print, Audio, Video, Multimedia, Web etc in order to help distance learning study these and learn in their own time and at their own pace.

Characteristics of self-learning materials :

- 1. Self-Explanatory** : The Self - Learning Materials are written in a way that does not require an intermediary to explain the content.

2. Self-contained : The self - learning materials are prepared in such a way that the learners normally do not require additional material to learn the concepts / subject matter.

3. Self-Directed : As learners study in Isolation. It is important that the Self-learning materials are designed in a way that provides necessary directions to the learners to study and progress.

4. Self - Motivating : One of the Major roles of a teacher in the face-to-face education system is to motivate and encourage the learners towards study and research.

5. Self- Evaluating : It is important for the learners to know how they are progressing in their studies, particularly because they are quasi- permanently separated from the teachers and others in their peer group.

Types of self -learning materials : According to Lock wood there are three types of self-learning materials 1) Tutorial - In print 2) Reflective Action guide 3) Dialogic

Components of Self Learning Materials : At IGNOU, the format of self learning materials used covers the following.

A) Beginning of the unit : + Title + Contents
+ Information + Objectives

B) Main body : + Sections and sub-sections
+ Illustrations + Objectives

C) End matters : + Summary + Glossary + References
and further readings

Advantages of Self-Learning : The students learn more effectively when they learn on their own Self learning develops critical thinking in handling of study material on one's own and enhances communicative skills and self - reliance.

UNIT - 3

LIFE LONG PHYSICAL SCIENCES LEARNING

1. Explain the following : a) Science clubs b) Science Exhibition c) Science museums d) Olympiads

Ans: a) Science clubs: Through the science club, the learning of science becomes joyful. The students learn the things without the conscious effort on their part and pursue science as a pleasant hobby. It provides an opportunity to the students for self expression and creativity and acquaints the facts, and principles of science

Aims and objectives of a science club:

✦ To develop heuristic ability ✦ To develop scientific attitude ✦ To arouse interest towards science ✦ To encourage critical thinking and keen observation

Organization of a science club: Every Science club should have a constitution and every member should strictly abide by it. A Science club should be as:

Position	person	Name of the work
Patron	Head of the Institution	Extends all types of facilities and co-operation
Sponsor	The teacher In-Charge	Adviser, guide and helps in conducting of club activities
Chairman	One amongst the students	Presides over the functions of the club
Secretary	One amongst the students	Maintains the record of club activities
Asst. Secretary	One amongst the students	Invites guests
Treasurer	One amongst the students	Maintain the accounts of the club

Librarian	One amongst the students	Collect the information
Store- Keeper	One amongst the students	Maintain the club equipment
Publicity officer	One amongst the students	Publishing the activities of club through different means
Class representatives	One From each class	Executive committee members of the club

The above executive body should work for a period of one year

Activities of the club:

✦ Celebrating science days ✦ Science exhibitions and fairs
 ✦ Seminars, debates etc ✦ Drawing charts, preparation of Models etc
 ✦ Excursions and visits to places of scientific Interest.

b) Science Exhibition/ Fairs : The Science fairs have social, Intellectual, psychological and educational values. The Science Exhibition Provides an excellent Opportunity for discovering and encouraging science talent. NCERT Sent the Norms and guidelines about the Exhibition to the schools across, the country through SCERTS, DEOS and MEO/ HMS.

Goals of the Exhibition: ✦ Show case examples of cutting - edge science and its impact on society ✦ Provide visitors with an interactive and hands on Learning experience

Organization of a science exhibition:

It Should be a teacher pupil activity and everything Should be thought of well in advance

1. Planning: During planning- objectives of the Fair, Procedure of financing, place etc should be considered

2. Distribution of work: Work should be assigned to different committees based on the Interests and talents of the students.

3. Execution: The Fair is Inaugurated by a great scientists or an Important person.

4. Judging: The Judging should be as objective as possible by the different terms of experts

Advantages:

- ❖ It can influence One's Ideas and values
- ❖ Science Exhibition Integrate school subjects.

c) Science Museums: A science Museum is devoted primarily to science. Modern trends in Museology have broadened the range of subject matter and introduced many Interactive exhibits.

Objectives of science Museum:

- ❖ To Supplement science education given in schools and to organize various out - of - school educational activities to foster a spirit of scientific enquiry and creativity among the students.
- ❖ To collect, restore and preserve Important historical objects which represent land marks in the development of Science, technology and industry.

Setting UP a science Museum in the school: The basics should always Include at least the following

1. A class set of hand lenses
2. A class set of thermometers
3. A collection of Nature materials these can Include samples of a) Fossils b) Seashells c) Rock Specimens etc
4. Sense jars 5. Touch bags
6. Balance scales
7. Basic cooking supplies.

d) Science Olympiads: Science Olympiad is an middle school and high school team competition In which students compete in events pertaining to various scientific disciplines, Including Physics, Chemistry

History: The First Recorded Science Olympiad was held on 23-11-1974 at North Carolina.

Divisions: There are 4 divisions In the higher archy of Science Olympiad

- ❖ Division A1 for elementary school (grades K-3)
- ❖ Division A2 for elementary school (grades 3-6)

❖ Division B for Middle school (grades 6-9)

❖ Division C for High school (grades 9-12)

Science Olympiads:

1. IGNOU- UNESCO Science Olympiad

2. International Junior Science Olympiad (IJSO)

3. National Science Olympiad (NSO)

4. Junior Olympiad (JSO)

2. What are the efforts undertaken by Government and Non governmental organisations in propagation of Science ?

Ans: Role of Government organisations in the propagation of Science:

1. Department of Science and Technology (DST)

The Department of Science & Technology plays a pivotal role in promotion of Science and technology in the country.

2. Council of Scientific and Industrial Research (CSIR) CSIR established in 1942 is an autonomous body and the largest research and development organisation in India. It runs 37 laboratories and 39 field stations or extension centres spread across the nation, with a collective staff of over 17000.

3. Bhabha Atomic Research centre (BARC)

Motto : Atoms in the service of the Nation

Formation: January 30, 1954.

Purpose : Nuclear Research

Location : India

The Bhabha Atomic Research centre (BARC) is India's premier nuclear research facility based in Maharashtra. BARC is a Multi disciplinary research centre with extensive Infrastructure for advanced research and development covering the entire spectrum of Nuclear Science, engineering and related areas.

4. Indian Space Research organisation - ISRO

Established : 15 August - 1969

Headquarters : Bangalore

The Indian Space research organisation is the space agency of the Indian government its vision is to "Harness space technology

for National development" While pursuing Space Science research and planetary exploration

Role of NGO in the propagation of Science: There are many voluntary science organisations at various parts of the country some are discussed here

1. Kerala Shashtra Sahitya parishat (KSSP)

✦ Established in 1963 ✦ Conducting science campaigns, science, centres ✦ Spread over, through out kerala state with 600 units ✦ Participated in a total literacy compaign, Excise prohibition campaigns.

2. Janavignana vedika (JVV)

✦ Established 28- 2- 1988 ✦ It has organising committees from village to state level ✦ Conducting national days In school premises promoting National Integration ✦ Publish several scientific pomplets, Science magazines etc.

3. Jawahar Bal Bhavan:

It is a unique Institution for creativity among children of the age 5 to 16 years. It was inaugurated by Smt. Indira Gandhi.

Functions and Services: ✦ Preparation of childrens Encyclopedia ✦ Conducting Inter School competitions and work shops

4. Vikram Sarabhai community science centre.

Objectives: ✦ To promote Scientific thinking in science teachers and students ✦ To inculcate the skills of observation and prediction.

3. How do you utilize knowledge resources in teachings physical sciences

Ans: a. on line Knowledge Resources:

Data Bases: ✦ India stot.com ✦ JSTOR

E-Journals: ✦ Economist ✦ American Journal of Evaluation

Publications: ✦ Library documentation ✦ News paper clippings Index ✦ Library services

b. OFF Line Knowledge Resources: ✦ Records ✦ Reports ✦ Books ✦ Comes

Under thin category. That means the resources available other than online are known as offline resources

4. Explain the following

a)DST b) NCSTC Network C) National Children Science Congress d) National teachers Science Congress e) Initiative for Research and Innovation in Science.

Ans : DST (Department of Science and Technology)

Department of Science and Technology was established in may 1971, with the objective of Promoting new areas of science and technology and to play the role of a nodal department for coordinating and promoting Science and technology activities in the country. The department has major responsibilities for specific projects and programmes as some of the listed below.

- ❖ Formulating of policies relating to science and technology.
- ❖ Matters relating to the scientific advisory committee of the cabinet (SACC)
- ❖ Futurology
- ❖ Support and Grant - in- aid to scientific research Institutions, scientific associations and bodies

Critical Role of DST: The department is responsible for conceptualization and implementation of Science and technology programmes.

b) NCSTC Network: (National council for science & Technology communication)

The National council for Science and technology communication (NCSTC) is mandated to communicate science and technology to masses, stimulate Scientific and technological temper and coordinate and orchestrate such efforts through out the country. The programmes of NCSTC aims at Building Capacity For Informed decision making in the community and promote scientific thinking.

The NCSTC Focuses on out reach activities training in science and technology communication, development, production of S & T Software, Incentive programmes and environment

awareness and programmes with a special component exclusively for women.

c) National children's Science congress: This is an opportunity for brilliant young scientists (10-17 years) Started since 1993 to popularize the method science with following steps. Work in terms under a guide on an indetified theme.

✦ Select a problem From the Neighborhood. ✦ Develop a hypothesis and conduct field research ✦ See patterns in data and prepare a report ✦ Present findings before peer group in one's own Language.

Innovative projects are selected For district congress, state congress and national convention.

The NCSC has been organized in almost all districs every year

d) National Teachers Science congress: Initiated by RVPSP- DST National Teachers Science congress provides a forum to teachers of the country to enhance their level of Scientific awareness: The first national event was held in 2003. It has become a biennial activity of NCSTC Network since 2005

NTSC is round table for teaching community of the country to communicate their innovative concepts, share their creativity in the methodologies of science education. Besides imparting innovativeness in sharing educative processes, participating teachers are induced to prove their localized knowledge in respective field of science and technology.

e) Initiative for Research and innovation in science [IRIS] The Initiative for Research and innovation in science (IRIS) is a research - based program that aims to infuse the spirit of discovery , increase interest in STEM and build a robust scientific temper among the young innovators of the country.

5. Write a note on

a) Development of scientific temper

b) Encouraging and inspiring students to choose science as career and to become scientists

Ans: Scientific temper has been defined by several educationists, philosophers and scientists our Indian constitution

upholds the cultivation of scientific temper as one of the fundamental duties of citizens. Scientific temper is an attitude or a way of being that involves application of the mind application of logical analysis willingness to meet with new facts and evidence with out pre conceived notions and willingness to question conclusions based on newer evidence. What does this entail or lead to? Necessarily an open mind, the ability to consider facts as they exist discuss debate develop rationale argue analyse before concluding and the willingness to live with the coexistence of several truths

Methods to develop scientific attitude : Scientific attitude can be developed in the following way

1. Discussion : Large / small group discussions on topics of scientific interest, common superstition and other such topics can be undertaken

2. Direct Teaching : There are a number of puzzles quizzes which could be used directly as a means of developing aspects of scientific attitude.

3. Organisation of co-curricular activities: Science Fairs, clubs and projects are useful means to develop scientific attitude

b) Encouraging and inspiring students to choose science as career and to become scientists Here are a few strategies that will help you learn how to motivate students

❖ Improve the image of science

❖ Act as a positive role model

List of scientific occupations : The list of science and science related occupations which include various scientific research disciplines and explorers.

Applied science : ❖ Educational technologist ❖ Engineer ❖ Engineering technician

Formal science : ❖ Computational scientist ❖ Mathematician

Statistics : ❖ Demographic marketer ❖ Statistician

Natural science : ❖ Astronaut ❖ Astronomer ❖ Naturalist

Physical science : ❖ Physicist ❖ Chemist

UNIT - 4

PROFESSIONAL DEVELOPMENT OF PHYSICAL SCIENCES TEACHERS

1. **Explain the professional development of physical sciences Teachers.**

Ans : To Teach the physical science subject is completely depends up on the skill of the physical science teacher and also teacher should gain the knowledge on the subject other than the text book like technicals, skills and new teaching methods.

1. Courses : Teacher should learn the higher courses to improve the teaching skills.

2. Workshops : Teachers should attend the work shops that are arranged by the different section of Institutions.

3. Individual and / or collaborative Research : Teacher should research on subject either by individual or Group and share this knowledge to group members.

4. Observation visits to the schools : Teacher should improve their teaching skills by visiting others schools and check whether the teaching skills are up to the mark or not.

5. Informal dialogue to improve teaching.

6. Participation in co curricular activities.

7. Use / Application of information and communication Technology.

8. Visits to the place importance of physical sciences.

9. Participate in refresh courses to get acquainted with the latest development in the field.

10. Write articles etc for the professional journals like school science.

2. **Write about participation in seminars, conferences, workshops and In -service training Programmes.**

Ans : Need for In-Service Training : In Service training provides teachers with opportunities to Learn specific skills

techniques and New Instructional approaches that they can use in their own teaching.

There is need to provide In- Service training to science teachers because it.

✦ Suggests remedies for inadequacies of existing teacher training programs. ✦ Helps in updating knowledge of teaching techniques that particularly apply to science teaching. ✦ Provides opportunities for updating the knowledge of developments in science and technology and application.

According to Lawrence "Inservice education in the education a teacher receives after he has entered to teaching profession and after he has had his education in a teachers college. It includes all the programmes educational, social and others.

Seminar : In a seminar some problems of education are taken up and there is collective thinking. Discussions are held and conclusions are arrived at all under the guidance of some experts.

Conference : In a conference, there is a broad discussion of subjects of practical interest. Generally there is a central theme around which several sub topics are given. Teachers as per their interest, present paper at the time of conference. The session ends with the concluding remarks of the President.

Workshops : Work shops are organized for giving in - service education to teachers. They involve more of practical work and less theoretical discussion. These types of programmes are more useful for the teachers. The teachers have to work practically and come out with final material to be seen by others. Organization of work shops consumes more time than a seminar or conference.

3. Write about the membership in professional organisations and the characteristics of Teachers as a community of Learners.

Ans : A professional association (also called professional

organization) is usually a Non project organization seeking to further a particular profession, the Interests of Individuals engaged in that profession and public interest.

Reasons to join a professional organization :

❖ Build a better resume. ❖ Broden teachers knowledge ❖ Enhance teachers Network ❖ Become a mentor ❖ Give back to the community.

Physical Sciences Societies : 1) Indian Physics Association (IPA)

2) Indian Association For Physics Teachers (IAPT)

3) American Association of Physics Teachers (AAPT)

4) American Physical Society(APS)

5) Institute of Physics (IOP) U.K.

6) Association of Chemistry Teachrs (ACT)

Functions of Professional Organisations : ❖ Set and assess professional examinations. ❖ Publish professional journals or Magzines ❖ Provide support for continuing professional development through learning opportunities and tools for recording and planning ❖ Issue a code of conduct to guide professional behaviour. ❖ Provide networks for professionals to meet and discuss their field of expertise.

Characteristics of Teachers as a community of Learners

1. Responsibility : Teachers set guide lines and expect students to responsible. They also model responsible behaviour.

2. Opportunities : Teachers provide opportunities for students to read and write in Genuine and meaningful activities.

3. Engagement : Teachers nurture students engagement through authentic activities and opportunities to work with classmates.

4. Choice : Teachers offer choices because they

understand that students are more motivated when they can make choices.

5. Assessment : Teachers monitor students learning and set guidelines about how students will be graded.

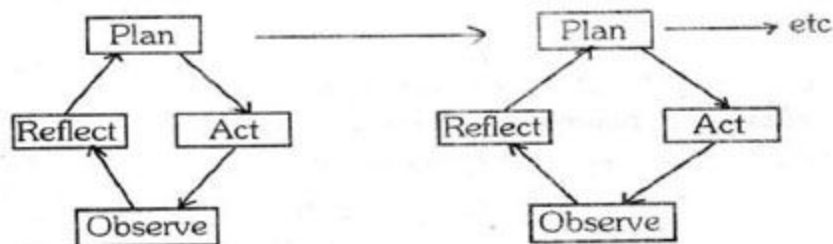
4. Explain the role of reflective practices in professional development on physical science Teachers ?

Ans : Reflective practices is the capacity to reflect on action so as to engage in a process of continuous Learning.

Reflective practice involves paying critical attention to the practical values and theories which inform everyday actions, by examining practice reflectively and reflexively.

Reflective practice involves reviewing and analysing the experiences for the purpose of learning from that experience.

The action learning cycle provides a structured approach to reflective practice.



Origin/ History of Reflective Practice

Models of Reflective Practice :

1. Kolb's Reflective Model
2. Argyris and Schon Loop learning Reflective practice Model
3. Gibbs; Structured Debriefing Reflective practice
4. John's structured Model of Reflective practice
5. Brook Field Complimentarylens Reflective practice
6. Rolf's Reflective practice Model
7. Ganshirt's Design cycle Reflective practice Model

Dimensions of Reflective Practice :

1. Study your teaching for personal Improvement (Reflect regularly)
2. Evaluate your teaching using Research (Action Research)
3. Link theory with practice (Use the Literature)
4. Question your personal theories and beliefs (Critical analysis)
5. Consider alternative perspectives and possibilities (Learning conversations)
6. Try out New strategies and Ideas (Innovation)
7. Maximise the Learning potential of students (Inclusive practices)
8. Enhance the quality of your teaching (Effective practice)
9. Continue to improve your teaching (Professional Learning)

Benefits : The teachers identify a variety of different aspects of their lessons for their partners observe and collect Information on. These include organization of the lesson, teacher's time management, students performance on task, teacher questions and student responses, student performance during pair work and students use of the first language or English during group work

Role of reflective practices in professional development of Physical Science teachers : Reflective teaching means looking at what you do in the class room thinking about why you do, it and thinking about If, it works - a process of self observation and self - evaluation.

Reflective teaching is therefore a means of professional development which begins in our classroom.

Process of Reflective teaching

- 1) Beginning :** ♦ Teacher Diary ♦ Peer observation
♦ Recording ♦ Students Feed back

2) What to do Next + Think + Talk + Read + Ask

3) Conclusion

1. Beginning : The teacher may begin a process of reflection in response to a particular problem that has arisen with one or classes or simply as a way of finding out more about teaching.

The first step is to gather information about what is happening in the class. How are some different ways of doing this :

Teacher diary : Easiest way to begin a process of information about the lesson.

Recording lessons : Video or Audio recordings of lessons can provide very useful information for reflection.

Student feed back : Teacher can also ask their students what they think about what goes on in the classroom.

2. What to do Next ! Once the teacher has some information recorded,

The teacher should

Think : Think about noticed patterns occurring in teaching, noticed things that were previously unaware of.

Talk : Talk about what they have discovered - to a supportive colleague or even a friend.

Read : Read some of books related to teachers where teacher can find articles on a wide range of topics. There are plenty of websites for teachers now where they can find useful teaching ideas, or more academic articles.

Ask: Pose questions to website or magazines to get ideas from other teachers or local teacher's Associations or other opportunities for in service training.

Conclusion : Reflective teaching is a cyclical process, because once the teacher starts to implement changes, then the reflective and evaluative cycle begins again.

5. **Explain the concepts of 'Teacher as a researcher'**

Ans : Teacher as a Researcher : The concept of teacher

as researcher is included in recent literature on educational reform, which encourages teachers to be collaborators in revising curriculum, improving their work environment, professionalizing teaching, and developing policy.

6. Describe the Action Research in Physical Science?

Ans : Action Research : Action Research is deliberate, solution oriented investigation that is group or personally owned and conducted.

Scope of action research: The scope of action research is pretty wide. It may range from a single unit to an organised group or system. On the one extreme we may have a single teacher who tries out a novel way of teaching in his class while on the other extreme action research may extend to a sophisticated study of the organisational change in industry.

The scope of action research in classrooms and schools is quite flexible. It covers a large number of areas such as teaching methods, learning strategies evaluation procedures in service development of teachers administration and so on.

The following steps of procedure are involved in action research.

Step 1 Locating the problem Area: The first stage in action research is the location of problem area in school education. It may refer to pupil behaviour or teaching practice or curriculum organisation, examination or administration. The problem area may refer to frequent absence of certain students, or late school arrival or truancy or creating mischief and so on. Poor Performance in house tests in particular subjects, lack of interest in studies, failure to do home work also fall in the category of problem areas of academic work.

Step 2 Identify the problem : It is important to identify the problem about which it is desirable to take action. The individual or the group selection the problem should act objectively while making selection. One should know how far the working of the system would be influenced after a solution has been found. While pin pointing the problem the teacher should be fully aware

of its nature and scope. For example the problem may be identified as "Class students are not showing good progress in English".

Step 3 Analyze the problem to define and delimit it: After a problem has been pinpointed and selected it is necessary to analyse it in its various aspects. This analysis will lead to the exact definition of the problem to be stated in limited words, in terms of limited areas of distribution. For example, the problem stated above may be delimited as "Class VIII students commit many spelling formula in Physics."

Step 4 Diagnose the factors causing the problem: After the problem has been defined the action researcher makes an attempt to search for the causes of the difficulty or the reason for the existence of the problem. The relation between the stated reasons and the difficulty or problem should be well established before the action hypothesis is arrived at. Moreover the causes should be verifiable, specific and authentic.

The probable causes for the above problem may be listed as

- i. Students are careless in written work.
- ii. Students are not careful observants.
- iii. Teacher of Physics does not check student's written work.
- iv. Teacher of Physics does not do follow up work.

Step 5. Formulate the action hypothesis: Action hypothesis refers to a certain tentative assumption or assumptions that point to the possible solution of the problem or difficulty. Formulating a hypothesis is important in the sense that it brings clarity and definiteness to the work of action research. It also gives an idea of the procedure to be adopted for reaching the goal.

In case of the above problem, the hypothesis may be stated as, "If the pupils are given written work regularly and the teacher does systematic correction work followed by student's practice, spelling errors will be removed."

Step 6 Research design to test the hypothesis : After the teacher researcher has finalised the action hypothesis

he wants to test, he must plan the design the plan to test the hypothesis. The research design for an action hypothesis involves the following aspects:

- i. Description of activities and procedures for getting evidence or for collecting data.
- ii. An outline of sources tools or means to execute the design.
- iii. Time required finalise the action and complete procedures.

Step 7. Testing the action hypothesis: The next step is to test the action hypothesis. In case of the problem stated is done, the teacher may

- i. Examine pupils exercise books:
- ii. Give written tests

7. How does a teacher learn to understand how children learn science

Ans. 1) Active involvement: Teachers must help students to become active and goal oriented by building on their natural desire to explore to understand new things and to master them.

2) Social participation : Learning is primarily a social activity and participation in the social life of the school is central for learning to occur.

3) Meaningful activities : People learn best when they participate in activities that are perceived to be useful in real life and are culturally relevant.

4) Relating new information to prior knowledge : New knowledge is constructed on the basis of what is already understood and believed.

5) Being Strategic : People learn by employing effective and flexible strategies that help them to understand reason memorize and solve problems

6) Helping students learn to transfer : Learning becomes more meaningful when the lessons are applied to real-life situations

UNIT - 5

EVALUATION IN PHYSICAL SCIENCE

1. Explain the Evaluation of learning out comes in physical sciences

Ans: Concept of Test, Examination/Measurement and Evaluation :

1. Test : A test is a set of standardized or controlled occasions for responses presented to an individual with design to elicit a representative sample of his behaviour when meeting a given kind of environmental demand.

A psychological test is a standardized instrument designed to measure objectively one or more aspects of a total personality by means of samples of verbal or nonverbal responses or by means of other behaviour.

Examination : Generally the instruction is followed by various kinds of evaluation throughout the academic schedule. Teachers who provide the instruction or involve directly in the process of instruction also devise different types of tests from time to time and evaluate the students performance. Basically they can be broadly divided into two categories of examinations i.e.. internal and external.

Measurement Measurement is an important feature of our daily life "From birth to death " says Ross

According to R.N. Patil, Measurement is an act or a process that involves the assignment of a numerical index to whatever is being assessed.

According to Anthony J. Measurement is a procedure for assigning numbers to specified attributes or characteristics of a person in a manner that maintains the real world relationship among persons with regard to what is being measured.

Prof. Richard & Lindemad defines measurement is the assignment of one of a set of number to each of a set of persons or objects according to certain established rules.

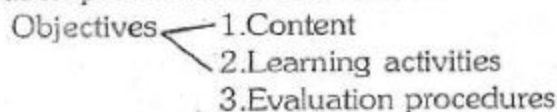
Evaluation

Evaluation is a new term in the field of education which is introduced to replace the terms like testing or examinations etc. It has a wider meaning as it includes assessing all educational outcomes and outputs of the teaching learning process

In the words of the kothari commission

" Evaluation is a continuous process, it forms an integral part of the total system of education and is related intimately to educational objectives

Objectives learning experiences and evaluation : The interrelationship among objectives, content, learning activities and evaluation procedures is shown below



The above figure clearly indicates the evaluation involves continual appraisal of objectives and of the testing procedures used by the teacher.

Purpose of Evaluation : These are 1. To monitor pupil progress 2.To improve the quality of learning environment 3.To improve courses and curricula, texts and teaching - learning materials 4.To diagnose students weakness and determine the need for remedial work

Types of evaluation : 1) **Diagnostic Evaluation :** It determines the causes of learning problems and formulates a plan for remedial action.

2) **Formative Evaluation :** Formative Evaluation is the assessment made by the teacher during teaching learning process in order to know about learner's progress in learning and make essential changes to improve teaching learning process. Formative evaluation is a continuous process that simultaneously happens with teaching. Asking questions during classroom teaching, classroom assignments, home assignments informal interviews with students etc. are examples of formative evaluation.

Need and Importance : Formative evaluation is must to provide immediate feedback to teacher so that he/she modify and improve instruction.

❖ It is also necessary to provide feedback to students enable them to identify their learning errors and rectify them immediately.

❖ Since it is child centered, it gives more importance to student's achievement or their learning.

❖ It is a flexible way of evaluation.

❖ It helps in designing remedial teaching by providing data of student's performance regularly.

3. Summative Evaluation : Summative evaluation is the assessment made at the end of the term, semester, course or instructional program to assign a grade for learners. The term summative means the summing up of all the available information regarding a program at its terminal point. Unit test, quarterly examination, half yearly examination, semester examination and annual examination are examples of summative evaluation. Summative test is given to a learner after he/she has passed all the formative tests.

Need and Importance The summative evaluation is conducted to give overall picture of student's performance.

Process of Evaluation :

Steps involved in the evaluation process :

1. First and foremost is to formulating and selecting worth while objectives of teaching in a subject.
2. The objectives and the behavioural changes are brought through proper content and subject matter.
3. Learning experiences can be brought through reading good number of text books listening and acquiring the subject matter.
4. In accordance learning experience, use devise proper evaluation procedures
5. The expected output can be obtained and suggest in turns by results or behavioural changes.

Evaluation tools and techniques

A tool of evaluation is used in education as a technique that will facilitate the process of measuring and recording the characteristics of pupils. The following are the some main tools of evaluation in equation

1. Tests:

a. Achievement tests: Essay type, short answer type, objective type

b. Personality tests: Paper and pencil tests

2. Questionnaires: The information collected with a questionnaire helps in evaluation of personality traits, interests etc.

3. Observation : They are two types

a. Direct observation b. Indirect observation

4. Check lists : It is a simple tool or evaluation which tests various aspects of an individual's behavioural adjustment

5. Rating scales: There are 5 types of rating scales

a. Numerical b. Graphic c. Scorecards d. method of paired comparison e. man of manscale

6. Anecdotal record : It is a record of written description of a specific incidents / which a teacher has observed the students behaviour from time to time.

7. Interview : There are two types

a. Structured interview b. Unstructured interview

2. Explain the qualities of a good test? Explain the classification tests

Qualities of Good test

The following figure represents the criteria of a good test.

Good Test

Technical Criteria	Practical criteria
✦ Reliability	✦ Ease of application/ administration
✦ Validity	✦ Cost(Economy)
✦ Objectivity	✦ Time Frame
✦ Discrimination	✦ Acceptability
✦ Standardization	✦ Scoring and Interpretation

Reliability : A test is reliable to the extent that it measures consistently from one time to another. It must function similarly with similar groups. It should rate the same candidates with the same or different examiners at the same or different times. The difference in score should be negligible.

Validity : A test is said to be valid when it measures what it claims to measure. For example, a test of science should not measure linguistic ability. It must measure the acquisition of scientific knowledge for it to be valid.

Objectivity : A test should yield a clear score value for each performance the score being independent of the personal judgement of the scorer i.e. an objective test should yield the same or nearly the same score, irrespective of the person scoring it.

Economical : A test should be economical both in terms of cost and time.

Clarity : The language used in the questions should be simple, clear, precise, specific, easy to comprehend and unambiguous.

Practicable : It should be easy to administer. It should be suitable for both bright and dull students. It should neither be too long nor too short. It should be useful and acceptable to both teachers and students.

Score able : The test should be such that during scoring subjectivity can be kept at a minimum and the scorer doesn't get bored due to monotony or laborious nature of paper.

Simplicity of Administration, Scoring and Interpretation : It should be easy to administer, score and interpret. Clear-cut instructions for administration must be provided. A scoring key/guide must accompany the test.

Interesting : An interesting test would automatically secure the cooperation of the students. The test should encourage reflective thinking and not rely on mere recall/ reproduction of knowledge.

Graded : A test should be graded according to the age, intelligence, maturity level of students.

TYPES OF TEST

Written tests : Written tests can be further classified into essay-type, short answer type and objective type.

Essay-Type tests : Students write essay on the concerned topics, expressing the over all meaning.

Advantages : ✦ Easy to construct ✦ Free to express his in heart ability skill, Ideas ✦ It does not give scope for copying.

Limitations : Low validity and realiability ✦ Time taken in scoring ✦ Lack of comprehensiveness.

Short -answered type questions : These types of tests are testing high through - providing. They used in testing some what we actually expert from the students.

Objective type tests : It tests the factual information an objective type test is importing to the objectivity rather than the subjectivity.

Advantages : ✦ No bluffing ✦ Economy of time ✦ Speed and accuracy

Limitations : ✦ Often Antiguans ✦ providing guessing priority

Practical Tests : These test are used to primarily test the ability of students to

a) Manipulate simple apparatus b) Make simple deductions from observed facts c) Apply their knowledge of practical methods and procedures to new experiments.

3. **Explain the planning, preparation and conduct of Achievement Test in CCE Model.**

Ans : Concept of Achievement Test Achievement may be defined as a change in the behaviour of students in a desired direction. It is an important and essential constituent in the process of evaluation. 'Achievement' means one's learning attainments, proficiencies, accomplishments etc.

According to N.M. Downie, any test that measures the attainment or accomplishments of an individual after a period of training or learning is called an achievement test. Waters says that Achievement tests are useful aids for diagnosing a students specific learning needs, for identifying his relative strengths and

weaknesses, for studying his progress and for predicting his success in a particular curriculum.

Good defines an achievement tests as a test that is designed to measure a person's knowledge, skills, understanding etc., in a give field taught in a school.

Assessment involves collecting information about students knowledge, skill and abilities. An achievement test is a formal assessment. The test helps the teacher to understand the level of comprehension of the students in a particular subject and helps him to estimate the capabilities of the students.

In the school evaluation programmes, various forms of achievement tests are used to measure the extent of learning of the pupils. So, it is necessary for the teacher to know how to construct an achievement test efficiently.

Important features of achievement test

- ✦ Achievement tests measure the modification of behaviour brought about by learning.
- ✦ It is a standardised test to suit needs of the students.
- ✦ It is based on the difficulty level of students.
- ✦ It contains a number of items in all three domains.
- ✦ It is accompanied by a test manual for administering and scoring the test. .

Functions of Achievement Tests

The major functions are :

- ✦ To provide basis for promotion to the next classes.
- ✦ To motivate students before a new assignment is taken up.
- ✦ To know the placement of a student in a particular section.
- ✦ "A teacher can use achievement to see for himself how effectively he is doing, what is getting across to his pupils and what is not."
- ✦ It helps in ascertaining quantity and quality of learning, attained in the subject of study or group of subjects after a

period of instruction by measuring the present ability of the individual.

- ❖ To know the performance of the students.
- ❖ To know the efficiency of learning experiences provided.
- ❖ To know the extent of teaching - learning process.

Construction of a Scholastic Achievement Test (SAT) In CCE modal

A teacher prepares the test, and gives due weightage to academic standards distribution and difficulty level. These tests help in :

- a) Understanding the success of a teaching method.
- b) Identifying the strengths and weakness of the students.
- c) Developing the remedial measures.
- d) Application of knowledge gained.

Steps in the Construction of an Achievement Test:

The following figures represents the steps based on which an achievement test is constructed :

- 1) Planning the test
 - Weightage to Academic Standards
 - Weightage to Questions
- 2) Preparing the Blue print
- 3) Designing questions and Editing question Papers
- 4) Administering the test

IX CLASS MODEL QUESTION PAPER SUMMATIVE - 3

Academic Standard	%of weightage	Marks Allotted
AS-1	40%	16
AS-2	10%	04
AS-3	15%	06
AS-4	15%	06
AS-5	10%	04
AS-6	100%	04

Question wise weightage table

Types of Question	Allotted Marks	No. of Questions
Essay type questions	16	04
Short answer questions	04	05
Very Short answer questions	06	04
Multiple Choice Questions	06	20
	40	33

2. Preparation of Blue Print**Blue Print**

Academic	Essay Type	SAQ	VSAQ	MCQ	No. of Questions
AS-1(40%)	1P/.P	1(P) (1C)	2c, 1P	10	16
AS-2 (10%)	-	1(P)(1C)	-	-	2
AS-3 (15%)	1C/C	-	-	4	5
AS-4(15%)	1P/C	-	1-p	2	4
AS-5(10%)	1P/C	-	-	-	1
AS-6(10%)	-	1p	-	4	5
Total	4	5	4	20	33

Summative Assessment - III
Physical Sciences

Class : IX**Marks : 40****Time : 2Hrs, 30 min****1. Answer the following Questions. 5 x 1 = 5**

- Classify as scalar and vector quantities given by your teacher is displacement, velocity, speed and time. (AS-1)
- Ravi and Ramu discussing on gravitational force. In their discussion Ravi said gravity on earth 9.8m/Sec^2 and ask his friend Ramu what is the gravity at the centre of earth ? (AS-2)
- Which method is suitable to separate constituents of ink. (AS-3)
- Where do we observe the application of Pascal's Law in daily life. (AS-6)

II. Answer the following Questions. 5 x 2 = 10

5. What is the average speed of an athlete, if he covers 36 m. in 4 seconds. (AS-1)
6. When a bus reaching busstand, a student observed the change in velocity of the bus. Write the questions which are raised in student mind on acceleration. (AS-2)
7. What will you do the given iron nail float on surface of water. (AS-2)
8. Describe the consequences faced. If the symbols are not given to the elements by scientists. (AS-6)
9. The particles of a solid are packed closely, are the particles in liquids also similar? How can you explain. (AS-3)

Answer all the questions in the following. 4 x 4 = 16M

10. State Newton's Laws of and give one example for any law. (AS-1)

(Or)

Write a note on density and relative density and write their units.

11. Write the history of any scientist proposed Atom model from John Dalton to Sommerfeld. (AS-4)

(Or)

Write the information which you gathered from internet or another sources on Atomicity of molecules.

12.
 - a) Define wave length and frequency.
 - b) What is the frequency of sound of wave length 5 m and speed 34 m/s. (AS-1)

(Or)

- a) What is evaporation and which factors influence on evaporation?
- b) Convert 27°C into degree Kelvin.

13. State the law of conservation of energy and draw a diagram showing freely falling. (AS-5)

(Or)

Draw a diagram showing to separate two or more ... liquids when the difference in their boiling points is less than 25°C.

Part-B

Class: IX

Marks : 10

1. The process of changing solid Iodine to gaseous state directly is ()

A) Melting	B) Boiling
C) Sublimation	D) Freezing
2. The process used to separate butter from curd ()

A) Distillation	B) Fractional distillation
C) Evaporation	D) Centrifuge
3. Molecular weight of water (H_2O) ()

A) 18	B) 16	C) 3
D) 2		
4. Sub atomic particles of an Atom

A) Electrons	B) Protons
C) Neutrons	D) All the above
5. Correct answer in the following ()

A	B
1. Sodium	a) K
2. Sulphur	b) S
3. Potassium	c) Na
A) 1-a, 2-b, 3-c	B) 1-c, 2-b, 3-a
C) 1-b, 2-c, 3-a	D) 1-a, 2-c, 3-b
6.

1) $V = u + at$	2) $S = Ut + \frac{1}{2} at^2$
3) $V^2 - u^2 = 2as$	

Which of the above indicate the equations of uniform accelerated motion ()

A) 1, 2	B) 2, 3
C) 1, 3	D) 1, 2, 3
7. The project of mass and velocity is ()

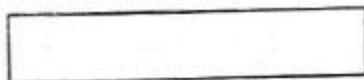
A) Momentum	b) Impulse
C) Acceleration	D) Force
8. S.I. unit of Force ()

A) Newton	B) Dyne
C) Erg	D) Joule
9.

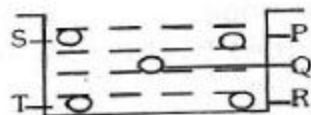
1. Archimedes Principles	()
2. Pascal's Principles	
3. Boyle's Principles	

The above principle related to apparent loss of weight of the immersed stone is equal to the weight of water displaced by the stone

- A) 1 B) 2
C) 3 D) 1, 2, 3
10. Work done to carrying 3 m distance by applying a force of 5 m is ()
A) 5J B) 15J
C) 3J D) 8J
11. Which of the following question is related to acceleration?
A) Is the body to avelin with uniform volacity an acceleration ()
B) Is the body traveling with non-uniform velocity has an acceleration
C) Is the body traveling with uniform speed has an acceleration
D) Is the body in the rest position has an acceleration
12. Two bodies of unequal masses are dropped from the top of building which of the following is equal for both body it any instance ()
A) Speed B) Force of gravity
B) Potential energy D) Kinetic energy.



13. The above experiment related to
a) Newton's law B) Newton's II law
C) Newton's III law D) All above.
14. Two bodies experience pressure in a liquid ()
A) P, Q B) Q, R
C) S, Q D) S, T



Cation	Anion	Formula
Mg ²⁺	Cl ⁻	Y
X	SO ₄ ⁻	Na ₂ SO ₄

- Observe above table and which is suitable in the Position of 'Y' ()
- A) MgCl B) MgCl_2
 C) Mg_2Cl D) 2MgCl
16. Observe above table and which is suitable in the position of 'X' ()
- A) Na^{+3} B) Na^{+2}
 C) Na^{+} D) Na
17. Raju gathered Iron piece, milk in glass and cup and analysed as
- 1) Iron piece has fixed shape and volume
 - 2) Milk has fixed shape volume
- Correct analysis is
- A) 1 - True, 2-False B) 1-false , 2-True
 C) Both 1,2 True D) Both 1,2 False
18. 1) Salt + water forms homogeneous solution
 2) Sugar + Kerosene forms Heterogeneous solution
 3) Sand + water forms Heterogeneous solution
- A) 1,2 B) 2,3
 C) 1,3 D) 1,2,3
19. The Isotope used to treat cancer treatment
- A) Cobalt B) Iodine
 C) Uranium D) Sodium
20. The device working by multiple reflection of sound
- A) Megaphase B) Musical instrument
 C) Stethoscope D) All the above
4. **Write about Evaluation of Responses, scoring and Tabulation.**

Ans. How to do summative assessment : This is similar to an examination that assesses the achievement children in acquiring certain competencies specified for the class. But this should be stress free and should not encourage rote memorization and mechanical writing. Summative assessment should be done

in the form of a written examination after the completion of syllabus or a part of the syllabus.

Some Important points in conducting summative assessment: ✦ The teacher need not prepare a scoring key since most of the questions in the paper are open ended and since there is a scope to get a multiplicity of answers. We should not assume that all children come up with the same answer for a question.

✦ Since every section is a unit of 5 marks, the teacher should read the answer carefully and award marks.

✦ If there are two marks questions and one mark question in a section, total marks out of 5 should be noted.

Example : Ravi in class 8. Given below are his marks in various academic standards in the first summative assessment in physical sciences. Here the teacher gave a question paper for 100 marks in 6 sections. Marks are distributed among the sections according to the weightage given to each academic standard.

Academic standards						Marks	Grade
1	2	3	4	5	6		
40	10	15	10	15	10	100	B ⁺
20	8	10	6	11	7	62	

The answer scripts are marked and the scores are tabulated as shown. From the table we know that Ravi secured 62 marks out of 100. Since his marks fall in the range 51-70 and the corresponding grade is B⁺, he is given the grade.

Percent	Grade
91-100	A ⁺
71-90	A
51-70	B ⁺
41-50	B
Below 40	C

5. Describe analysis and Interpretation of test scores

Ans: Analysis and Interpretation of scores The teacher after marking the answer papers based on scoring key and marking scheme prepared lists and tabulates the scores obtained by individual students. A comprehensive score sheet could be in the following format.

Score Sheet

Form of Question	E	S.A	V.S.A	Objective Type					
				Multiple choice		Fill up the blanks			
Q.No.									
Max Marks									
Objective									
Name of the pupil									Total
Marks obtained									
1.									
2.									
3.									
No of Correct answers									
No. of wrong answers									
No. of Omissions									

The data can be analysed in many different ways:

a) Objective-wise Analysis

S.No	Name of the pupil	Objective				
		Knowledge	Understanding	Application	Skill	Total
1.						
2.						
3.						
Total						

b) Question Type wise Analysis

Reg.No	Name	Essay	Short answer	V.S.A	Objective type	Total
1.						
2.						
3.						
Total						
Average% Of Marks						

c) Individual Pupil Analysis

Reg.No	Name of the Pupil	% of Marks Obtained	Mistakes Committed	Probable Causes for Measures	Remedial Measures Suggested

d) Unit wise Analysis for individual pupils

Topic Student Reg.No. Name	Unit 1	Unit 2	Unit 3
1.			
2.			
3.			

These type of analysis help in assessing the students achievement objective wise, unit wise. It helps the teachers to identify the level of the students in the class and obtain classwise average. The measures of variability central tendencies and divergence can be used to find out the relation between the marks obtained by the students. The results can also be graphically interpreted. The statistical analysis of the data will help the teacher in understanding the achievement of the objectives, the relevance of the learning experience provided, the appropriateness of the teaching method used, and the adequacy of the content provided.

Analysis and interpretation of the results using the statistical measures will help the teacher to bring about required changes in teaching methodology, and develop quality in the teaching - learning process.

Conclusion : Evaluation is an integral part of teaching learning process. In practice evaluation is used to pass judgements and improve students and teacher teaching. Evaluation is an inseparable part of the teaching - learning process and the data so obtained can be used as a diagnostic device so that proper remedial Instruction could be initiated to improve students learning.

Thus educational evaluation is a systematic process, which determines.

- ❖ The extent to which educational objectives are achieved.
- ❖ The effectiveness of the various learning experiences provided in the class room.

