

Physical Science 10th Class Teachers' Handbook





State Council of Educational Research & Training Telangana State, Hyderabad.





Prepared by

Sri R. Ananda Kumar, School Assistant ZPHS Gavaravaram, Visakhapatnam.

Sri S.U. Siva Rama Prasad, School Assistant GHS Sultan Bazar, Hyderabad.

Sri A.V. Sudhakar, School Assistant ZPHS Inukurthy, SPSR Nellore.

Sri M. Eswara Rao, School Assistant GHS Sompeta, Srikakulam.

Sri D. Madhusudhan Reddy, School Assistant ZPHS Munagala, Nalgonda.

Sri M. Ramabrahmam, Lecturer IASE Masabtank, Hyderabad.

Dr. T.V.S. Ramesh, Coordinator SCERT, Hyderabad

Editing & Coordination

Dr. N. Upender Reddy, Prof. & Head, SCERT, Hyderabad

Sri M. Ramabrahmam, Lecturer IASE Masabtank, Hyderabad.

Dr. T.V.S. Ramesh, Coordinator SCERT, Hyderabad

Chief Advisors

Sri G. Gopal Reddy,

Former Director, S.C.E.R.T., Hyderabad

Sri S. Jagannath Reddy

Director, S.C.E.R.T., Telangana State, Hyderabad.

Designing

Sri M. Krishna Rao,

Rasmi Graphics, Hyderabad Sri K. Sudhakara Chary,

Coverpage Designer SGT, UPS Neelikurthy, Maripeda (M), Warangal Sri Kannaiah Dara

Computer Operator, SCERT, Hyderabad

ముందుమాట

పాఠశాల విద్యలో చేపట్టిన సంస్కరణల్లో భాగంగా ఈ విద్యా సంవత్సరంలో పదో తరగతికి నూతనంగా రూపొందించిన పాఠ్యపుస్తకాలు [5] క్రుపుస్తకాలు [5] కల్పిస్తూ, దానికి అనుసందానంచేస్తూ పదో తరగతి పాఠ్యపుణ్ణళిక రూపొందింది. జాతీయ విద్యాప్రణ్ణళికా చట్టం [5] రాష్ట్ర [5] కల్పిస్తూ, దానికి అనుసందానంచేస్తూ పదో తరగతి పాఠ్యప్రణ్ణళిక రూపొందింది. జాతీయ విద్యాప్రణ్ణళికా చట్టం [5] రాష్ట్ర [5] కల్పపుస్తకాలు రూరపదిద్దుకున్నాయి. పాఠ్యాంశలలోని భావనలను అర్థంచేసుకోదానికి వీలుగా అనేక కృత్యాలు, [5] క్రుపుస్తకాలు రూరపదిద్దుకున్నాయి. పాఠ్యాంశలలోని భావనలను అర్థంచేసుకోదానికి వీలుగా అనేక కృత్యాలు, [5] క్రుపుస్తకాలు రూరపదిద్దుకున్నాయి. విభిన్న ఉదాహరణలు జోడించారు. కాబట్టి భౌతికశాస్త్ర ఉపాధ్యాయుడు ఇంతకు ముందులా పాఠం మొత్తం తానే వివరించాలని [5] కుయత్నించకుండా పిల్లలు వివిధ అభ్యసన సన్నివేశాలలో పాల్గొంటూ నేర్చుకోవడానికి అవకాశం కల్పించాలి. చర్చించడం, అన్వేషించడం, [5] కుయోగాలు చేయడం ద్వారా పిల్లలు సొంతంగా నేర్చుకునేలా [5] కున్హహించాం.

పదవ తరగతిని పాఠశాల విద్యలో అత్యంత కీలకమైనదిగా మన మందరం భావిస్తుంటాం. ఉన్నత ఫలితాల సాధనకోసం అవిడ్రాంతంగా కృషిచేస్తుంటాం. అయితే మనం పాటించే విధానాలు పిల్లలు అర్థరహితంగా బట్టీపట్టే విధంగా మార్చేవిగా ఉండకూడదు. పరిక్షలు, మార్కుల ఒత్తిడికి ఆందోళనకు గురిచేసేవిగా ఉండకూడదు. పిల్లలు స్వేచ్ఛగా అభ్యసన (ప్రక్రియల్లో పాల్గొంటూ స్వతంత్ర అభ్యాసకులుగా ఎదగడానికి దోహదపడేవిగా ఉండాలి. కాబట్టి వారు పాఠ్యపుస్తకాలలోనుండి, గైడులు, క్వశ్చన్బ్యాంక్ నుండి గుడ్డిగా చూసి రాయడం, కంఠతాపట్టడం వంటి అలవాట్లను అవకాశం లేకుండా చూడాలి. పాఠంలో ఉన్న ప్రశ్నలపై చర్చించడం, (ప్రయోగాలు, ప్రాజెక్టులు చేయించడం అనుబంధ అంశాలు పై చర్చించడం ద్వారా పిల్లలు వివిధ భావనను సులభంగా అర్థంచేసుకో గలుగుతారు. ఒక భావన నేర్చుకోడానికి కావలిసిన పూర్వజ్ఞానం ఏమేరకు అవసరమో గుర్తించి వాటిపై అవగాహన కలిగించాలి. భౌతికశాస్త్ర అంశాలు నేర్చుకోడానికి కావలసిన గణితపరిజ్ఞానం కలిగించడం ఉపాధ్యాయుని కర్తవ్యం. పాఠ్య ప్రణాళిక మార్పులలో భాగంగా నూతన భావనలు పాఠ్యపుస్తకాలలో పొందుపరచిన వాటిని అర్థం చేసుకోడానికి ఉపాధ్యాయులు సం(పదింపు గ్రంథాలు పరిశీలించాలి. అదనపు సమాచారం సేకరించి మరింత అర్థవంతంగా విషయాలపట్ల పిల్లలకు అవగాహన కలిగించేందుకు కృషిచేయాలి.

నిరంతర సమగ్ర మూల్యాంకనంలో భాగంగా నిర్వహించే నిర్మాణాత్మక మూల్యాకనంలో పిల్లలతో తప్పని సరిగా ప్రయోగాలు చేయించి ప్రయోగశాల రికార్డును నిర్వహింపజేయడం. నోటుపుస్తకాలు సరిగా, సొంతంగా రాసేలా చూడడం అవసరం. పిల్లల ప్రగతిని నిరంతరం పరిశీలిస్తూ స్వయంగా నేర్చుకొనేందుకు తోడ్పదాలి. శాస్త్రీయ అభిరుచిని పెంపొందించేందుకు వివిధ సైన్సు మ్యాగ్జైన్లలు పుస్తకాలు పాఠశాల గ్రంధాలయంలో ఉండేలా చూడాలి. సైన్సు తరగతి గదికి ప్రయోగశాల, గ్రంధాలయం రెండు కళ్ళులాంటివి. వాటిని సమర్ధంగా నిర్వహించడం లోనే ఉపాధ్యాయుని వృత్తి పరంమైన వికాసం దాగిఉంటుంది.

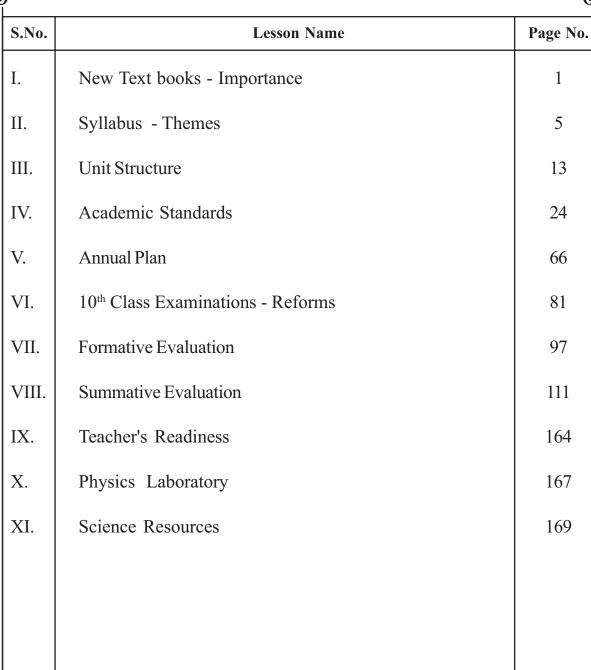
పాఠ్యవిషయాలను పుస్తకం నుండి విద్యార్థికి చేరవేయడంగా కాకుండా పిల్లల్ని ఆలోచింపచేస్తూ, అన్వేషింపచేస్తూ ప్రశ్నలద్వారా చర్చలలో పాల్గొనచేస్తూ తరగతి గది బోధనలో నూతనత్వాన్ని నింపాలి. సైన్సు నేర్చుకోవడం అంటే పుస్తకాలకు పరిమితంకావడం కాదనీ విభిన్న భావనలను నిత్యజీవితంలోని వివిధ సందర్భాలలో పరిశీలిస్తూ, అన్యయిస్తూ కొత్త కోణంలో సృజించడం అని గుర్తించాలి. కేవలం పదవతరగతిలోనే ఫలితాల సాధనకు ప్రయత్నించడం కాకుండా 6వ తరగతి నుండే పిల్లలు చేస్తూ చర్చిస్తూ, పాల్గొంటూ స్వంతంగా నేర్చుకోవడం అలవడేలా ఉపాధ్యాయనిపుణులు కృషిచేస్తారని, బట్టీచదువుల బంధనాలనుండి పిల్లల్ని విముక్తంచేసి నైపుణ్యాల సాథనలో స్వీయ అభ్యాసకులుగా మారేలా తీర్చిదిద్దుతారనీ ఆశిస్తూ.......

విజ్ఞానాభివందనాలతో

సంచాలకులు రాడ్ర్షవిద్యాపరిశోధన శిక్షణాసంస్థ, హైదరాబాద్.



INDEX















I. New Text books - Importance

We all know that in our state new text books are formed according to the instructions of NCF - 2005, RTI- 2009 and aims of STCF - 2011. As a part of it new text books for class X for the academic year 2014-15 are introduced. Tenth class is crucial in school education. We treat that this is the last step in school education. Hence tenth class syllabus should help the students in their intermediate course or other competative exams. All the same time it should make them new concepts. Accordingly New text books are formed.

Text books reflect the below topics which are mentioned in State Curriculum Frame work. Position paper.

1. To get rid of rote memory:

There is no information of any topic in the text book which one can rote. For example, in a text book, it is questioned that is there any relation among a candle, rat and mint plant? If so, what is it? The answer for this question will not be in any lesson. After doing experiments, children can come to a conclusion and can establish relationship between the experiment and the result. To understand the topics and concepts in the text books different activities are framed.

Example:

- Flow charts should be used to know the complex topics.
- Instead of filling with the information about Human digestive system children should pose questions, discuss, observe and can understand on their own.
- They can analyse the graphs and tables and can write the answers on their own and can recognise the contrasts and comparisons in the topics.
- To make them understand the functioning of kidneys by introducing the medical topics like dialysis and artificial kidneys.

The activities children can understand different topics.





2. Learning should not be limited to the text books:

Children can gain more knowledge through the activities and project works of text books. Hence group works, discussions and project works are included in every lesson, children can learn new things when we can take them out from the class room. In order to understand the concepts deeply and meaningfully many projects, group works and field trips are there in the text book.

3. To make use of the learnt classroom concepts in day to day life:

The topics in the lessons of the text book are based on our daily life activities. Activities and experiments which included in the text books are arranged in such a way that they can make use of daily life incidents.

eg: Why does vomits come?

How will be the movements in the elementary canal at the time of vomiting?

Why do legs pain when we run or walk long distances?

What for dialysis when the kidneys are not function.

In this way so many experiences which we face in our daily life are included in the lessons. Children can make else of this knowledge and can solve their daily life problems.

4. Evaluation methods should bring out the abilities in children:

Topics in the text books are arranged in such a way that instead of mugging them up, students can add their opinions and experiences to the knowledge they gained and can acquire analysing skills, experimental skills can draw the pictures, diagrams, can understand the flow charts and express them on their own, can put the information in flowcharts and tables.

Flow charts like this will enchance student's knowledge. Activities in the text book cater student's background, their culture, their interest and provide them the opportunities to utilise their doing capacities.

New text books help the children to study the science in a scientific way. As part of qualitative education it is necessary for all the children to attain determined educational standards.

To achieve the academic standards through the lessons of this text book teachers should follow the teaching learning strategies like making the children to think, to question, to discuss and make them participate in activities and experiments.



New Text book - Characteristics:

- Topics are based on the topics of earlier classes, in a new angle.
- The interesting topics like the different findings in science and the experiments by scientists to find these are included in the lessons. Through these topics their interest towards science will increase. They show interest to learn new things and to do experiments. Children will recgonize that the scientific findings are not happened all of a sudden but are the results of the scientist's experiments for years together.
- Space for continuous comprehension evaluation is provided through asking them thought providing questions to test their understanding in the middle of the lesson.
- Science should be studied in a scientific way through the activities like field trips, experiments, group works, discussions and project works. Hence to study the different concepts in the lessons these activities are included in each lesson.
- Besides satisfying the children with the classroom experiments, motivate them to know the
 result in an experiment by changing different factors. Children can make the experiments
 with locally available things. With this not only the concepts strengthens but they can learn
 new topics also. Given activities not only make them understand the textbook topics, but
 also make them learn new things by doing experiments.
- To understand the concepts in the text book, diagrams help them a lot. And these diagrams in this text book are of different colours and hence it is easy for the children to understand them. Most of them are 3D, Microscopic and real pictures.
- In order to make them understand different organ systems flow charts and tables are given.
- At the time of introducing complex concepts in the lessons, daily life incidents are added for their understanding. Most of the topics of these lesson can be utilised in their daily life.
- Discussion topics and the activities in the text book should not give them specific answers all the time. By giving open-ended questions there will be scope for the children to think and write individually. Hence, topics like 'think-discuss' like activities are given.
- The activities in the text book help the children to compare and decide their hypothesis.
- The activities are arranged in such a way that, in most of the situation, children themselves can search and find out the answers
- Children can do the experiments, observations on their own or with the help of the teachers.



- In order to assess children's progress there are many types of questions in the middle of the lesson and at the end as well. There are meant to think and write individually on their own.
- In order to give them additional information besides the content in the lesson, the topics like
 'Do you Know', Annexure, etc. are included.
- To improve analytical thinking among the children, information is given in table form wherever necessary.

New text books are made to learn mainly the concrete concepts through experiments and observations. Observations and experiments make the children to have specific opinions towards scientific concepts and give them the skills to utilise the learnt concepts to solve their daily life problems in an efficient way. These new textbooks help the children to understand the nature, environment and make them grow the person with scientific attitude through science.



II. Syllabus - Themes

National Curricular Framework - 2005 suggested that while selecting the themes, care should be taken to incorporate social needs, specific efforts in the fields of science and technology, human resources, future needs and the changes in the nature and the environment. As it is difficult to provide the vast information to children only through texst books, we should make them to get habituated to collect the relevant information pertaining to a topic through different media. This facilitates the construction of knowledge topics and syllabus in the new textbooks of class 10 are designed in continuation with the syllabi of classes 8 and 9.

8th and 9th text books are designed as an extension of 6th and 7th classes syllabi. As per the objectives of State Curricular Framework - 2011, the lesson plan is designed in such a way that it reflects the constructive approach that aids the development of interdependence of educational philosophy and knowledge construction. In classes 8, 9 and 10 science is divided into physical science and biological science. In each of these divisions lessons are selected on the basis of themes. Let us observe the themes in physical science on which the designing of lessons took place.

- 1. Materials
- 2. How things works
- 3. Moving things, people's ideas
- 4. Natural resources
- 5. Natural phenomena.

Lessons are selected based on the above themes under the theme 'materials', in classes 6 & 7 we explained matter around us, methods of separating the materials, how are materials made. Based on the above topics, in classes 8 and 9 lessons like states of matter, synthetic fibres and plastic metals and non metals are designed. Similarly based on the theme "How things work", lessons like sound, are designed. Force, friction, velocity, movement etc. are written based on the theme movign objects - people's ideas. In the same way, in primary classes the lesson "some natural phenomena" is based on "changes around us". Precautions to be taken at the time natural calamities



are discussed in this chapter. Even though the topic, combustion fuels and fire discusses about natural resources like fuel, it is also useful in knowing how different materials are formed and the reason for their behaviour. Lessons like, stars & solar system help children to understand the physical world around them and its order and rules. The lessons is class 10 have been selected as a continuation of the above topics. Under the theme "materials", acids, bases, salts, their properties and reactions are explained. How do chemical reactions take place methods of writing chemical equations and the rules to be followed while balancing the equations are also explained. By dealing with the internal aspects of an atom, it is made clear how molecules are formed. Chemical bond, vacancy and the classification of elements based on electron theory are also explained. Potential difference in electric current, electro motive force ohm's rule are discussed under the theme "How things work". Under the section "moving things - people's ideas" appliances like electric motor generator based on electromagnetism, magnetic fields formed due to solanoids, effect of electric current on magnetic properties are discussed Carbon exhibits a vessatile nature. Many artificial things are made of carbon because of its peculiar characteristic features like hybridisation and catenation. Various carbon compounds, different metals and the methods of their extraction are discussed under the theme "Natural Resources". Aspects related to heat such as specific heat, evaporation, condensation, humidity are discussed as natural phenomena. Under the same theme, reflection of light, refraction of light dispersion, scattering and their rules and principles are discussed. An opportunity to realise the relation between biological and physical sciences is provided by discussing the relation between eye and light, structure of an eye, method of identifying colours, eye diseases etc.

Sl. No.	Theme	8th Class	9th Class	10th Class
1.	Materials	Artificial fibresplasticsmetalsnon metals	 Matter around us Is matter pure molecules atoms what is inside atoms 	 Chemical reactions equations acids bases salts atomic structure chemical bond periodic classification
2.	How things work	Sound	- Work force - Sound	Electric Current



Sl. No.	Theme	8th Class	9th Class	10th Class
3.	Moving things People's ideas	ForceFriction	- Floating objects	Electric magnetism
4.	Natural resources	Coal, petroleumFuel, combustion fire		Extraction of metalsCarbon and its compounds
5.	Natural Phenomena	Some natural phenomenaStars solar system	- Gravitation	 Head, reflection refraction, scattering dispersion Human eye - colourful world

CLASS X – PHYSICAL SCIENCE syllabus

1. Heat

- 1.1 Temperature (based on thermal equilibrium), heat
- 1.2 Specific heat capacity
- 1.3 Thermal expansion [solids and liquids only]
- 1.4 Methods of mixtures
- 1.5 Evoporation, condensation, humidity, Bioling, Melting, Freezing

2. Chemical Equations and Reactions:

- 2.1 Introduction to Language of Chemistry
- 2.2 Atoms, molecules, Elements, Compounds, Mixtures, Atomic mass, Molecular mass, Gram Atomic mass, Gram molecular mass, Molar & Mole concept.
- 2.3 Some daily life examples of chemical reactions.
- 2.4 Chemical equations writing chemical equations, skeletal chemical equations, balancing chemical equations, writing symbols of physical states.
- 2.5 Types of Chemical Reactions:
 - 2.5.1 Combinations reactions: (Exothermic chemical reactions, Endothermic reactions)





- 2.5.2 Decomposition reactions: (Thermal, Electrolytic, Photo-chemical reactions-examples only without mentioning names)
- 2.5.3 Displacement reactions:
- 2.5.4 Double displacement reactions:
- 2.6 Oxidation and Reduction:
- 2.7 Corrosion and prevention of corrosion
- 2.8 Rancidity

3. Reflection of Light

- 3.1 Theories of light
 - 3.1.1 Fermat principle
- 3.2 Reflection its laws
- 3.3 Mirrors
 - 3.3.1 Plane mirrors image formation
 - 3.3.2 Spherical mirrors, convex, conclave mirrors
- 3.4 Rules for Ray diagrams by sing laws of reflection
 - 3.4.1 Images formed by spherical mirrors
 - 3.4.2 Formula for spherical mirrors focal length and sign convention
 - 3.4.3 Application of reflection

4. Acids, Bases and Salts:

- 4.1 Introduction (for Recalling only) to Acids & Bases
- 4.2 Chemical properties of acids & bases
 - 4.2.1 Acids & Bases in laboratory Indicators
 - 4.2.2 Reaction of Acids & Bases with Metals
 - 4.2.3 Reaction of Acids & Bases with each other (Neutralization)
 - 4.2.4 Reaction of Acids & Bases with Metal Carbonates and Metal hydrogen carbonates
 - 4.2.5 Reaction of Acids & Bases with Metallic oxides with acids
 - 4.2.6 Reaction of Acids & Bases with Non-Metallic oxides with bases
- 4.3 What do acids have in common? What do bases have in common?
- 4.4 Importance of P^H in everyday life
 - 4.4.1 Sensitive of plants and animals to $\mathbf{P}^{\mathbf{H}}$
 - 4.4.2 $\mathbf{P}^{\mathbf{H}}$ of soils, $\mathbf{P}^{\mathbf{H}}$ in digestive system, $\mathbf{P}^{\mathbf{H}}$ tooth decay
- 4.5 Self defense by animals and plants through chemical warfare





- 4.6 Some naturally occurring acids
- 4.7 Salts
 - 4.7.1 Nature of salts
 - 4.7.2 p^{H} Of salts
 - 4.7.3 Sources of common salt
 - 4.7.4 Common salt a raw material for other chemicals (NaOH, Bleaching powder, baking soda, washing soda, and their uses)
 - 4.7.5 NaOH, Bleaching powder, Baking soda, NaHCO₃ uses washing soda and its uses
 - 4.7.6 Salt crystals water of crystallization eg: CuSO₄.5H₂O₅, Plaster of Paris
 - 4.7.7 Plaster of Paris

5. Refraction of light at plane surface

- 5.1 Refraction and its laws
- 5.2 Refractive index
- 5.3 Relative refractive index
 - 5.3.1 Snells law
- 5.4 Total internal reflection and its applications (Mirages)
- 5.5 Application of total internal reflection
- 5.6 Reflection through a glass slab
 - 5.6.1 Refraction through a thin slab

6. Refraction of light at curved surface

- 6.1 Refraction of light through lenses and prisms by using Fermat principle
 - 6.1.1 Image formatioon
- 6.2 Lenses
- 6.3 Rules for Ray diagram
- 6.4 Images formed by the lenses
- 6.5 Formula for derived for thin lenses
 - 6.5.1 Applications

7. Human eye and colourful world

- 7.1 Least distance of distinct vision
- 7.2 Structure of human Eye
- 7.3 Common defects of vision Myopia, Hypermetropia, presbyopia





- 7.4 Prism
- 7.5 Dispersion
 - 7.5.1 Rainbow
- 7.6 Scattering of light

8. Structure of atom

- 8.1 Electro magnetic spectrum
- 8.2 Atomic spectrum
- 8.3 Planck's theory/Einstien's theory
 - 8.3.2 Bohr's theory
- 8.4 Hiesenberg Uncertainity Principle functions
 - 8.4.1 Probability functions probability diagrams orbitals
- 8.5 Quantum numbers: (no mathematical derivations)
- 8.6 Main shells, Sub-shells and orbitals in different sub-shells
- 8.7 Electronic Configuration of elements in their atoms
- 8.8 ${}_{n}I^{x}$ rule, Energies of electronic energy levels (n+l) rule; Aufbau Principal, Paulis principal, Hund's Rule of maximum multiplicity, Stable configurations.

9. Classification of Elements:

- 9.1 Need for arrangement of elements in an organized manner
 - 9.1.1 Historical background of classification of elements
- 9.2 Doberieners Triads
- 9.3 Newland's law of Octaves
- 9.4 Mendeleev's Periodic Table (Achievements & Limitations)
- 9.5 Modern Periodic Table.
 - 9.5.1 Position of Elements in Modern Periodic Table
 - 9.5.2 Trends in Modern Periodic Table (Valency, Atomic size, Ionization Energy, Electronegativity, Metallic & Non-metallic properties)

10. Chemical Bonding:

- 10.1 Chemical bond definition (brief explaination)
- 10.2 Electronic theory of Valence by Lewis and Kossel
 - 10.2.1 Octet Rule
- 10.3 Ionic and Covalent bonds: examples with Lewis Dot formulae
- 10.4 Shapes and bond lengths in molecules





- Valence bond theory examples like H_2 , Cl_2 , H_2O , BF_3 , CH_4 , NH_3 , C_2H_6 , C_2H_4 , C_3H_2 etc
- Hybridisation and explaination of H₂O, BF₂, CH₄, NH₂ etc., molecules
- 10.7 Properties of Ionic and Covalent Compounds

11. Electricity

- 11.1 Electric charge
 - 11.1.1 Electric force
 - 11.1.2 Electric field
 - 11.1.3 Electric potential, potential difference
- 11.2 EMF
- 11.3 Electric current
- 11.4 Ohm's law, resistance, specific resistance, factors influencing resistance, electric shock
 - 11.4.1 Kirchoff's Laws
- 11.5 Series and parallel connection of resistances
- Heating effect of electric current, safety fuses
- 11.7 Electric power

12. Magnetic effects of electric current

- 12.1 Magnetic field field lines
- 12.2 Magnetic field due to currents
 - 12.2.1 Duet to current carrying wire
 - 12.2.2 Due to circular loop
- 12.3 Solenoid
- 12.4 Magnetic force on moving charged particle and long straight conductors
 - 12.4.1 Fleming's left hand rule
- 12.5 Electric motor
- 12.6 Electromagnetic induction Faraday's law (including magnetic flux)
- 12.7 Generators and Alternating Currents
- Latent heat; changes of phases, condensation, fog and cloud, boiling, melting

13. Metallurgy:

- 13.1 Occurance of Metals
- Extractions of metals activity series and related metallurgy, flow chart of steps involved in the extraction of metals from ore





- 13.3 Enrichment of ores
- 13.4 Extracting metals low in the activity series
- 13.5 Extracting metal in the middle of the activity series
- Extracting metal in the top of the activity series
- 13.7 Refining metals
 - 13.7.1 Electrolytic refining
- 13.8 Corrosion Prevension of Corrosion

14. Carbon and its compounds:

- 14.1 Introduction
- 14.2 Bonding in Carbon including Hybridization
- 14.3 Allotropes of Carbon (Diamond, Graphite and C₆₀)
- 14.4 Versatile nature of carbon
 - 14.4.1 Catenation and tetravalency
 - 14.4.2 Chains, branches and rings
- 14.5 Saturated and Unsturated carbon compounds
 - 14.5.1 Bonding of carbon with other elements
- 14.6 Functional groups in carbon compounds (alcohols, ketones, aldehydes, halo and esters)
- 14.7 Homologous series (Alkanes, Alkenes and Alkynes)
- 14.8 Nomenclature of Carbon compounds
- 14.9 Chemical properties of carbon compounds
 - 14.9.1 Combustion (Blue and Sooty flame observed in carbon compounds, exothermic)
 - 14.9.2 Oxidation (Alcohol to Acids)
 - 14.9.3 Addition reaction
 - 14.9.4 Substitution reaction
- 14.10 Important carbon compounds
 - 14.10.1 Ethanol
 - 14.10.2 Ethanoic acid
 - 14.10.3 Properties of Ethanol General properties, reaction of ethanol with sodium, reaction with hot concentrated sulphuric acid.
 - 14.10.4 Properties of Ethanoic acid General properties, Esterification reaction, Reaction with a base, sodium hydroxide, sodium carbonate and sodium hydrogen carbonate
- 14.11 Soaps Saponification, Micelles. 7





III. Unit Structure

Tenth class new science text book is based on the philosophy of knowledge construction in which students participating in the incidents and gaming knowledge themselves. Let's observe how the lessons are formed.

- Lessons start with the incidents children face in their daily life or with the revision of earlier classes concepts.
- Question and discuss about the concrete concepts of earlier classes.
- Prepare the students to study science through thought provoking, researchable questions.
- Conducting activities and experiments to make aware of the topics of new concepts.
- Analytical exercise through activities, experiments, projects, information gathering tables, asking thoughtful questions to analyse the information, conducting discussions and make them aware of the concepts.
- Explaining the diagrams and the structure of different cells and organs and explaining how the activities happens in the organs. Exhibiting the processes in the form of flow charts.
- In order to create curiosity, scientific thinking and scientific attitude, keeping additional information available
- Teaching learning methods should mix with the learner's mutual interactive activities.
- Self responses should be in such a way that children should add their own thoughts and opinions and findout the things in their own way.
- Lessons in the text books are arranged in such a way that they will achieve academic standards.
- Text books help to improve the learning through individual and self-evaluation.

The lessons in the text book which are based on different themes are arranged in the order of conceptual importance. It is necessary to observe many topics starting from introductory scene to



improve the learning in a philosophical angle. Let's kindly observe different parts of the science text books which are based on theoretical strategy to build the knowledge.

- Introducing scene / introduction with thoughtful questions.
- Activities / experiments
- Think / Discuss
- Do you know?
- Laboratory activities
- Filling the labels / analysis
- Observing the maps
- Drawing the graphs, diagrams, flow chars and annexures.
- Making and exhibiting the models.
- Reading stories and biographics
- Key words
- What we have learnt?
- Improve our learning (questions).

Every lesson in the text book is based on the above topics. In addition to analyse these things deeply, let's observe how to conduct these steps in the class room.

1. Introduction:

The lesson starts with the introductory scene. In order to understand the lesson, this introductory scene is based or children's earlier experiences. Some lessons start with thoughtful questions too.

Eg: The lesson excretion - the wastage disposing system starts with the following thoughtful questions.

- Where are the wastes produced?
- How are they produced?
- What are the substances present in them?
- Does the composition very in the same organism in different situations?

By questioning and discussing thoughtful questions like these we can know their earlier experiences and can create interest to learn the lessons.

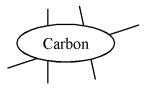




How to conduct?

To understand the concepts in a science text book, it is necessary to observe children's earlier experiences. For this the teacher should discuss topics in the beginning of the lesson with the children. Mind mapping based on the key concepts of the lesson should be concluded.

For example when beginning the lesson on carbon and its compounds, let the children do the mind mapping on carbon with the things known to them. Aren't diesel and petrol fuels? They are formed of carbon. Say some more of that type. Ask them such thought provoking questions while doing mind mapping.



While making mind mapping teacher should discuss and question the children the topics what they have learnt in the earlier class and should write them on the black board.

2. Activities / experiments :

By analysing the results of the activities and experiments makes understanding towards different concepts. The activities and the experiments can be done with locally available things. These can be performed individually or under teacher's supervision. After completion of the activity/experiment thoughtful questions are given for the understanding of the concepts.

For example formation of barium sulphate, formation of hydrogen with aqueous HCl and Zinc, how to measure the least distance of clear vision, series and parallel connections, magnetic lines of force.

If children can imagine answers for the above three questions children can understand that the gas that changes lime water milky is carbondioxide and hence the presence of carbon dioxide will be in layer amounts in exhaled air.

How to conduct?

- Why the activity/experiment is going to be done should be discussed with the children.
- The aim of the activity / experiment should be written on the blackboard.
- Make the children guess the result, and write the answers on the blackboard.



- Make the children read the text book thoughroughly to know the method and apparatus to conduct the activity / experiment.
- Teacher should provide the necessary tables to enroll the observed items of the activity / experiment.
- Activities should be done individually, with in the group or with the help of the teacher.
- The results should be enrolled individually or in groups.
- Compare the experiment results with hypothesis.
- Children's report should be exhibited and discussed in the class room by asking thoughtful questions.
- Explanations and conclusions in the textbook should be discussed individually to test student's understanding.
- New thoughts / problems are based due to the experiments should be discussed.
- Experiments cans be done by using alternative methods and instruments and discuss their thought and experiments.

3. Think - Discuss:

To understand the lesson thoughroughly thoughtful questions are given under the topic. These will make the children to think in different angles.

Example: Where is the image of the formed when a candle is kept on the principal axis of the mirror?

What happens if the pH value of chemicals in our body increase?

The above questions give complete understanding about the functioning of the valves and which the blood flows in arteries and veins.

How to conduct?

- After reading a question make the children think and speak.
- For the sake of understanding give them direction and if possible ask follow up questions.
- No need to ask the students to copy down the answers in the note books. These help to strengthen the concepts.



 Provide chance to the students to observe or to do follow up experiments whenever necessary.

4. Do you know?

In every lesson to understand the concepts deeply and to observe them some additional activities are given under the topic "Do you Know?" For example, in transportation - the circulatory system lesson there are explanations about blue whale, elephant, human being, coaltit bird, weight of the heart and number of heart beats. In the same way in the lesson coordination - the linking system, the reasons for the nastic movements in Mimosa pudica are explained. By reading these the curiosity to know how things develop among the children.

Example : How did the alkaline metals halogens etc in the periodic table got their name? Mendeleev's hypothesis, salt satyagraha.

How to conduct?

- As a part of teaching the lesson pase thoughtful question and encourage the students to read the items in the box.
- Make them read individually and discuss.
- Encourage the students to gather the related information from library books, internet etc.
- Keep the information gathered by the children (diagrams, questions, books, information) in school bulletin/wall calender.
- These are not meant for testing. Hence, there will not be questions on these either in summative or in formative exams.

5. Laboratory activities:

In new textbooks conducting experiments in laboratory are given much priority. For this weekly one lab period (two 45 mts periods) is allotted. Laboratory activities are given in every lesson. Though there are many activities in the text book, the laboratory activities are special. To conduct these specific operates and specified situations are needed. To conduct an experiment in the laboratory necessary equipment and chemicals should be arranged in advance.

Example: Ohm's Law stating that potential difference of a conductor is directly proportional to the flow of the current. Finding refractive index of a prism.

How to conduct?

• Laboratory activity can be conducted either in the class room or in the lab.





- Make ready of the necessary equipments chemicals and observation tables to conduct an experiment.
- By keeping the equipments ready, teacher should give suggestions to the students wherever they needed and make them to do the activities in the lab.
- Discuss and analyse the recorded results with the whole class.
- Experiments can be done in such a way that the students should.
- Experiments can be done by making the students guess the result by changing the factors and the situations. Encourage the students to learn new things and to come to a conclusion.
- Ask the students to write the experiment in their lab record.

6. Filling the tables - Analysing:

Learning activities in the new textbooks make the children develop the processing skills among the students. Gathering the information on their own, classifying it, and come to conclusions by observing it should be implemented as a major learning process. In the textbooks, tables filled with information, information gathering and the tables which develop the analysing skills are given. These help the students to understand the lesson effectively. For example in the lesson Heredity in the table of Mandal's peas plant traits minute pictures are included. By this students can easily understand the observations of the scientists. On the same way in the lesson transportation - the circulatory system the table of Harvey's experiment is given and asked to fill the blanks for arteries and veins. With this students can easily understand the functioning of the veins.

Example : Identifying the acidic & basic natures of substances refractive indices of different materials and media, shells and number of orbitals valency position of elements.

How to conduct?

- Instruct the students how to gather the information for the tables given in the lessons.
- Ask the students to gather the information individually / in groups from the library books, field trips and internet. Give them ample time for this.
- Ask follow up questions from the text book for the discussion save to develop their understanding.
- If the space provided in text book is not sufficient ask the students to prepare information cards and to conduct the activity.
- With the help of gathered information prepare graphs, flow charts and exhibit.



- Discuss the topics to be filled in the tables.
- Give necessary instructions while filling the tables.
- Teacher should give examples.
- Ask the children to give examples.
- Make the students to fill the tables individually.
- As part of teaching tables should be conducted in the class room only.
- Ask the students to fill the tables at their home, school or wherever they get information.
 It takes much time to fill some tables.

7. Observing maps and diagrams and preparing flow charts:

Much information can be provided in brief through maps and diagrams. A picture gives much information. Most of the diagrams in biology and physical science are given in the form of quality photos and microscopic pictures. Pictures which show internal construction and instrumental arrangement are given. There is much importance of maps and pictures in science.

Example: Electric circuits, magnetic lines of force, ray diagrams of reflection and refraction of light, types of chemical reactions, arrangement of tools, orbitals, molecular structures, hybridisation.

How to conduct?

- Utilise maps, diagrams, and flow charts for understanding whenever necessary.
- Make them practice to draw the pictures which are given in 2D form.
- Ask the students to read the lesson and recognise the parts of the diagram.
- Ask the students to read the information and put it in the form of flow chart.
- Ask the students to exhibit the gathered information in graph form.
- Make the students draw the arrangement of apparatus in the lab and internal parts of the body.
- Make the students draw different stages in the life cycles of creatures.
- Ask them to complete the incomplete diagram.
- The diagrams in tenth class text book are useful to some extent only to inculcate the academic standard of information transfer among the students. Hence ask the students to take the diagrams of different biosystems and organic constructions from other books.





Earlier text books, intermediate and degree text books are useful for this. But tenth class stage should in be keep in mind while selecting the diagrams.

8. Stories, Personal history and Annexures:

Reading the backgrounds of different findings develop interest among students towards science. By regarding different experiments, results help them to know whether their ideas towards them are right or wrong. eg: In the lesson of coordination the linking system researches done by Leonardo Davincy gives the knowledge that spinal cord not only sends the information from the obtain to the body parts but also works as a controlling unit.

By regarding the personal history children can understand the scientist efforts, dedication, their thinking behind their findings and think to find out new things.

Annexures will help the students to understand the concepts deeply. The annexure in the lesson Heredity - from parent to the progeny children will know the importance of Heel a cell and by the researches of Potti Narasimha Rao they'll know how other scientist went forward.

How to utilise?

- Stories personal history, annexeral issues in the annexures of the lesson must be read by the students only. And should ask them what have grasped from it.
 - Eg: In the lesson excretion. The wastage disposing system the importance of organ donation is given. 18 years old yashwanth kumar, who was in coma with brain dead donated his kidneys, hear valves, liner and gave life for some more people is a miracle. Learning issues like this in the childhood helps the children a lot.
- Collect the lesson related issues from newspapers and internet and exhibit them in t he wall magazine.
- By reading the stories, personal histories, and annexures develop the quality of praising among the students.
- Make the students appreciate the scientists and get inspiration from them by reading their biographies.
- Ulmost recognisable thing is that stories, personal histories and annexures are not meant for testing. They are intended to create interest among the students.



9. Making Models - Exhibition :

Though there are 2D pictures, maps and graphs to explain the concepts of bio and physical sciences, it is better to introduce 3D pictures of Heart structure, electric motor, shapes of different atoms, kidney structure etc. For this models are required. By making alternative models children can understand the concepts.

How to utilise?

Besides collecting the information and understanding it, it should be expressed to others meaningfully by using technical terms. There should be provision to exhibit the models prepared by the children

- Ask the children to prepare models individually or in a group.
- Prepare the write ups that explain about the models and exhibit in the classroom.
- Ask the children to exhibit their models and to talk about them.
- When the students prepared working models they should talk about its functioning.
- Take care of preserving the collected and prepared models in the classroom.

10. Key Words:

The important concepts of the topics in the lesson are included as key words at the end of the lesson. With the help of these key words children will for psychological pictures related to those concepts and can analyse. eg: By learning the key word peristalic movement children can remember the waves movement when the food passes through alimentary canal.

How to conduct?

- Key words are the brief concepts of the lesson.
- While learning the key words and concepts make aware of them through experiments and activities.
- Understanding the lesson is explaining the key words fluently and hence make the students to talk on them.
- The key words of the earlier units should be utilised in learning the later units.
- Teachers should not define the key words.
- Students should make mindmap based on the key words.



11. What we have learnt:

It's a revision topic. Important concepts discussed in the lesson are given briefly in this. With the help of this we can know what are topics we discussed in the lesson. This helps for self assessment like what we have learnt and what should we learn through this lesson.

How to conduct?

- Discuss with the children about each item / sentence. Ask the children to say what have understood about that
- Ask the children to explain the concepts and write it down in their notes.
- The items under the topic what we have learnt are meant not only for revision but for use as an exercise to discuss and analyse the lesson once again.
- Make them help these to collect additional information and to conduct annexural activities.
- These should not be made rate learning.

Improve our learning:

Achieving specified academic standards is the main objective of teaching - learning activities. Though the teacher achievement of the academic standards while teaching the lesson, the items in improve our learning help him / her to observe how the children understand and how they are analysing the lesson. This is one angle and on other side they help the students to assess themselves.

How to conduct?

- The items in the topic will be like another effort to learn individually the contents in the lesson.
- Though it is an evaluation, it is not meant to test now for the students have learnt.
- As a part of continuous comprehensive learning, the items in improve our learning help to learn the lesson more comprehensively.
- There will not be direct answers in the text book for the questions in this topic.
- Encourage the students to understand the content and write answers on their own.
- Utilise this to know how far the students achieved the specified academic standards.
- The activities which should be done individually/group work/whole class will be conducted as they are intended.



- There are games and puzzles and these are part of evaluation and help to understand the content. Hence these should be conducted without learning.
- Annexural experiments should also be conducted and reports should be written in the notebooks.
- Make the students to write the answers to the questions related to the academic standards like interests, appreciations, bio diversity and applying to real life. Much priority should be given to these.
- Teacher should prepare some more questions, wherever necessary to achieve the academic standards
- Give ample time to the questions related to the field trips like collect and enroll.
- Ask the students to write answers to the questions in the middle of the lesson then and there only (individually/groups).

By understanding the construction order of the lesson in the text book teacher will have annexures on how to prepare the teaching learning processes. They will have an awareness on how to teach about an item in a lesson. They will have an understanding on how to teach different topics in teaching learning processes by mixing with the content.



IV. Academic Standards

APSCF - 2011 specified that children should participate in learning activities which reflects class specific academic standards, then only it is considered as qualitative education. That is why for each class and each subject academic standards are specified. The important objective of teaching learning process is to achieve academic standards based the information they got from the text books than the information in the books.

The main aim of the science is to create a new society having concern towards animals and the nature, patience and equality. Solutions to the problems like droughts, and disease is also the responsibility of the science. To prepare our children as future Indian scientists it is necessary to make changes in our text books, teaching learning processes and examination system.

I. Conceptual Understanding

It indicates comprehensive understanding of a concept student has to explain a concept if s/he understands that s/he has to classify, it analyse, give examples, tells the reasons and make psychological pictures. Hence under the academic standard understanding comes explaining, classifying, analysing, giving examples, telling the reasons and forming psychological pictures.

1. Explaining

It indicates student's comprehensive understanding of a concept understanding means explaining, classifying, analysing, giving examples, telling the reasons and forming psychological pictures.

2. Classifying:

- Recognizing differences between the things in a group.
- Recognising comparisons between the things in a group.
- Grouping the things according to their special traits.
- Telling the sources and methods that are followed for classification.



3. Analysing:

- Explaining an incident or a situation in their own words.
- Telling the reasonable causes about the concepts.
- Analysing the formulae, equation and experiments results, recognizing the relation and forming intra and new relations.

The following items can be classified by analysing.

- Observe various experiments
- graph which shows veriuos functions
- The diagram that shows different function of heat, light, electicity etc.

4. Giving Examples:

- Instead of saying what the teacher has said, student has to tell similar example by using classroom knowledge is said to be 'giving examples'.
- Giving examples on the basis of common and different traits.

Students can give examples of the concepts which they have learnt in the classroom.

5. Saying the causes:

- Explaining the results of the experiments and concepts with reasons.
- Recognizing the relations connecting the reasons for action and reaction.
- Explaining the observations on the basis of reasons.

6. Formation of Mental Images:

- The abstract concepts which can not be understand through direct experiences can be understand by mathematical forms and logical thoughts and those concepts can be psychologically.
- Reusing those already formed psychological pictures whenever necessary.

II. Asking questions, making Hypothesis:

- Children have inquisitive nature science they have the curiosity and questioning capacity. Asking thoughtful questions on different concepts.
- Asking thoughtful questions to deeply analyse the selected issue.





- All the times of gathering the information, observing the situations prepare questions for interview
- Questioning is the natural trait of the children. These are keys for research. Hence continue their nature of questioning and develop the capacity of making research.
- Guessing the results through prior thoughts that help problem solving.
- While doing experiments, observations, guessing the results and making hypothesis.

III. Experiments - Field Investigations :

This include the skills of selecting the instruments, arranging, observing, enrolling, analysing, determining and generalization etc.

Observing:

- Collecting the information through the experience of sensory organs.
- Observing a thing, a situation, a happening.
- Recognising the happened/completed incidents in a order.

Enroll: Enrolling the collected information in a table or in a notebook.

Analysing:

- Explaining an incident, a situation, a method with reasons in their own words.
- Anedite reasonable causes for any incident.
- Recognising which of the collected is right with evidences.
- Preparing concepts by keenly observing the graphs and reports.

Determining:

Saying a result by practically observing, analysing a correct guessed hypothesis is determining.

By conducting the above experiments and field trips children can achieve the skills like selecting the suitable equipments in an experiment, arranging them, observing, enrolling, analysing, determining and generalisation etc.

IV. Information skills - project works :

Information skills: Collecting the information, exhibiting the collected information in data form, analysing the data, coming to conclusion are the important informative skills.



- In the process of learning is necessary for the students to collect the information in many ways. They have to classify the collected information, prepare the tables, and by analysing the reports they have to write the report.
- Through the skill of information collection children learn different life styles, cultures and honour other's opinions.
- They will be sympathetic towards the environments and will be ready to take the responsibilities.
- Ready to accept their strengths and weaknesses, participates.
- Work with others, share and help others.

Project Works:

- The process of selecting a problem and by following different steps to solve that problem is project work.
- These will help the children to utilise their unnate and creative abilities.
- Wait patiently until the results come.
- Behaving leader as well as follower in the group.
- Writing the reports and exhibiting them.
- Explaining analytically.
- It's group work, hence develop mutual cooperation, patience.

The following can be given under project works.

V. Communication through drawing and model making

- This includes expression through diagrams, recognising the parts of the picture.
- Drawing the pictures by observing them through microscope.
- Preparing black diagrams, flow charts, classifying tables.
- Expressing opinions through creative pictures, models and alternative equipments.
- Expressing collected information, results through bar graphs, pie graphs.

VI. Aesthetic sense - appreciation - Values :

- Developing the nature of competetive spirit, accepting the win and lose equally.
- Developing the characters of accepting the real, appreciation.





- Observing the different issues in the nature and recognising their importance through their hidden relations.
- Enjoying by seeing the specialities of bio, physical and chemical issues.
- Appreciating the efforts of the scientists.
- Participating in science clubs, seminars.
- Writing quotations, pamphlets, poems etc.

Seminars

Students to participate different seminars in school can collect and explain regarding the following issues.

- Importance of science day.
- Conservation of natural resources our responsibility.

Writing Slogans - Making Pamphlets

Children can write slogans on different issues which are mentioned in the textbook.

VII. Concern towards bio diversity, application to real life:

- Children recognising the importance of bio diversity in their surroundings.
- Making efforts for saving.
- Recognising that every creature has right to live.
- Knowing that how human behaviour is damaging the nature.
- Understanding and behaving responsibly towards nature and environment.
- Applying the knowledge that they gamed in real life situations.
- Understanding that the nature is not mains own, he is the only part of it.



ACADEMIC STANDARDS X CLASS PHYSICAL SCIENCE

Chapter - I : Heat

I. Key Concepts

Temperature, Heat, Thermal equilibrium, Specific heat evaporation, Condensation, humidity, dew, fog, boiling, latent heat of vaporization, melting, freezing.

II. Learning outcomes

1. Conceptual Understanding:

- Explains in own words the concepts of heat and temperature.
- Differentiates between the concepts of heat and temperature.
- Gives reasons why thermal equilibrium is explained through temperature.
- Explains specific heat.
- Cites examples for specific heat.
- Explains in own words method of mixtures.
- Gives examples for evaporation and condensation.
- Differentiates between evaporation and condensation.
- Explains boiling, melting and freezing.

2. Asking questions and making Hypothesis

- Makes hypothesis to understand the concepts of heat and temperature.
- Questions to understand the relation between temperature and KE.
- Questions on "Concept of specific heat"
- Questions to understand the difference between boiling and evaporation.
- Questions the reasons of condensation.

3. Experimentation- Field Investigation:

- Experiments to find out specific heat of solids.
- Reports the results.



4. Information skills and Project:

- Collects the uses of specific heat.
- Collects the reasons for using water in nuclear reactors.
- Collects Information on reasons for the harm caused by using dew.

5. Communication through drawing Pictures:

- Draws the graph between time and temperature changes in different states of water.
- Explains drawing pictures whereever necessary.

6. Appreciation and aesthetic sense - values.

- Appreciates explaining daily life situation relevent to temperature.
- Appreciates the wat heat is useful.

7. Application to daily life and concern to bio-diversity

- Applies the knowledge gained in daily life.
- Applies the uses of specific heat water.
- Takes up the responsibility of conserving biosphere.

Chapter - II : Chemical Reactions

I. Key Concepts

 Reactants, Products, Exothermic reaction, endothermic reaction, Chemical combination, Chemical decomposition, Displacement reaction, Double displacement reaction, Oxidation, Reduction, Corrosion, Rancidity, Autioxidants.

II. Learning outcomes

1. Conceptual Understanding:

- Explains the types of chemical reactions like chemical combination chemical displacement, Chemical decomposition, Double decomposition etc.
- Explains the methods to be followed in writing and balancing the chemical equations.
- Gives examples for different chemical reactions.
- Gives reasons for chemical reactions taking place between defenite materials.
- Compares and contracts between, Chemical combination, Chemical oxidations and reduction.
- Solves problems based on chemical reactions.



2. Asking questions and making Hypothesis:

- Imagines the products of chemical reactions.
- Questions about the products formed during various chemical reactions.
- Questions about precautions to be taken against corrosion of iron etc.

3. Experimentation- Field Investigation:

- Conducts experiments on formation of baria sulhate precipitate, hydrogen gas, producing Co₂, Electrolysis of water, formation of lead iodide, reduction reaction in copper oxide.
- Conducts experiments to explain concepts of chemical combination, displacement, decomposition, double decomposition, oxidation and reduction.

4. Information skills and Project:

- Collects information related to prepare various substances using different types of chemical reactions.
- Collects information and prepares reports about the methods followed to prevent corrosion of iron.

5. Communication through drawing Pictures:

- Draws pictures showing the arrangement of experiments related to chemical combination, displacement, decomposition, double decomposition, electrolysis, oxidation, reduction.
- Makes models and prepares flow charts to explain the rules followed while balancing chemical equations.

6. Appreciation and aesthetic sense - values:

- Appreciates the chemical nature exhibited by different substances and the products formed by chemical reactions.
- Identifies the wonders in chemical reactions that occur as and in oxidation. reduction, exothermic and endothermic.

7. Application to daily life and concern to bio-diversity:

- Identifies the diversed chemical reaction of substances.
- Applies the results of different chemical reactions in daily life.



Chapter - III : Reflection of light by different surfaces

I. Key Concepts

Angle of incidence, angle of reflection, normal, plane of reflection, lateral inversion, centre
of curvature, radius of curvature, pricipal axis, pole, focus/focal point, focal length, object
distance, image distance, virtual image, real image, magnification, fermal principle, mirror
formula.

II. Learning outcomes

1. Conceptual Understanding:

- Explains the reflection of light on plane mirror.
- Explains the method of formation of images on a plane mirror with reasons.
- Explains spherical mirron and the terms used in it in own words.
- Explains with reasons the method of formation of images on a sherical mirror.
- Explains the mirror formula.
- Derives mirror formula.
- Explains the need of praxial approximation gives reasons.

2. Asking questions and making Hypothesis:

- Questions about normal and its importance in plane mirror and spherical mirror.
- Imagines drawing normal.

3. Experimentation- Field Investigation:

- Experiments to find out focal length of spherical mirrors.
- Follows the precautions during the experiment.
- Tabulates the information.
- Prepares reports.

4. Information skills and Project:

• Collects information on the impact of spherical mirrors in daily life.

5. Communication through drawing Pictures:

- Draws ray diagrams.
- Makes solar cooker.
- Draws graphs(between u,v)



6. Appreciation and aesthetic sense - values:

- Respects the efforts and method of finding mirrors.
- Appreciates the uses and impact of mirrors.

7. Application to daily life and concern to bio-diversity:

- Applies the knowledge in daily life.
- Uses the formula properly.

Chapter - IV : Acids, Bases and Salts

I. Key Concepts

• Indicator, acid, base, chemical properties of acids and bases common properties of acids and bases, strength of acid or base p^H scale, importance of p^H, common salt, plaster of paris.

II. Learning outcomes

1. Conceptual Understanding:

- Explains different properties of acids and bases, their reactions with metals and non metals.
- Gives examples to acids bases salts and their products.
- Compares and contrasts the reactions of acids and bases with metals and non metals.
- Gives reasons for the strength of different acids and bases. Gives reasons for the formation of salts.
- Analyses the reactivity of acids and bases with metals and non metals.

2. Asking questions and making Hypothesis:

- Understands the p^H scale of acids and bases, neutralisation reaction, strength of acids and bases, products of salt.
- Makes hypothesis regarding the reactivity of acids and bases with metallic and non metallic oxides.
- Makes hyposthesis on the effect of decreasing and increasing of p^H value on different substances.

3. Experimentation- Field Investigation:

 Conducts experiments like reaction of acids and bases with metals, with carbonates, nuetralisation reactions, electrical conductivity of acids, preparation of HCL, identifying p^H



• Suggest the alternative instruments and their arrangements to conduct the above experiments, prepares the report based on the results and displays.

4. Information skills and Project:

- Collects information about **P**^H scale, uses of various salts, effect of acids and bases.
- Analyses the tables containing results of reactions of different acids and bases with litmus.

5. Communication through drawing Pictures:

- Draws pictures of reactions of Zn pieces with aqueons $HC\ell$, chemical reactions od carbonates, electrical conductivity in salts, crystallization.
- Makes the model of **P**^H scale.

6. Appreciation and aesthetic sense - values:

- Appreciates the reactivity shown by different substances based on their acidic and basic strengths.
- Appreciates that various acids and bases form salts through neutralisation.
- Identifies that various chemical substances exhibility specially the effects of acids and bases.

7. Application to daily life and concern to bio-diversity:

- Identfies the diversity in the behaviour of different substances as acids bases and neutral substances.
- Uses the reactions of various acids bases, salts and neutralisation in daily life, suggests solution to the problems faced.

Chapter - V : Refraction of light through plane surface

I. Key Concepts

 Refraction, incident ray, refracted ray, angle of incidence, angle of refraction, absolute refractive index, relative refractive index, Snell's law, critical angle, Total internal reflection, Mirage, shift optical fibre.

II. Learning outcomes

1. Conceptual Understanding:

• Explains the concept of refraction



- Explains Fermat's Principle.
- Derives snell law from Fermat's principle.
- Explains the reasons for the formation of mirage.
- Elaborates the reasons for the method of formation of mirage.
- Gives examples for refraction.
- Explains the need for refraction through a glass plate/slab
- Explains the need for Snell's rule.
- Explains with examples Total Internal Reflection.

2. Asking questions and making Hypothesis:

- Questions to clear the doubts arised while deriving snell's law.
- Makes hypothesis before analysing the results of experiments.
- Makes hypothesis about the refraction through glass slab estimates the results.

3. Experimentation- Field Investigation:

- Proves through experiment that the values of Sin i/ sin r is constant.
- Takes necessary precautions to conduct the experiments.
- Prepares the report on the results of experients.

4. Information skills and Project:

- Conducts some projects (Refractive index, total internal reflection)
- Collects information related to the results of refraction.

5. Communication through drawing Pictures:

- Draws pictures explaining refractions.
- Draws pictures explaining Total Internal Reflection.
- Expresses the glass experiment through a picture.

6. Appreciation and aesthetic sense - values:

- Appreciates the method of formation of mirage.
- follows values.

7. Application to daily life and concern to bio-diversity:

- Uses the knowledge of refraction refractive index, Total Internal reflection.





Chapter - VI : Refraction of light through curved surface

I. Key Concepts

• Lens, Focal length, focus, optic centre, Principal axis, radius of curvature, centre of curvature.

II. Learning outcomes

1. Conceptual Understanding:

- Explains refraction of light through curved Surfaces based on the knowledge of refraction of light through plane surfaces.
- Explains the terms to be used for refraction through curved surfaces.
- Explains lens and its types.
- Explains the principles involved in drawing ray diagrams for lens.
- Elaborates the reasons behind principles of drawing ray diagrams.
- Explains in his own words how to draw a ray diagrams.
- Gives reasons for the characteristics of images in ray diagram.
- Derives lens formula.
- Derives Lens makers formula.

2. Asking questions and making Hypothesis:

- Questions the derivation of formula at curved surface.
- Imagines the approximation while deriving $\frac{n_2}{v} \frac{n_1}{u} = \frac{n_2 n_1}{R}$
- Predicts the results of experiments with lens.
- Questions on drawing of ray diagrams.
- Questions to clear the doubt that the focal length of an object immersed in water depends on its surroundings.

3. Experimentation- Field Investigation:

- Finds out the focal length of lens through an experiment.
- Follows the precautions while experimenting with lens.
- Submits the report with the results.



4. Information skills and Project:

- Collects the information regarding lens
- Analyses the information.
- Prepares new projects.

5. Communication through drawing Pictures:

• Draws ray diagram of lens formula.

6. Appreciation and aesthetic sense - values:

- Appreciates the lens maker formula
- Conserves values

7. Application to daily life and concern to bio-diversity:

• Applies the knowledge of lens to overcome daily life problems.

Chapter - VII: Human eye and colourful world

I. Key Concepts

 Least distance of a distinct vision, Angle of vision, Accommodation of eye lens, myopia, Hypertropia, Presbyopia, Power of lens, Prism, Angle of Prism, Angle of minimum deviation, Dispersion, Scattering.

II. Learning outcomes

1. Conceptual Understanding:

- Explains angle of vision, accomodation and structure of an eye.
- Explains least distance of distinct vision.
- Explains defects of vision with reasons.
- Explains accomdation of lens.
- Explains dispersion with reasons.
- Explains with reasons how to avoid deflects of vision.
- Explains the method of formation of RAINBOW.
- Explains scattering.



2. Asking questions and making Hypothesis:

- Questions how the eye works.
- Questions to know the reasons for colour in RAINBOW.
- Questions to get a clear idea of scattering.

3. Experiments with prism to find out refractive index.

• Does new activities on dispersion

4. Information skills and Project:

- Collects information regarding scattering dispersing and other reflections.
- Collects the information on uses of prism.
- Collects information about C.V. Raman's research.

5. Communication through drawing Pictures:

- Draws diagram showing structure of eye.
- Draws diagram on deflects of eye and the methods preventing them.
- Expresses understanding with the help of above diagrams.
- Draw diagrams of prisms experiment.
- Draws graph based on the values got in prism experiment.
- Analyses the graph.

6. Appreciation and aesthetic sense - values:

- Appreciates the working of an eye.
- Avoids the behaviour that affects other eyes.
- Sympathises people with vision defects
- Appreciates the formation of RAINBOW and its explanation with concept of waves.
- Shows interests in aspects related to light.

7. Application to daily life and concern to bio-diversity:

- Solves daily life problems with efficiency.
- Realises the responsibility of donating eyes.
- Uses scattering phenomenon properties while wring spectacles.
- Explains accomodation of lens Explained



Chapter - VIII : Structure of Atom

I. Key Concepts

 Wave, Spectrum, intensity, discrete energy, line spectrum, orbital quantum numbers, shell, sub-shell, electron spin, electronic configuration, the Pauli's exclusion principle, Aund's rule, stable electronic configuration

II. Learning outcomes

1. Conceptual Understanding:

- Explains wave nature of light, electromagnetic spectrum, atomic models of Bohr. Sommerfield, Quantum theory, structure of electron (Principles Explaining in it)
- Gives examples of different quantum numbers.
- Uses the Pauli's, Aufbau's and Hund's rules as per the situation.
- Compares and contrasts the atomic models of Bohr and Sommerfeld.
- Gives reasons for light exhibiting wave nature.
- Writes electronic configuration based on Moeler's chart imagines energy levels.
- Explains the equations of electronic spectrum $\in = hv; n\ell^x; 2n^2$

2. Asking questions and making Hypothesis:

- Questions to about electromagnetic spectrum, different atomic spectra and quantum numbers.
- Imagines the electronic configuration and energy levels based on the values of n, l, m.
- Imagines the next energy level as per the rules of Aufbau, Pauli, Hund.

3. Experimentation- Field Investigation:

- Comments on structure of atom based on electro magnet and hydrogen spectrum.
- Discusses the highlights and results of experiments related to the atomic theories proposed by Bohr and Sommerfeld.

4. Information skills and Project:

- Collects and prepares a news report about the experiments of Bohr, Sommerfield, Max planck.
- Fills the table of electronic configuration of various elements.
- Prepares tables of electronic configuration of various elements.





5. Communication through drawing Pictures:

- Draws rough diagrams of Bohr and Sommerfeld models of atomic structure.
- Prepares flowcharts to know the electronic configuration.

6. Appreciation and aesthetic sense - values:

- Appreciates the wonders in electromagnetic spectrum.
- Appreciates the discoveries explaining the internal structure of the tinies atoms.
- Appreciates the aspects not proved by experiments are proved using mathematical principles.

7. Application to daily life and concern to bio-diversity:

- Identifies the diversity in the micro world.
- Uses Moelers chart to write electronic configuration of other elements based on quantum number.

Chapter - IX : Classification of Elements : Periodic Table

I. Key Concepts

 Triad, Octave, Periodic law, Periodic table, Period group, Lanthanides, Actinides, Element family, Metalloids, Periodicity, Atomic radius, Ionisation energy, Electron affinity, Electronegativity, Electropositivity

II. Learning outcomes

1. Conceptual Understanding:

- Explains Dobernair's law if Triads, Newland's law of Octaves, characteristics of Modern periodic table.
- Classifies elements on the basis of atomic number and electronic configuration.
- Explains the difference between Mendeleef's periodic table and the modern periodic table.
- Gives reasons why different exhibit same characteristics as per Dobernair's and Newland's theories.
- Analyses the changes in atomic radius, atomic volume, ionisation energy, electron affinity in the periodic table.
- Analyses equation.



2. Asking questions and making Hypothesis:

- Questions why elements exhibit common characteristics though they are special when compared to other elements.
- Discusses Mendeleef's hypothesis and proof's in a later period.
- Makes hypothesis on the properties of elements based on periodicity.

3. Experimentation- Field Investigation:

- Discusses Dobernair's triads Newlands Octaves, Mendeleef's Periodic law.
- Discusses the basis for the changes across a group-period.

4. Information skills and Project:

- Collects and analyses the information on elements hypothesised by Medeleef.
- Tabulates and displays the information related to the characteristics exhibited by different elements to periods and groups based on periodic table.
- Collects and displays the additional information needed to explain ionisation energy and electron affinity.

5. Communication through drawing Pictures:

- Prepares flow charts to explain periodic rules of Dobernair, Newlands and Mendeleef
- Prepares block diagram, flow charts to show the characteristic of modern periodic table.

6. Appreciation and aesthetic sense - values:

- Appreciates that different elements in nature exhibit diversified characteristics.
- Appreciates that Mendeleef's hypothesis became true that elements are arranged in an order.

7. Application to daily life and concern to bio-diversity:

- Identifies the diversity displayed in the arrangement of elements having different characteristics.
- Identifies the relation between groups and periods in periodic table and also the properties of elements
- Uses rules of periodic table in solving chemistry problems.



Chapter - X : Chemical Bonding

I. Key Concepts

Electrons, nobles gases, Lewis dot structures, octet rule, chemical bond, Ionic Bond,
Covalent Bond, cation, anion, electro static force, electrovalent polar solvent, formula of
molecules, ionic compounds, covalent compounds, electro positive character, electro negative
character, polar bonds, bonded pair of electrons, Ionic pairs, bond length, bond energy,
shape of the molecule, linear, tetrahedral, properties of ionic and covalent compounds.

II. Learning outcomes

1. Conceptual Understanding:

- Explains Lewis dot structure, rules of ionic and covalent bond, properties of matter, octet rule, molecular structure of water, oxygen valence bond theory, hyridisation.
- Differentiates between molecules of water and ammonia, ionic bond and covalent bond,
 σp-sp² and hybridisation.
- Explains the reasons for bond angle of molecules and their properties.
- Explains giving reasons for the stability of molecules, following the Octet rule and to participate in chemical bond.
- Comments on the molecular structure through the concept of hybridisation.

2. Asking questions and making Hypothesis:

- Questions to understand Lewis dot structure, properties of ionic and covalent substances and molecular structure.
- Makes hypothesis on the shapes of orbitals and the resultant molecular strucuture when participated in chemical bond.
- Imagines the shape of hybridised orbitals formed through hybridisation.
- Makes hypothesis on the consequences if bond angle of water is 108°

3. Experimentation- Field Investigation:

- Uses rules of chemical bonding to explain molecular structure through hybridised orbitals.
- Discusses the fundamentional aspects of Lewis dot method.
- Discusses Chemical bond and the resultant shape molecules and bond angle.



4. Information skills and Project:

- Collects the information about nature of substances, arrangement of molecules, bond angles and reasons for the bonds formed by bond angle.
- Collects the necessary information on relation between hybridisation and the shape of orbitals, prepares reports on it.

5. Communication through drawing Pictures:

- Draws pictures of molecular structures, method of formation of ionic and covalent bond through Lewis dot method.
- Analyses the molecular structures based on hybridisation.
- Makes models of shapes of molecules using sticks and beads.

6. Appreciation and aesthetic sense - values:

- Appreciates the formation of molecules through ionic and covalent bond.
- Appreciates that fact that some basic atoms in nature combine.
- Observes the special properties and nature like salt dissolves in water and not in kerosene, visualising the rules of chemical bonding.

7. Application to daily life and concern to bio-diversity:

- Identifies the diversity in substances being ionic or covalent.
- Uses the rules of chemical bonding in writing, balancing the chemical equation solves the problems.

Chapter - XI : Electric Current

I. Key Concepts

• Charge, potential difference, Electric current, multi-meter, Ohm's law resistance, Resistivity, Kirchoff's law's, Electric power, Electric energy.

II. Learning outcomes

1. Conceptual Understanding:

- Explains electric current in his own words
- Explains the difference between electric conductors and non conductors.



- Explains Drude and Lorentz theory to explain electric current.
- Elaborates the reasons for electric current.
- Explains the difference between electric current and potential difference.
- Explains Ohm's law.
- Explains on what values does the value of resistance depends.
- Explains series and parallel connections.
- Explains equivalent resistance.
- Explains electric shock, overloading, electric unit.

2. Asking questions and making Hypothesis:

- Quesitons method of wiring a house.
- Questions on overload.
- Makes hypothesis on how to solve problems on kirchoff's rule.

3. Experimentation- Field Investigation:

- Experiments to prove that resistance depends on temperature, nature of substance, length of the conductor and cross section area.
- Follows the precautionary measures while conducting experiments.

4. Information skills and Project:

- Collects information related to the reasons for resistance.
- Collects additional information on electric shocks.
- Collects information on role and making of fuse.

5. Communication through drawing Pictures:

- Draws diagrams showing the method of working of a battery communication through them.
- Draws diagrams of series and parallel connections.
- Draws diagrams showing the movement of electrons in conductor.

6. Appreciation and aesthetic sense - values:

- Appreciates the behaviour of electron which causes electric energy.
- Tries to prevent loss of electric energy.
- Implies aesthetic sense to the behaviour of conductors.



7. Application to daily life and concern to bio-diversity:

- Uses the concepts of electricity in daily life.
- Selects the proper to be used for fuse.
- Search and follows the ways to use electricity properly as it is the backbone of nation's development.

Chapter - XII : Electromagnetism

I. Key Concepts

 Magnetic flux, magnetic flux density, electric motor, slip rings, induced current, induced EMF, electric generator, DC and AC currents, Rms values.

II. Learning outcomes

1. Conceptual Understanding:

- Explains Oersted's experiment.
- Explains electro magnetic field and the importance of its features.
- Explains magnetic flux density using the concept og magnetic lines of force.
- Elaborates that electric wires can induce magnetic field.
- Explains right hand rule.
- Explains that a charged, electrical wire moving in magnetic field is acted upmE by force.
- Derives F=BIL.
- Elaborates the working of electric motor and electric generator.
- Explains through a situation relation between Faraday's principle and law of conservation of energy.
- Explains how to derive Faraday's principle from law of consevation.

2. Asking questions and making Hypothesis:

- Makes hypothesis and questions to explain Dersted's experiment.
- Maked hypothesis on how magnetic field induces force on moving charges.
- Questions on law of conservation of energy, Faraday's principle.



- Questions on what to do to make the electricity move round the wire in a motor.
- Questions about electric generator.

3. Experimentation- Field Investigation:

- Experiments to explain Faraday's principle.
- Conducts experiments to show that magnetic field induces force on electrified wire.

4. Information skills and Project:

- Collects information about Faraday's experiment.
- Collects information about Oersted's experiments.
- Collects additional information regarding electric motor and electric generator.

5. Communication through drawing Pictures:

- Draws picture on electric motor.
- Draws pictures of electric AC and DC.
- Draws necessary graphs to explain AC DC generators.

6. Appreciation and aesthetic sense - values:

- Appreciates the experiments of Oersted and Faraday.
- Appreciates working of electric motor and generator.
- Appreciates usefulness of law of conservation of energy.

7. Application to daily life and concern to bio-diversity:

- Uses generators and motors properly and also their theory.
- Solves the given problems.
- Puts efforts to save the labour of persons who invented electric motor and generator.



CHAPTER - XIII : METALLURGY

I. Key Concepts

• Minerals, ores, froth flotation, thermite process, distillation, poling, liquation, electrolutic refining, smelting, roasting, calcination blast furnace, reverberatory furnace.

II. Learning outcomes

1. Conceptual Understanding:

- Explains the basic forms(minerals) in which metals are available, methods of seperating the metals, refining them and processes like smelting and roasting used in extraction of metals.
- Classifies minerals based on their reactivity, methods of separating and methods of refining.
- Explains the reasons for non-availability of free metals in nature separating them using mechanical methods, conducting reduction reactions to get metals and for using furnace.
- Differentiates between metal and minerals, blast furnace and reverbatory furnace.
- Analyses the chemical reaction in chemical extraction.

2. Asking questions and making Hypothesis:

- Questions the stages in separating and refining the metals.
- Makes hypothesis on the reasons for the appearance of mineral in many forms in nature.
- Predicts the results of oxidation and reduction reactions of metals.

3. Experimentation- Field Investigation:

- Experiments on rusting and using electrolysis in purification of copper.
- Discusses the separating the ore through mechanical methods stages and methods of using different types of furnaces.

4. Information skills and Project:

- Collects information about the areas in out state and India as where various ores are found prepares a report.
- Prepares reports analysing the reasons for the occurrence of ores in different forms and their stability.
- Prepares a scrap with particulars of the minerals available in their surrondings like coal, limestone etc.



5. Communication through drawing Pictures:

- Draws the pictures of separating the minerals, electrolysis, furnaces etc. and comments on them.
- Draws pictures blowing the actions taking place in reverberating.

6. Appreciation and aesthetic sense - values:

- Appreciates that metals are present in the form of ores in nature.
- Shows interest in knowing the details of methods and equipments designed to extract different types of minerals.
- Appreciates persons and systems who are involved in extracting and refining minerals, production of metals and making many instruments and objects from them.

7. Application to daily life and concern to bio-diversity:

- Discusses on the process of extracting and its impact on environment.
- Suggest the measures for conserving bio-diversity by analysing mining and movements and struggles related to it.
- Co-ordinates the information from the lessons, chemical bonding and chemical equations to understand the chemical reactions taking place in a furnace, reactivity of metals and repeating the ores.

Chapter - XIV : Carbon and its compounds

I. Key Concepts

 Hybridisation, allotropy, diamond, graphite, buckminsterfullerene, nanotube, catenation, tetravalency, hydrocarbons, alkanes, alkene, alkynes saturated hydrocarbone, unsaturated hydro carbons, functional group, isomerism, homologous series, nomenclature, combustion, oxidation, addition reaction, substitution reaction, ethanol, ethanoic acid, ester, esterification, saponification, micelle.

II. Learning outcomes

1. Conceptual Understanding:

Explains about cantenation property exhibited by carbon method of hybridisation, allostsopes
of carbon, graphite, diamond, buckmisnsterfullerene, nanotubes, hydrocarbons, their



reactivities, functional group in carbon compounds method of nomenclature, products of soaps.

- Gives examples for different forms of carbon alkanes, alkenes, alkynes.
- Gives examples for carbon exhibiting catenation property and the functional groups changing the nature of substances
- Differentiates between different carbon forms their oxidation and reduction reactions sp, sp2, sp3 identifies similarities between diamond graphite, alkened alkanes.
- Analyses addition and substitution reactions of carbon compunds.

2. Asking questions and making Hypothesis:

- Questions to understand clearly nature of carbon catenation, method of nomenclature forms and structure of hydrocarbons.
- Makes hypothesis abour different hydro carbons based on functional groups and steps in nomenclature.
- Imagines the discoveries in future through catenation nature of carbon.

3. Experimentation- Field Investigation:

- Conducts activities to understand foam of a soap cleansing micelle and its nature.
- Experiments on esterification.
- Names carbon compounds following the 11 steps, writes formula based on the name.
- Discusses the methods and stages of hybridisation exhibited by carbon based on energy levels.

4. Information skills and Project:

- Ramu prepares tables on catenation of carbon, formation of plenty of products like alkenes, alkynes etc.
- Prepares reports on modern aspects like nanotubes, their uses and discovery of graphic.
- Prepares a news letter about preparation and uses of ethyl alcohol displays and discusses.

5. Communication through drawing Pictures:

 Draws pictures of carbon catenation, hybridisation, micelle, preparation of estes and explains about them.



- Prepares shapes of different hydrocarbons using beads and sticks based on nomenclature and exhibits them.
- Prepares flow charts on the preparation of hydrocarbons.

6. Appreciation and aesthetic sense - values:

- Appreciates formation of many substances by an element carbon through its nature of catenation.
- Congratulates the specialities of different atoms in reacting with carbon (Keeping in view the nomenclature)
- Identifies the greatness of carbon in producing a new substance and by products through a slight change.

7. Application to daily life and concern to bio-diversity:

- Identifies the importance and diversity of carbon displaying different types of reactivities bestowing many benefits.
- Applies the concepts of chemical bonding and electronic configuration wherever necessary to understand carbon catenation.
- Co-ordinates the principle behind cleansing by soaps and the usefulness of bond angle and shape of water in cleansing.



Essential Mathematical Concepts for a Physical Science teacher

Angle:

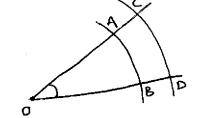
The concept of "angle" is used abundently in chapters like, reflection of light, refraction of light at Plane Surfaces, refraction of light at curved surfaces, human eye and colourful world. Hence the concept of angle has to be understood thoroughly. Do the following activity.

Draw two rays taking 'O' as initial point. Draw an arc AB with a fixed radius and 'O' as the centre. Similarly draw another arc CD with a radius different from the above.

Measure the lengths of OA, OC; are CD

Note:
$$OA = 08$$
; $OC = OD$

Calculate
$$\frac{AB}{OA}$$
 What did you observe?



The ratios are almost equal.

Note: The reason for these defects is that we measure the length incorrectly while measuring i.e if the radius is increased the length of the arc will also increase. Similarly if the radius is decreased the length of the arc will also decrease i.e. the ratio of the radius and the length of the arc becomes constant. Angle is defined as this ratio.

angle (
$$\theta$$
) = $\frac{length \ of \ the \ arc \ 1}{radius \ (R)}$

Angle can be represented using symbols like θ , α , β , γ , δ . Angle is measured in radians and degrees.

$$\theta = \frac{l}{R}$$

When the above formula is used, ' θ ' must be measured only in radians. The ratio of circumference $(2\pi R)$ and radius (R) is equal to 2π . So

$$2\pi$$
 radians = 360 degrees

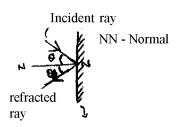
An angle is a property of two rays with a common point.

Note: While deciding an angle, two rays with common initial point must be identified.



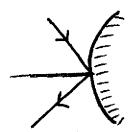
NN is the normal of plane mirror. The angle between incident ray and normal is called incident angle. The angle between refracted ray and normal is called refracted angle.

Why do we measure incident ray and the refracted ray with normal?



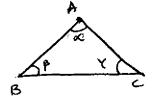
Observe the adjacent figure.

We've shown incident ray and refracted ray on a concare mirror Angle cannot be decided based on curved surface. But a normal can be decided for that surface at the refracted point. That is the reason we decide incident and refracted rays with normal.



Triangle: Exterior angles; interior angles.

The aspect given below is used in reflection of light - derivation of mirror formula for curved mirrors - Refraction at curved surface, process of image formation, refractive index formula derivation, human eye - colourful world. Triangle is a closed figure formed by three lines. It has three sides. Observe the figure - what is an interior angle?



ABC is a triangle.

 $\alpha \beta \gamma$ are interior angles.

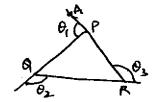
In the triangle the angle between AC, AB is called the interior angle of AC, AB. Let us represent this with α . Now tell how P and R are

formed?

Observe the picture.

What is an exterior angle?

How do we measure this?

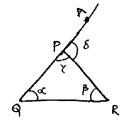


Let us extend RP. The angle between PQ, PA is called exterior angle. This is represent by with θ_1 . Similarly, say how θ_2 , θ_3 are formed ?

PQR is a triangle.

 θ_1 , θ_2 , θ_3 are called exterior angles.

Observe the adjacent figure.





PQR is a triangle. Its interior angles are α , β , γ . We know that the sum of these three angles is 180° .

$$\alpha + \beta + \gamma = 180^{\circ}$$

Can we say $\gamma + \delta = 180^\circ$ from the figure ? Extend QP. QA is a straightline. Straight angle at P is 180° , so $\gamma + \delta = 180^\circ$

$$\alpha + \beta + \gamma = \beta + \delta$$

$$\alpha + \beta = \delta$$

Sum of interior opposite angles = exterior angle

The sum of interior angles at the two ertices of a triangle is equal to the exterior angle at the third vertex. This is extensively used in the class X lessons mentioned above.

Trigonometric Ratios

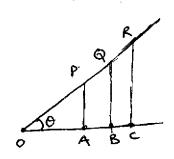
	Lesson	Context	Aspect needed
1.	Reflection of light	 Mirror formula of curved mirror (Fig - 32) Magnification (Fig - 34) 	Tan values
2.	Refraction of light at plane surfaces	Deriving Snell's law after conducting Activity 4 Fig (6-c)	Sin values
3.	Refraction of light at plane surfaces	Total internal Reflection (Fig - 7)	Sin values
4.	Refraction of light at curved surfaces	Image formation	Tan values
5.	Human eye and colourful world	Derivation of formula for refractive index Ex: 2	Sin values Values regarding different angels of Sin
6.	Electromagnetism	Activity-7 Before activity - 8	Sin values Sin values

Trigonometric ratios are extensively used in the contexts mentioned above. Let us know about them.



Do the following activity.

Draw two rays with 'O' as the centre. Identify points A, B, C on the parallel line. Draw perpendiculars to those points as shown in the figure. These perpendiculars intersected another ray at P, Q, R.



Angle is the common property of the two rays mentioned above. That angle is represented by $\boldsymbol{\theta}$ in the figure.

Is APO a right angled triangle?

If any angle of a triangle is 90°, then it is a right angled triangle.

Here angle at A is 90° hence APO is a right angled triangle.

In a similar way, can you identify the remaining right angled triangles in the figure?

BQO, CRO are two right angled triangles.

Measure the lengths of OA, OB, OC.

Measure the lengths of AP, BQ, OC.

Measure the lengths of OP, OQ, OR.

Calculate the ratios of $\frac{AP}{OA}$, $\frac{BQ}{OB}$, $\frac{CR}{OC}$.

What have you observed?

Observe that the result is $\frac{AP}{OA} = \frac{BQ}{OB} = \frac{CR}{OC}$.

(Note: There will be minor defects)

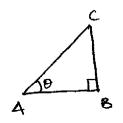
What do the above ratios depend on?

If the angle between the rays changes the value of the ratio too changes. So we can say that the above ratio depends on θ .

Calculate the ratios of $\frac{OA}{OP}$, $\frac{OB}{OQ}$, $\frac{OC}{OR}$. What have you observed?

We observe that

$$\frac{OA}{OP} = \frac{OB}{OO} = \frac{OC}{OR}$$



Even these ratios are dependent the angles. Let us definie the above ratios based on the right angled triangle. AB is a right angled triangle.

AC is called hypotenuse.

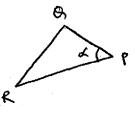
The side opposite to the angle θ , BC, is called opposite side.

In this same way the side adjacent to the angle θ , AB, is called adjacent side.

Note: Opposite and adjacent sides must be identified based on the angle.

Identify the opposite side, adjacent side and hypotenuse for the following figures.

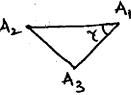
i)



opposite side adjacent side

hypotenuse

ii)



opposite side

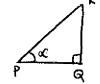
adjacent side

hypotenuse

PQR is a right angled triangle

We define
$$\frac{Opposite}{adjacent}$$
 side

We define
$$\frac{Opposite \text{ side}}{adjacent \text{ side}}$$
, $\frac{Opposite}{hypotenuse}$ and $\frac{Adjacent}{hypotenuse}$ as follows.



Tan
$$\alpha = \frac{Opposite\ side}{Adjacent\ side} = \frac{RQ}{PO}$$

We read Tan α as "tan alpha".

Sin
$$\alpha = \frac{Opposite}{Hypotenuse} = \frac{RQ}{PR}$$

We read $\sin \alpha$ as "Sin alpha".

$$\cos \alpha = \frac{Adjacent}{Hypotemuse} = \frac{PQ}{PR}$$

We read $\cos \alpha$ as "Cos alpha".

The above formula are used in the topics mentioned previously.



Note: Fix the values of Tan, Sin, Cos based on adjacent side and hypotenuse.

Use the following table wherever necessary.

	0°	30°	45°	60°	90°
Sin	0	1/2	$1/\sqrt{2}$	$\sqrt{3}/2$	1
Cos	1	$\sqrt{3}/2$	$1/\sqrt{2}$	1/2	0
Tan	0	$1\sqrt{3}$	1	$\sqrt{3}$	Cannot be defined

Approximations

(i) $\sin \theta \cong \tan \theta \cong \theta$ contents in which the above has to be used are given below.

Lesson

Content

- (i) Reflection of light De
 - Deriving mirror formula of curved mirrors drivation pictures 32;33
- (ii) Refraction of light

method of image formation (Pic-5)?

Note: The symbol \cong means that values given on left and right are almost equal.

In the above contexts $Sin \theta \cong Tan \theta \cong \theta$ is used. Let us see how.

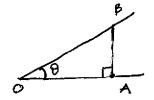
Observe the adjacent picture. Draw two rays with 'O' as initial point. Identify point 'A' on the horizontal parallel line. Let us draw a perpendicular at A as shown in the picture. It touches another ray at B. We know that ABO is a right angled triangle.

Let us assume that θ is the angle formed at O between two rays.

From picture

$$\sin \theta = \frac{AB}{OB}$$

$$Tan \theta = \frac{AB}{OA}$$



Yes.

Can you say what happens in the value of θ goes on decreasing (perpendicular must be drawn at A only)

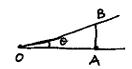


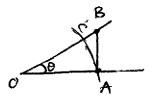
The value of OA will be constant. But values of OA and OB decrease. Observe picture-2.

Can we prove

Tan $\theta \cong \sin \theta \cong \theta$ based on the picture.

Do like this. Draw OA, OB as shown in the picture. Draw a perpendicular at A. Draw an arc with OA as radius. The arc intersects OB at C. Measure the lengths of arcs AB and AC. What did you observe.





We can say that there is a difference in values of AB and AC.

Draw the above picture decreasing the angle you'll observe that the difference between the length of side of AB and length of the arc AC. Similarly the difference in lengths of OC and OB also decreases. If we go on decreasing the angle the difference between the lengths OC and OB becomes less. In such cases the difference can be neglected. This doesn't mean that the difference is zero.

If θ is very less,

$$AB \cong AC, OC \cong OB; OA \cong OB$$

$$\tan \theta = \frac{AB}{OA} \cong \frac{AC}{OA} = \frac{length \ of \ the \ arc}{radius} = \theta$$

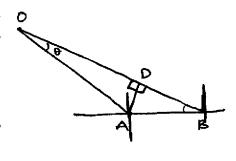
i.e.,
$$Sin \theta \cong \theta$$

 \therefore Tan $\theta \cong Sin \theta \cong \theta$ can be considered when θ is very less.

ii) Observe the adjacent picture. Draw a horizontal parallel line AB. Draw line segments OA, OB from point 'O' to A and B. From the picture we can say OA < OB.

Measure the lengths of OA, OB and AB. Record them.

Now draw a perpendicular from A to OB. AD becomes a perpendicular line to OB.



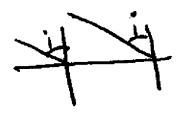
Let us assume θ is the angle between OB, OA.

Measure the lengths of OD and OA. Calculate OA-OD. Similarly identify the difference between OD and OA by decreasing the distance between A and B or decreasing the angle θ . What did you observe.



We came to know in the last section that as the θ becomes less OD \cong OA.

We can take that OA and OD are parallel. So the angles made by perpendiculars drawn at A and B are equal to the angles at OD and OA.



This is used in the lesson "Refraction of light plane surfaces" after Activity 4 in order to prove Snell's Law.

Congruent triangles

The following things are used in deriving the lens formula in the lesson "Refraction of light at curved surfaces".

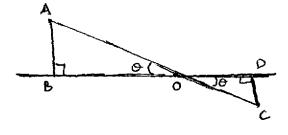
Draw a horizontal parallel line BD. Draw a line segment AC at point θ .

Draw perpendicular from A and from C on to the line BD. AB and CD are perpendicular to BD.

What can you say from the picture?

Is $\angle BOA$ equal to $\angle COD$?

We can say that $\angle BOA = \angle COD$ using a protractor since ABO and ODC are right angled triangles from $\triangle ABO$ we can write



Tan
$$\theta = \frac{AB}{BO}$$
 and

from $\triangle ODC$ we can write

$$Tan \theta = \frac{CD}{OD}$$

Calculate ratios of $\frac{AB}{BO}$, $\frac{CD}{OD}$

What did you observe? We observe that $\frac{AB}{BO} = \frac{CD}{OD}$

We can change it to $\frac{AB}{CD} = \frac{OB}{OD}$



This is the principle of congruent triangles. If the ratio of any two is same then they are congruent triangles.

Quadratic Equation

We've used Quadratic Equation in 6th example in the lesson "Refraction of light at curved surfaces". Let us learn this we call the equation which is in the form of

$$ax^2 + bx + c = 0$$
; $a \neq 0$

What is solving the equation?

Solving the equation means finding the value of variables.

Note: We use $(p + q)^2 = p^2 + q^2 + 2pq$ in solving the above equation.

How to convert $ax^2 + bx + c = 0$ to the above form $ax^2 + bx + c = 0$

dividing the equation with a we get the equation

$$x^2 + \frac{b}{a}x + \frac{c}{a} = 0$$

We shall change the above equation to

$$x^{2} + 2.x.\frac{b}{2a} + \left(\frac{b}{2a}\right)^{2} = -\frac{c}{a} + \left(\frac{b}{2a}\right)^{2}$$

add $\left(\frac{b}{2a}\right)^2$ to both sides.

$$\left(x + \frac{b}{2a}\right)^2 = -\frac{c}{a} + \frac{b^2}{4a^2}$$

$$\left(x + \frac{b}{2a}\right)^2 = \frac{-4ac + b^2}{4a^2}$$

$$\left(x + \frac{b}{2a}\right)^2 = \frac{b^2 - 4ac}{4a^2}$$

From this

$$x + \frac{b}{2a} = \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$



$$x = -\frac{b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$

$$\therefore x = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

 \pm means, you can a solution with + and another solution with -.

There are two solutions for a quadratic equation.

They are

$$\mathbf{x}_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$$x_2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

To get the above solutions the value of b^2 - 4ac should more than zero i.e., b^2 - 4ac > 0. Only then the solutions x_1 and x_2 are taken as possible values.

Proportion

This concept is used in-heat in the activity of deriving $Q = ms\Delta T$ in stating ohms law V = IR in current electricity; in $R = \frac{\rho l}{A}$. Let us observe this.

Proportion is of two types. They are

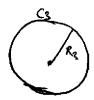
- (a) Direct proportion
- (b) Inverse proportion

Direct Proportion

Do the following activity.







Draw circles of different radii as shown in the picture. Measure their radii. Calculate their circumferences. Divide each circle's circumference by its radius. What did you observe?

The ratio of circumference and radius of a circle are equal by the same ratio to another circle. That means the ratio and circumference are a constent.

$$\frac{Circumference (c)}{Radius (r)} = Constant$$



In mathematical language we say that circumference is in direct porportion to its radius.

Circumference (c) = Constant \times radius of circle (r)

 \therefore Circumference (c) ∞ radius of the circle (r)

 ∞ indicates direct proportion generalisation.

Let us take x and y as countable components. Let us assume that value of y is dependent on the value of x. Then x is an independent component and y is a dependent component.

Let us assume

 y_1 is the related value x_1

 y_2 is the related value x_2

If we can prove

$$\frac{y_1}{x_1} = \frac{y_2}{x_2}$$

then we can mention the following:

- i) If the value of x increases then value of y also increases making the value of y/x constant
- ii) If the value of x decreases then value of y also decreases making the value of y/x constant

Graph

Let us take the value of x on X axis on a appropriate scale and the value of y on Y axis on appropriate scale. Let us mark the values of x & y in the graph. Let us join the points if the graph thus formed by joining the points is a straight line, then we say that the value of y is said to be in inverse proportion to the value of x. Based on the above explanation, we can write

$$y/x = constant$$

 $y = constant \times x$
 $y \propto x$

We say that y is inversely proportional to x. Can we measure the above constant through a graph.

Let us assume that the straight line forms angle θ with X-axis.

Value of Tan θ equals constant.



Can you say why?

Let us now take three components x, y, z.

If
$$y \propto x$$

 $y \propto z$ then we can write

$$y \propto xz$$

i.e
$$y = (constant) xz$$

Based on the above explanation

$$Q \propto m \quad (\Delta T - constant)$$

$$Q \propto \Delta T$$
 (m - constant)

We can write $Q \propto m\Delta T$

$$Q = constant m\Delta T$$

We show this constant as specific heat of the substance 'S'

$$Q~\propto~Sm\Delta T$$

Some tips:

We can write

- (i) If m, S are constant \Rightarrow Q \propto ΔT
- (ii) If m, ΔT are constant \Rightarrow Q \propto S
- (iii) If ΔT , S are constant $\Rightarrow Q \propto mS$
- (iv) If ΔT is constant $\Rightarrow Q \propto mS$
- (v) If m is constant $\Rightarrow Q \propto S\Delta T$

From $Q \propto S\Delta T$ we can write

$$\frac{Q_1}{Q_2} = \frac{S_1}{S_2} \frac{(\Delta T)_1}{(\Delta T)_2}$$

We can write many equations for the problems in a similar way and solve them.

Problem : 25,000 cal of energy is required to increase the temperature of 1 kg mass of water with specifi heat 1 cal/g-c° from 25° C to 50° C. How much heat is required to increase the temperature of 1 kg mass of iron with specific heat 0.1 cal/g-c° from 5° C to 15° C.



Solution : How many substances are there in the problem ? Two. What are they ? Water and iron. How many values are equal among the given values ?

Mass of the two i.e, water and iron are same constant.

So, which relation should we use?

We know that $Q = ms\Delta T$

 $Q \propto s\Delta T$ (m is constant)

$$\frac{Q_1}{Q_2} = \frac{S_1}{S_2} \frac{(\Delta T)_1}{(\Delta T)_2} - - (a)$$

Water: Specific heat $S_1 = 1 \text{ Cal/g-c}^{\circ}$

Increase in temperatures $(\Delta T)_1 = 50 - 25 = 25^{\circ} C$

Heat $Q_1 = 25,000$ Cal

Let us write similarly for iron.

Iron : Specific heat $S_2 = 0.1$ Cal/g-c°.

Increase in temperatures $(\Delta T)_2 = 15 - 5 = 10^{\circ} \text{ C}$

Heat $Q_2 = ?$

Let us substitute these values in equation (a)

$$\frac{25000}{Q_2} = \frac{1 \times 25}{0.1 \times 10}$$

$$\frac{25000}{25} = Q_2$$

$$\therefore$$
 Q₂ = 1000 Cal.

Thus the problems have to be solved. Now let us understand increase proportion.

Inverse Proportion

Let us first understand this with an example. Let us assume there was a running race. Let us take two persons Sudhakar and Eshwar. Sudhakar can reach the final point quicker than Eshwar who has more speed?



Note: Let us think their speed is constant we can say Sudhakar has more speed than Eshwar.

If Sudhakar ran with a speed of 10 m/s in 10 seconds how much distance did he run.

Distance = Speed
$$\times$$
 time
= 10 \times 10
= 100 m

If Eshwar took 12 seconds, what is his speed. The distance Eshwar ran is also 100 mts hence 100/12 = 8.33 m/s

The person with more speed reaches the final point in less time. In the same way the person with less speed takes more time to run the same distance. In mathematical language we say that time is inversely proportional to speed.

From this

Speed
$$\times$$
 time = constant

Speed =
$$\frac{\text{Constant}}{\text{Time}}$$

Mathematically this can be written as

Speed
$$\propto \frac{1}{\text{Time}}$$

Generalisation: x and y are two variables; x is independent component; y is dependent component.

 y_1 is the value dependent on the value of x_1

 y_2 is the value dependent on the value of x_2

If we can write

$$\mathbf{y}_1 \ \mathbf{x}_1 = \mathbf{y}_2 \ \mathbf{x}_2$$

then value of y_1 is inversely proportional to x. If y has to be directly proportional to x,

- i) When the value of x is decreasing, the value of y increases so that the value of xy is a constant.
- ii) When the value of x is increasing, the value of y decreases so that the value of xy is a constant.
 i.e.

$$yx = constant$$

$$y = \frac{\text{constant}}{x} = y \propto \frac{1}{x}$$

y is inversely proportional to x.

Let us know this through $Q = mS\Delta T$

We can write

- i) If Q, S are constant \Rightarrow m ΔT = Constant \Rightarrow m $\propto \frac{1}{\Delta T}$
- ii) If Q, m are constant \Rightarrow S Δ T = Constant \Rightarrow S $\propto \frac{1}{\Delta T}$
- iii) If Q, ΔT are constant \Rightarrow mS = Constant \Rightarrow m $\propto \frac{1}{S}$
- iv) If Q is constant \Rightarrow mS Δ T = Constant from (iii)

If mS = constant. Then from

 $Q \propto S\Delta T$. We can write $M_1 S_1 = M_2 S_2$

Problem : The same amount of heat is supplied to water of mass 2 kg and to iron of mass 20kg. As a result the temperature of water increased from 5° C to 30° C. If the specific heat of water is 1 Cal/g-c°, what is the specific heat of iron.

Solution : There are two substances in the problem. They are water and iron which physical values are constant?

i) The heat supplied to them ii) increase in temperature

Water: mass of water
$$m_1 = 2 \text{ kg}$$
 Iron: mass of iron $m_2 = 20 \text{ kg}$
Specific heat $S_1 = 1 \text{ Cal/g-c}^{\circ}$ Specific heat $S_2 = ?$

We know that $Q = mS\Delta T$

Sin Q and ΔT are constant mS = constant

$$\mathbf{m}_1 \mathbf{S}_1 = \mathbf{m}_2 \mathbf{S}_2$$

by substituting the given values in the above equation

$$2 \times 1 = 20 \times S_2$$

$$\therefore S_2 = \frac{2}{20} = \frac{1}{10}$$

$$S_2 = 0.1 \text{ Cal/g-c}^{\circ}$$





Annual Plan

1. Class: 10th Class

2. Subject: Physical Science

3. **Total number of periods :** 130

i) For teaching : 100

ii) For lab : 20

4. Academic standards to be achieved:

- 1. Students will explain the concepts of types of chemical reactions, acids, bases, salts, reflection and refraction of light at different surfaces, relation between atoms of a molecule, processes in the extraction of metals speciality of carbon. Gives examples and reasons.
- 2. Question to understand the above concepts. Makes hypotheses on the results of experiments conducted.
- 3. Conduct experiments on topics like specific heat, evaporation, types of chemical reactions, reflection and refraction of light at different surfaces, parallel and series connection of resistances. Participate in the field trips like collecting the samples of soil, find pH etc.
- 4. Display in the tabular form and analyse ohm's rule. Various informations related to the periodic table of the elements and strengths of acids and bases.
- 5. Draw pictures showing the experiments they've conducted, observations and the arrangement of tools. Explain by making models of electric motor and different molecules.
- 6. Develop regard to aspects like applications of reflection and refraction of light, physical science concepts in structure of eey and pH by applying them in daily life. Appreciates the efforts of scientists in arranging the elements in a proper order and thus making their study easier.
- 7. Use effectively lens, acids, bases, salts, carbon compounds and different chemical substances identifies the diversity in nature.



Plan of monthwise units division

Month	Name of the unit	No. of Periods	Programmes to be conducted CCE
1	2	3	4
June	Heat	08	Lab activity
July	Chemical reactions - equations	08	Conducting activities, collecting information, discussion
	Reflection of light	08	Conducts experiment with different lenses
August	Acids, bases, sath, refraction of light at plane surfaces	08	Collecting information field trip
September	Refraction of light at curved surfaces	10	
September- October	Refraction of light at surfaces	08	Interview, guest lecture by a doctor
October	Atomic structure	05	Model making
November	Classification of elements periodic table	10	Periodic table
November- December	Chemical Banding	10	Model making
December	Current Electricity	09	Guest lecture by an electrician, interview
December- January	Electro magnetism	10	Conducting activities making models of electric motor and solenoid
January	Metallurgy	05	Preparing flow chart drawing diagrams face to face with metallurgy specialist
February	Carbon - its compounds	12	Conducting activities discussion, seminar FA4
March	Revision classes		SA-3



Lesson Plan

Name of the lesson: Carbon and its compounds

Class: 10th Class

Periods: 12

Academic Standards:

1. Conceptual Understanding:

- Can explain the concepts like extraordinary properties of carbon, hybridisation, allotropy womenclature and the like.
- Classifies hydrocarbons into saturated and unsaturated hydrocarbons, carbon allotropes inito crystalline and amorphous.
- Can tell the differences between diamond and graphite.
- Can tell the similarities between alkenes and alleynes.
- Can give examples to different hybridised atoms and carbon allotropes.
- Can give reasons for alkanes participating in substitution reactions., alkenes and alkynes participating in addition reactions, using hydrocarbons as fuels.

2. Questioning - Making hypothesis

- Questions on concepts like action of ethanol with sodium, soap, cleansing method catenation and isomers etc.
- Make hypothesis about the gas released in action of ethanol with sodium by observing it.
- Make hypothesis about how many isomer can a carbon compound have.

3. Experiments, Field trips:

- Conduct an experiment to explain esterification (action of ethanol with acetic acid)
- Conduct an experiment to identify the gas released in the action of ethanol with sodium.

4. Information skills:

- Collects information about the carbon compounds used to ripen the fruits artificially.
- Conducts a project to test the cleansing property of different soaps.



5. Drawing pictures - model making:

- Can draw pictures of molecular structure of ethane, molecular isomers of any carbon compound.
- makes models of structures of diamond and graphite.

6. Appreciation, Aesthetic sense:

• Appreciates the role of carbon compounds in daily life.

7. Daily life application and concern towards Biodiversity

- Creates awareness in the society by knowing the bad effects of alcohol.
- Shall be aware of saving fuel.

Teacher's notes (additional resources, programmes)

- 1. Should observe the intermediate textbook to remember nomenclature of carbon compounds easily.
- 2. Should observe the NCERT book for additional information on soaps saponification : miscell.
- 3. Information from science magazines about the latest allotropes of carbon.
- 4. Information about the nomenclature of carbon compounds from internet.

Teacher's Reflections

Teacher should record the responses of students and self evaluation after completing the lessons.



Carbon - its compounds

$\displaystyle \bigvee_{7}$	Nomenclature	of carbon	compounds	activity-1	IUPAC	nomenclature					
$ ightarrow$ $^{ m q}$	a) Isomerism	b) Homologons	serie	c) Constructive	isomerism	d) alkane	homologous series	alkene	homologous series	alkyne	homologous series
$ ightarrow \mathbf{q}$	Hydro carbons	functional groups	A) 1) Saturated	2) Unsaturated	B) Alcohol,	alkahyde	ketone	Carboxylic acid	ether	ester	amine
$ ightarrow$ $f Q_{_4}$	Nature of	Carbon	1) Catenation	property	2) Multiple	ponds					
$\rightarrow_{\rm q}$	Carbon	allotropes	1) Amorphous	allotropes	2) Crystallive	allotropes					
$\rightarrow_{\rm q}$	Hybridisation	types	1) SP ³	2) SP ²	3) SP						
 →	Introduction	importance of types	carbon								

\rightarrow	\mathbf{P}_{12}	Cleansing	property of	soap						
\rightarrow	\mathbf{P}_{11}	Soaps	Saponification	preparing soap	froth particle	miscelle				
\rightarrow	\mathbf{P}_{10}	Some important	carbon compounds	ethanol	ethonoic acid	ethyl acetate				
\rightarrow	\mathbf{P}_{9}	Carbon compounds	chemical properties	a) Combustion	b) Partial oxidation	reactions	c) addition	reactions	d) Substitution	reactions
	${f L}^{8}$	Counting	Carbon	atoms	prefixes &	suffixes	functional	groups		



Period wise allotment

Period	Content	Strategy	TLM/Resources	Evaluation
1.	Importance of carbon	discussion	Chart, text book	What is the valency of carbon? Electronic configuration of carbon in excited state
2.	Hybridisation	Display, Discussion, Group activity	Ball and stick model chart	 Shape of molecule with SP³ hybridisation Number of σ & π bands in ethyne?
3.	Carbon allotropes	Display Discussion	ball and stick model chart	 Say the reason for using graphite as say as similarities and differences between graphite and diamond
4.	Nature of carbon	Display Discussion	ball and stick model chart	Which bonds are formed between carbon - carbon ?Give examples
5.	Hydrocarbons functional groups	Discussion	chart	 Mention the common ketone and write molecular formula Matching
6.	Isomerism Homologons series	Display, Discussion	Chart	 CH₃OH C₂H₅OH C₃H₇OH Do the above compounds belong to the same homologous series or not Write isomers of C₄H₁₀



Period	Content	Strategy	TLM/Resources	Evaluation
7.	Nomenclature of carbon compounds activity-1	Discussion Group activity	Chart, text book	Name of CH3-CH-CH2-CH3 Structural formula of bute-2-gne
8.	Counting carbon atoms	Discussion	Text book, Flash cards	Suffix of the functional group of alcohols
9.	Chemical properties of carbon compounds	Display, Discussion	Text book, Chart	
10.	Some important carbon compounds ethanol, ethanic	experiment display, discussion	ethyl alcohol, acitic acid, beaker, test tube burner	How can you say that esterification is
11.	Soaps - saponification action - Micelle	Display	Test Tubes, Cooking Oil	What materials are used in the preparation of soaps.
12.	Cleansing property of soap	Display Discussion	Text books, Chart, different kinds of soaps	Say the different stages to show the cleansing property of soap. Draw pictures.



Steps for teaching the lesson

While teaching science (Physical Science, Biological Science), teachers should keep in mind the academic standards of that particular class and accordingly prepare teaching learning strategies in order to achieve science teaching objectives.

- Teaching should not be same for all the lessons and according to the content of the lesson the teacher should prepare and implement the strategies like experiment, observation, collecting the information, field trip, interview, project etc.
- Teacher should not read the lesson insted give the choice to read the content and analyse it through descussions, questions.
- Create amicable situations for the children to question and to express their views freely.
- While conducting the experiments try to develop the processing skills like arranging the
 equipments, observing, noting, analysing and coming to conclusion in order to understand the
 content.
- The teacher should not expect only correct answers at the time of class room discussion instead accept their views when they express freely.
- The teacher should make the children to think by asking the questions of multiple answers.
- Teacher should try to make the children to guess the results by asking, questioning them different variables/alternatives while doing the experiments.
- Invite the professions, subject experts to teach the children whenever the teaching demands.
- Try to develop the qualities like mutual cooperation and mutual exchange by creating group activities.
- Prepare prior the needed equipments, materials in order to teach the lesson. The teacher should go through the library books and make notes on the content related issues, so that she/ he can teach the lesson more thoroughly, analytically.
- Teacher should recognise the achieved acadamic standards among the children and assess them how far they have achieved as a part of teaching.
- Teacher should analyse the results of assessment and give feed back to the children and help the children to achieve their standards.



How to teach Science?

Science Class room should be a dias to questions and learing by doing researches. It means that organization of teaching learning processes should keep in mind the nature of science and educational objectives, reading the information for the text books, explaining them, learning the answers to the questions etc., are opposite process to the nature of teaching science. Hence discussions through motivating questions to make the children think, organising the activities inorder to understand the process by adding teacher's experiences is necessary.

Science learning starts with questions. Hence teacher should encourage the children to question and express their doubts at Science freely. Discussions should give scope to express their views. Discussion should not limited to the concepts of the text book only, but there should be related items that helps to know those concepts perfectly. Scientific findings did not happen suddenly, those are not permanent truths alos. Teacher should explain the students that we are all able to know these things by the continuous and consistant researches and the teacher should also develop scientific thinking among the children in such a way that these findings are not permanent and there may be happen new findings in the future and should discuss on these topics.

The science concepts should be such a way that the children will be able to understand them through observing their environments and by doing researches. For this they have to conduct the experiments instructed in the text book. If the teacher explain the results of an experiment without doing it the children may misunderstand it. If the student does not know the basic issues learning science in higher classes becomes complex. Hence conducting experiment should not become mere exhibition instead it should be learning by doing and should be beasible to discuss on the results and come to a conclusion. In a science class room teaching strategies like questioning, discussion, individal-group, whole class activities, project works, conducting enterviews, seminars, symposeums, collecting the information, reports, analysing it, drawing diagrams, making models, conducting quize, writing letters, essays, slogans, makign alternative instruments, conducting experiments by using them field trips etc., should be used according to the needs.

Let's observe what steps teacher should follow in a period teaching:

I. Introduction

- 1. Greeting
- 2. Mind Mapping
- 3. Inquisite Questions
- 4. Saying the lesson name



II. Reading the Lesson : 1. Reading the lessons, recognising the words and

concepts that they do not understand.

2. Discussion in Groups.

3. Teacher explaining by writing on the black board.

III. Organising the Activities

understanding the concept : 1. Doing the activities in group.

2. Writing the reports, drawing the diagrams, making

models and graphs.

IV. Exhibition - Discussion : 1. Exhibiting reports, diagrams, models that the students

prepared.

2. Write the thoughtful questions on the black board

and based on children's exhibitions explaining and

discussing the lesson.

V. Conclusion - Evaluation : 1. Giving a brief conclusion on the discussed concepts

of the lesson.

2. Ask the children to write answers to the questions

on thier own reading the lesson for the next period,

collecting the necessary material and information.

The importance of the lesson, academic standards or objectives of the lesson that are going to be achieved through the unit should be discussed in the first period only.

 Academic standards to be achieved: Try to achieve the seven academic stands of the science upto the completion of the lesson. Hence teacher should notice that which concepts are there in a period and determine the academic concepts accordingly.

• Importance of the Lesson: Teacher should explain the importance of the lesson in such a way that why should they learn it and what profits are they are going to get through it.

• Mind Mapping:

Creating: Besides greetings like 'good moring', 'how are you' teacher should greet them with rythemic claping, small games, puzzles, by giving half of the picture ask them to think of the second half like different styles.



- Mind Mapping: Mind mapping should be in the first period of the lesson only. Teacher should write correct key word on the black board ask the children to say in their own words their concepts towards that word, examples, characters, properties and write them on the black board. It's not a trail to make them the little of the lesson. Some times lesson name will be the key word. But it's not always possible. Key word should be close / near concept to the lesson.
- Asking inquisite questions: Discuss and ask the students probing questions make them think the related concepts based on the key word and write the key issues on the block board. Motivate the children to learn the lesson with interest. Make the students ready to larn the concepts of the lesson. Mind mapping should be done in the first period of the lesson only. Later periods should start with the probing questions and thoughtful questions on the learnt issues of the earlier periods.
- Reading: Recognising key words: Ask the children to read individually the lesson which the teacher decided to teach in the period of that day. While reading the lesson, make them recognise the concepts they do not understand, nwly introduced words. Teacher should write them on the black board. Make the students discuss them in groups. Teacher should explain them and ask them to question on which issues they wanted to learn in the lesson.
- Conducting the Activities understanding the concepts: Ask questions in order to understand the concepts of the lesson and to clear their doubts. Make assumptions to solve the problems. Make them do the experiments to determine the assumptions. Ask the students to prepare equipments for this, conduct the experiment enrolling it, collecting and analysing the information as part of problem solution individually, in groups through different processing skills. Ask them to organise the projects and analyse the results.

They should express the learnt concepts through drawing the diagrams and labelling them. Make them prepare gradual process, draw the pictures that show observatory works and preparation of models, alternative equipments. Make them talk to develop the quality of appreciation in recognizing the greatness of the findings and scientific findings in the lesson. Develop the sense of saving the environments by recognising the biodiversity. The activities should be in such a way that they should apply the class room knowledge in their real life.

For the understanding of the above concepts the following activities should done in the class room teaching learning process:

1. Preparing experiments, projects, field trips, collcting the information and tables.



- 2. Analysing the information from the tables, determing the results.
- 3. Organising interview, quize, seminar, symposium.
- 4. Write reports and methods for the conducted experiments and observations.
- 5. Drawing maps, graphs for the observations, experients, drawing the diagrams labelling explaining and making models.
- 6. Make them read historical issues of the science, stories and thesis.
- 7. Make them prepare essays, posters, logos, songs, stories and cartoons.
- 8. Collecting the information for conducting / organising wall magazine, children's diary, school magazine, theatre day.

Note: This step in the period plan changes according to the topic. See in the new text book 'explanation of the topics' chapter to know how to conduct a selected topic in a period. Prepare this step in your plan according to these instructions. Teacher should collect and make ready of the necessary materials, equipments and things. Teacher should write thoughtful questions on the black board and discuss with the students if there is only information and no activity).

Demonstration - Discussion : In order to understand the concepts students participate in many activities. Make different items. Ask them to demonstrate all those. Discuss on them write the main items on the black board. Based on this analyse the items that the children have prepared write the thoughtful questions on the board which help to analyse, discuss the lesson.

Conclusion - Evaluation : At the end of teaching, learning provide chance to the children to revise what they have learnt. Teacher should follow many methods in this. Asking each student to tell each item and making a conclusion, making conclusion with only one student or teacher himself/herself guiving conclusion.

Evaluation should be done in two ways. It should be an internal part while teaching and the second one after teaching.

- Give chance for diverse responses in evaluation.
- The topics in the text book like discuss in groups, write what you have noticed, complete the tables etc., should be taught as part of the teaching. That means that teaching the lesson and evaluation occurs at a time.
- Evaluation should not be at a specified time but it should be situationally.





- Ask them to discuss in groups and write responses on their own regarding the items in the topic what we have learnt in a period.
- Make them do individually the items in the topic. Let's improve our learning.
- Either teacher or fellow student should observe the stundents' note books and their activity papers.
- Create activities for home work. Like this the teacher should implement the teaching learning strategies according to the above steps. Instead of role learning, mugging up, writing as it is from the text books, guides, question banks, mechanical reading, mechanised systems, teaching learning strategies should help the students to learn meaningfully.
- Interactions, self expression, questioning should become key in teaching learning processes.
- Experiments, searchings, activities, project works, games etc., should become key and internal part in teaching strategies and teaching learning processes.
- Teaching learning strategies are not that teacher explain or read them. Teachers should motivate
 the students to learn and participate. Use necessary material, make them available and provide
 learning atmosphere.
- Teaching learning strategies, process should be in such a way that the students learn individually
 or with the fellow students through teachers, materials. Learning time of the students should
 be completely utilised.
- The arrangements / atmosphere should help the students to learn in their own language. Teachers should use student's language.
- Organisation of the teaching learning strategies should start with the children's experiences, their earlier knowledge.
- Local arts, productive items, experiences of the hard working people should be used as resources in teaching learning strategies, processes.

Students learning is an important issue in effcient organisation of the school. It depends on the teaching learning strategies that the teacher follows. To make the students construct the knowledge in the class room teacher should impliment different teaching strategies.

• **Discussing - Mutual interactions :** Teacher, students should discuss every item in the class room. Mutual interactions must be done effectively. Every discussion should help to understand the concepts.



- Making them to read the lesson: Make every student read the lesson. It leads to understand the concepts.
- **Questioning:** Usually children have questioning nature. Hence develop among them the capacity of asking thoughtful questions on different concepts.
- **Doing research experiments:** Organise the experiments to determine experimentally what the students have learnt. Make them understand the content by discussion while doing the experiment. Make them decide the results, and follow the cautions.
- Observations Searchings Problem Solution: Develop problem solution abilities among the students. Help the students to select a problem and find solutions for it.
- Project Works: Project is a process of selecting a problem and to solve it they will follow
 many steps in order to come to conclusion. Hence it should be helpful to utilise children's
 inmate and creative abilities.
- Field Trip: As a part of it try to develop the skills like observing, analysing and determining.
- Collecting information Analysis making tables: Students follow so many methods in order to learn the things. Help the students to classify the collected information and note it down in the lables by analysing on their own.
- Writing Reports: Develop the abilities to write comprehensively in a report of the collected information, its method and style of collecting. Ask them to exhibit the information in the forms of graphs, picutres.
- Quize: Make the students organise and participate in quize competitions to develop curiosity, zeal among them on the key related issues of science.
- **Seminar symposium :** Encourage the students to select subject oriented items, collect the related information and express their views. Seminars should help the students to express their views and comprehensive understanding of that topic.
- Filling and making puzzles: Students fill the puzzles with much curiosity. Through these we can make them understand the content and can evaluate it also. Hence we should encourage the students to fill the puzzles and to create them.
- Making models, graphs, picutres: Encourage the students to draw the pictures in order to understand the concepts and their methods. Encourage them to use graphs to analyse the information to know the results and to determine. Encourage the students to develop aesthetic sense besides the subject awareness in making the models.
- **Preparing Scientific stories, poems, songs:** Encourage the students to prepare and collect scientific stories, poems, songs and make them discuss on them. Encourage the students to





form scientific concepts, to recognize the importance of biodiversity and appreciate them through reading the stories, poems and songs.

- Making cartoons and comments: Students show curiosity towards cartoons. Teacher himself/herself should prepare scientific, curiosity, creating cartoons. Encourage them to prepare cartoons on and captions on health, habits, life skills etc.
- Organising speeches with local professionals: Arrange a special programme in shool and organise vocational speeches with the local professionals. So that encourage the students to honour the professions, inspire and understand.
- Conducting Interviws: Conduct oral interviews to know student's thoughts, openions and views. Encourage the students to say the answers, to express their views without any stress. Interview should help the students to encourage them to clarify their doubts.
- Making Alternative Equipments: Teacher should discuss the topic before conducting the
 experiment and encourage the students to develop concepts and make assumptions. Encourage
 the students to conduct alternative experiment for every experiment. Help them to understand
 the content by discussing while doing the experiment.
- Using Libraries, internet: Besides the information from the text books teaches should
 collect it from the newspapers, magazines and internet. Make them available to the student
 and encourage them to collect more. Encourage the students to recognise the importance of
 biodiversity, to think deeply about the content and to appreciate contents and findings of the
 science.
- Reading Science histories: The results of science now we are seeing are not find out suddenly. These are the continuous efforts of the scientists for centuries together. After one scientist finding out a new thing another scientist make it base and finds out some more new findings. For example so many experiments had done to know our breathing air is oxyzen. By reading the histories regarding the findings of the science create interest and appopriate attitude towards science.



VI. 10th Class Examinations - Reforms

A. Need of the Reforms

- The aspect that is to be worried about is mainly the role played by 'school'. The role of school is reduced to prepare the children mechanically for their exams limiting their knowledge to textbooks. Learning by rote memory and mechanical completion of syllabus do not prove to be beneficial for achieving the objectives of education. A school must enable the children to explore, search, discuss, read the reference books, discriminate and analyze. When these are kept in view, the present system of examination has to be changed.
- The class X is treated as an important class and more focus on examination outcomes. Therefore, the syllabus of class X is being completed much earlier than decided months. The teaching is mostly aimed at examinations and school encouraging memorizing the answers with the help of guides, study materials etc. Most of the time the children are confined to reading and re-reading the texts and memorizing the answers. There is no opportunity and space for children to think on their own and construct answers applying their knowledge and experience. There is stress and anxiety in the entire preparation for class X on the part of the children and teachers. The schools are confined as coaching centres without much focus on developing analytical and logical thinking on the part of the children and develop knowledge and wisdom.
- The examination pattern and system is not focusing on testing the children's logical, analytical and communication abilities. Though the children are getting good marks, it do not reveal their abilities and competencies. There is high expectation on the part of the children at class X in terms of marks which leads to pressure on the children and they resort to various types of incidences. Therefore, it is required to take up appropriate reforms at class IX and X, which actually reveals the original potentialities and abilities of children. The entire process of education should aim at developing, thinking, analytical and communication skills among the children in a democratic climate.
- School should function for the all-round development of children. For their all-round development, children should participate in various activities and programmes to develop



physically, mentally, socially, emotionally and morally. Presently, teaching is limited to languages, Science, Mathematics, Social Studies. Only these are being evaluated. Teaching must take place considering Health & Physical Education, Arts & Cultural Education, Work & Computer Education and Value Education & Life Skills as curricular areas. They should not be treated as co-curricular activities. Even these areas also be evaluated periodically.

- The most important person in school education is teacher. Development of the students depends on the activities and programmes conducted by the teacher. Unfortunately all these activities are kept a side and giving utmost importance to only information oriented examinations. As a result of these teachers are not being trusted. If teachers are believed and given responsibilities fixing the targets we can achieve better results than now. Hence, the evaluation methods need to be reformed in this angle. Instead of allotting the complete weightage to the public exams, we should consider teacher at school level and some weightage must be given to internal assessment or Formative Assessment.
- In this present situation, children are under stress as evaluating them is just limited to exams. Alternate aspects must be included to avoid pressure among children. Project works, experiments, assignments, children's notebooks and children's participation must be made use of while evaluating their performance.

B. Reforms in class IX and X – Background

- APSCF-2011 was framed in accordance with RTE-2009 and NCF-2005. The textbooks from classes I to X are revised (modernized) on the basis of APSCF-2011.
- The new textbooks aim at achieving the class wise, subject wise, targeted competencies and developing multifaceted personality and competencies such as thinking, self expression, analysis, logical representation etc.
- Developed Position Papers and approaches to teaching in all the subjects focusing on the changes that are to brought in the Department of Education in the State. Similarly a Position Paper has also been developed on the reforms in examination and make examinations away from rote memory.
- CCE for classes I to VIII is being implemented in the State since April, 2010 with a focus on projects, self expression, change in the nature of questions etc.
- A shift in the nature of teaching learning processes and engagement of the children in learning
 process with activities, dialogue and discussions, projects, experiments etc. The very process
 of experiencing and knowledge construction have been changed.



In view of changes as above in the school curriculum, textbooks, teaching learning process, it is necessary to change the way we assess the children i.e. what to be assessed, how to be assessed and feedback procedures etc. it become necessary to bring reforms in class IX and X examination.

C. Guidelines

Series of actions contemplated by SCERT for developing proposals on SSC Examination reforms

- Conducted a meeting with textbook writers and experts on the proposed SSC examination reforms during September, 2013 and discussed the issue.
- Based on the above discussions and the existing CBSE pattern, draft proposals have been formulated.
- A meeting was conducted with subject specific teachers, headmasters, Mandal Education
 Officers, academic officers of AP residential institutions, representatives from private school
 managements during March, 2014 and discussed the draft proposals and formulated the second
 draft.
- The draft proposals have been sent to all the RJD SEs and DEOs in the State and requested
 them to discuss on the draft proposals and submit a report with suggestions and proposed
 changes. Accordingly, the DEOs conducted meetings with teachers and submitted their opinions
 and suggestion to the Director, SCERT.
- A request was made to all the teacher organizations in the State duly furnishing the draft proposals with a request to discuss the same and attend a meeting to submit their opinions and suggestions. A meeting was convened with teacher organizations on 26th April, 2014 at SCERT where in the teacher organizations presented their opinions and suggestions.
- A meeting was conducted by the Principal Secretary, School Education (PE & SSA) with Director SCERT, Addl. Directors of School Education, selective DEOs, Principal and staff members of CBSE schools, Professors of SCERT on 3rd May, 2014 at Conference Hall, J-Block, Secretariat, Hyderabad and discussed on the proposed class IX and X examination reforms. The members interacted presented their opinions and suggestions.

Based on the above meeting and discussions a penultimate draft on SSC examination reforms have been developed as given here under.



PROPOSALS

a) Quantitative aspects:

1) Number of papers for each subject

- Two papers for each language subjects i.e. Telugu, English, Hindi, Urdu etc., except second language (Telugu/Hindi).
- Two papers for non language subjects i.e. Science, Social Studies and Mathematics viz., Science–Paper 1 Biological Science, Paper 2 Physical Science; Social Studies–Paper 1 Geography and Economics, Paper 2 History and Civics; Mathematics–Paper 1 numbers, sets, algebra, progressions, coordinate geometry and Paper 2 geometry, trigonometry, mensuration, statistics, probability etc.

b) Papers and Marks:

Subject	Total Marks	Paper I Marks	Paper II Marks	Formative Assessment Marks
First Language				
(Telugu/ Hindi/ Urdu etc.)	100	40	40	20
Second Language (Telugu/ Hindi)	100	80	-	20
Third Language (English)	100	40	40	20
Mathematics	100	40	40	20
Science	100	40	40	20
Social Studies	100	40	40	20
Total	600	280	200	120



c) Marks weightage and duration of examination

- For all subjects—Telugu, Hindi, English, Mathematics, Science and Social Studies—Every subject will have two papers and each paper is for 40 marks and the examination duration is 2 hours and 30 minutes in addition to 15 minutes for reading the question paper, but for second language (Tel/Hindi) time duration is 3 hrs in addition to 15 minutes for reading the question paper.
- The summative examinations which is school based for class IX and the final summative is of public exams at class X conducted by Director, Govt. Examinations. Each subject will be conducted for 80% of marks. The remaining 20% of marks are through internal assessment i.e. Formative Assessment [FA].
- The average of four formative assessments conducted in an academic year will be accounted for 20% of marks i.e. the average of four formative assessments will be taken and accounted for 20% of marks in class X public examinations.
- Conduct one paper on each day except on general holidays.

Summative Assessment:

- Three summative tests must be conducted in each academic year for classes IX and X. In case of class X, public examination will be in place of third summative test to be conducted by the Board of Secondary Education.
- First and second Summative Assessments shall be conducted by schools itself through preparing
 question papers for 80% of marks. This ensures that the children are trained to write public
 exams. The remaining 20% of marks shall be awarded on the basis of the Formative Assessment.
- The summative assessment for class IX and 1st and 2nd Summative Assessment in class X must be on the lines of public exams.

The questions must be developed based on the blue print reflecting the academic standards.

d) Internal and external weightages - Formative and Summative:

80% of marks in each subject for the summative/external public examinations and. the 20% of marks for the proposed internals under formative assessment. The areas and marks for the formative assessment is given here under.



Sl. No.	Item for Formative Assessment	Marks
1	Language subjects – Reading storybooks, children literature, newspapers etc. and reflecting in terms of writing and	
	presentation in the classroom.	5
	Science – Doing the experiments and writing in the record.	
	Mathematics – Generating Mathematical problems under various	
	concepts – Writing and presentation in the classroom.	
	Social Studies - Reading the text and interpretation and	
	reflections on contemporary social issues through writing and	
	class room presentation	
2	Children's written work in their notebooks – Self expression/	
	writing to the questions/ tasks given in the exercise part under each	
	unit/lesson. The children shall not copy the answers from guides/	
	study materials etc. but they should think and write on their own.	5
3	Project works	5
4	Slip test	5
	Total	20

- A separate notebook for each subject for the formative assessment pertaining to three items of serial numbers 1, 3 and 4 of the above table shall be maintained by each student. However, in case of serial number 2 i.e. a separate notebook may be maintained by each child. These notebooks reflecting children works must be preserved which will be the basis for awarding marks by the teacher and for the verification of officials whenever required.
- The average of four FAs will be accounted for 20% of marks in public examinations under each subject.

Verification of internal marks and submitting to O/o Director, Govt. Exams:

After completion of the 4th Formative Assessment, the headmaster should verify all the records
for the above internal tests and keep ready for external moderation committee and submit the
details of the marks to the SSC board after committee verification and approval, in a fixed



format through on-line. The programming part of this for submission of internal marks from schools will be done by Director, Govt. Examinations.

 10 to 15 schools in two or three Mandals shall be considered as a unit for monitoring and moderating. The moderation committee formulated by the DEO, shall observe all the schools assigned in the given Mandals both government and private and verify the marks, grades awarded for internals and as well as co-curricular activities.

e) Pass marks and minimum marks for passing

- 35% is the pass marks for all the language and non language subjects.
- In case of formative assessment (internals), 20 marks each for all the subjects except Science i.e. 10 marks for Biological Science and 10 marks for Physical Science.
- Student must score a minimum of 35% of marks in each subject which includes both internals and externals. Students must secure 28 marks in external public exam.

Pass marks in Second Languages:

• The pass marks for second languages i.e. Hindi, Telugu etc. will be 35% on par with other language subjects.

f) Grading

• The marks based grading for classes IX and X with the range is given here under.

Grade	Marks in Languages	Grade points
(100 M)		
A1	91 to 100 marks	10
A2	81 to 90 marks	9
B1	71 to 80 marks	8
B2	61 to 70 marks	7
C1	51 to 60 marks	6
C2	41 to 50 marks	5
D	35 to 40 marks	4
Е	0 to 34 marks	3



Cumulative Grade Point Average (CGPA) will be calculated by taking the arithmetic average of grade points.

g) Other curricular subjects (Co-curricular areas) - Evaluation

- Co-curricular activities i.e. Physical & Health Education, Arts & Cultural Education, Work & Computer Education, Value Education & Life Skills are the part of the school curriculum.
 Periods have been allocated in the school timetable for transaction of these areas. These areas are now included for assessment in classes IX and X. Each area has 50 marks.
- Grade details of these subjects are to be recorded in the memorandum of marks of class IX and X. The 5-point grade scale is applied to these areas i.e. A+, A, B, C and D.
- No public exam shall be conducted in these subjects. However, these areas will be evaluated
 for three times in an academic year i.e. quarterly, half yearly and annually. Teachers shall
 observe and award marks. The average will be taken into account and the details of grade must
 be submitted on-line by HM to Director, Govt. Exams after verification by the moderation
 committee.
- HM should allot the responsibility of conducting these co-curricular activities followed by
 assessment to the teachers. Initially, choice may be given to the teachers to select the areas
 based on their interest. If it is not possible, the HM should allot co-curricular activities to the
 working teachers as suggested here under.

Ex:

- Value Education & Life Skills to language teachers/ Social Studies teachers.
- Art & Cultural Education to Social Studies teacher/language teacher
- Work & Computer Education to Physical Science/Biological Science teacher.
- Physical & Health Education will be conducted by Physical Director/Physical Education
 Teacher. In case PD/PET is not available other teachers like Biological sciences etc.
 may be considered.

However, the co-curricular areas shall be shown separately and will not be counted for grading the students in curricular areas.



QUALITATIVE ASPECTS

h) Nature of the question papers and questions

- The nature of questions are to be open ending, descriptive, analytic which tests children abilities of thinking, critical analysis, judgments and leads to self expression and away from rote memory. Children must be trained to think critically and construct the answers on their own. Ensuing that learning is shifted away from rote methods and memory oriented, focus on self expression and do away with using of guides and study material and memorizing of answers.
- The questions should make the children think and write. The questions should be analytical, application oriented and open ended.
- The questions once appeared in public exams should not be repeated.
- The questions given in the exercises of the textbook under each unit and lesson must not be given as such. The questions must reflect the academic standards.

i) Academic standards/ competencies to be achieved

- The questions in the public exam should be in relevance to the laid down academic standards/competencies to be achieved in the subjects concerned.
- Weightage for the competencies of the subjects shall be developed and blue print/ weightage table prepared and accordingly question papers shall be developed.

Types of test items:

- Following are the nature of test items.
 - A) Non language subjects (Science, Mathematics and Social Studies)
 - Essay type questions.
 Short answer questions.
 - Very short questions
 - Objective type questions Multiple choice questions.
 - B) Languages subjects Telugu and other Indian languages
 - o Reading comprehension o Writing



o Creative expression

Vocabulary

Grammar

C) Language – English

o Reading comprehension

Vocabulary

Creative writing

Grammar

• Objective type questions which are multiple choice in nature.

j) Questions - Choice

• Each question paper may contain internal choice for essay types of questions only.

k) Questions – Weightage

- Blue print will be developed reflecting weightage to the nature of questions and academic standards. No specific weightage to the lessons/units. Questions may be given from any lesson/ any part of the textbook.
- The weightage tables must be kept in view while preparing question papers. Type of questions
 (essay, short answer, very short answer and objective questions) and academic standardwise questions (how many marks and questions to each academic standard etc.).

l) Single answer booklet and no additional papers

It is proposed to give one answer booklet to the students to write the answers since suggestion
given for the extent of answer in the form of paras/ sentences/ words. No additional answer
papers will be entertained.

m) Correcting the answer scripts and the facility of revaluation

- As the questions are thought provoking and open ended, correction must be done carefully.
 Appropriate guidelines will be given from SCERT to the teachers along with key for undertaking proper correction of answer scripts.
- Transparency in paper correction must be made by way of facilitating for re-counting of the answer scripts if students represent.
- Guidelines on examination reforms and for correcting the papers will be framed from SCERT.



The children self expression, power of analysis, self writing, application and explanation, argument and representation of their perspective etc. will also form the basis for the correction in addition to subject matter.

n) SSC Memorandum of Marks

- Following are the items represented in the class X public examination memorandum of marks:
 - **Part I:-** General information about the student.
 - Part II:- Grades for the curricular areas i.e. languages and non languages both internals and externals and over-all grade.
 - Part III:- Grades for co-curricular activities with qualitative description.

Information on the grades and grade point average may also be given on the other side of the memorandum of marks.

o) Training Programme

- The SCERT shall design the training programme for the teachers teaching classes IX and X along with supervisory staff. SCERT develop teacher handbooks on entire process of examination reforms and new textbooks and train the District Level Resource Persons in every subject area for the teachers teaching classes IX and X including supervisory staff in collaboration with RMSA. The RMSA shall meet the expenditure towards developing teacher handbook, conducting training to District Resource Persons and actual conduct of training to the teachers in the field.
- Trainings may also be through teleconferences at regular intervals and sharing of good practices, doubts etc.

p) Responsibilities of D.C.E.B

- D.C.E.B. shall take up the responsibility of preparing question papers for classes IX and X (except public exam paper) and also sending them to schools.
- One Headmaster with sound academic background and commitment must be made as incharge of D.C.E.B. subject-wise district teams with 10 to 15 expert teachers must be



formed to prepare the question papers under D.C.E.B. The team members should include the textbooks writers from the district, SRG members, subject experts, teacher educators, experienced teachers etc.

- The subject groups of DCEB shall develop question papers and also examine the good
 questions furnished from schools and teachers. These teams must conduct subject-wise
 trainings in the district and also monitor the practice of assessment in the schools. They may
 be considered as members in the moderation committee.
- SCERT shall conduct orientations and trainings to the DCEB Secretaries and subject groups
 at regular intervals and build their capacity and also monitor the functional aspects of DCEBs.
 The DIETs, CTEs and IASEs shall support and supervise the work of DCEBs.
- DCEB should conduct seminars and training programmes to the teachers to develop awareness on the examination processes and correcting the answer scripts.

q) ROLES AND RESPONSIBILITIES

SCERT:

- The Director SCERT develops and submit the proposals to government in consultation with Director, Government Exams.
- Develops guidelines on all aspects of examination reforms in the form of handbooks to the teachers and supervisory staff along with additional booklet on subject-wise model papers.
- Develops guidelines for the valuation of answer scripts as a part of teacher handbooks.
- Proposals to the government on the required facilities to the schools to implement the curriculum so as to meet the examination standards.
- Guidelines on the moderation for internals.
- Monitoring and studies on the implementation of SSC examination reforms at various levels and take up follow up action.

Director, Government Exams:

• Collaboration with SCERT in finalizing the proposals based on the feasibility and for submission to government for orders.



- Development of programme for the on-line submission of internals and co-curricular activities to the Director, Govt. Exams and designing the memorandum of marks/ certificate.
- Monitoring the submission of internal marks and other nominal roles.
- Correction of answer scripts and declaring the results.
- Pre and post examination work, recounting etc.

RJD SEs and District Educational Officer:

- Conducting orientation to the teachers and supervisory staff on the new evaluation procedures. This also includes training to teachers and headmaster of private schools.
- Restructuring and strengthening the DCEB with one in-charge i.e. Secretary and constitution of subject specific groups with expert teachers @10 to 15 teachers per subject.
- Constitution of two member moderation committee for @1 for two or three Mandals.
 Steps for the capacity building of these moderation committee members with the help of SCERT and DIETs/CTEs/IASEs.
- Developing question papers printing and monitoring for the implementation for class IX and X except class X public examination.
- Focus on thinking and self expression of answers from the children and do away the practice of memorizing answers from the guides and textbooks.
- Gradual nurturing of self expression from class I onwards and focus on quality curriculum transaction and children learning outcomes rather than focus on class X alone.

Dy. Educational Officers:

- The Dy.EOs are responsible for 100% implementation of examination reforms of in their division and monitoring the internals. This is for both government and private schools.
- Identification of expert teachers in all the subjects and communicating list of such teachers to the DEO to consider for DCEB.
- Monitor the work of headmasters in monitoring the correct work of internals and implementation of curriculum and co-curricular activities.



- Record the nature of curriculum implementation and examination practices in the Acadamic Guidence Register (AGR) of every government and private school.
- The Dy.EO shall supervise the implementation of new textbooks, teaching learning process and implementation of formative and summative assessment procedures before moderation committee visits the schools.
- The Dy.EO is responsible for arranging training programmes and create awareness on curriculum transaction and examination reforms.
- Develop the knowledge on the basic aspects of curriculum, pedagogy, assessment duly reading and referring teacher handbooks, source books from SCERT and from other sources/ internet.

Headmaster:

- Headmaster is the first level supervisory officer to ensure proper implementation of curricular and co-curricular activities, teacher preparation, lesson plans, teaching learning process and conduct of exams properly by all the teachers.
- Identify and encourage teachers and children for their best efforts and talent and take it to the notice of higher officials and SCERT.
- Using of guides and study material by the children and memorizing the finished answers will
 damage the children's thinking capacities and self expression. Therefore, guides and study
 material shall not be used. HM should ensure this.
- Allotment curricular and co-curricular subjects to the teachers available and see that all these areas must be transacted.
- Headmaster must check the evidences for internal exams i.e. proper conduct of formative
 and summative assessments at school level and offer suggestions on the records and registers
 prepared by teachers and children. He should verify all the children and teacher records on
 FA and SA and satisfy himself before placing it to the moderation committee.
- HM to furnish internal (FA) marks and grades on co-curricular activities to the Director, Government Examinations through on-line as per the schedule from Director, Govt. Exams.



- The HM should follow the schedule for the conduct of internals and other exams and maintenance children cumulative records and communicating the progress to the parents at regular intervals.
- The HM must ensure for quality classroom transaction by utilizing available TLM, equipment and library books in the schools.
- The HM should conduct monthly review on the performance of the teachers and children
 and record in the minutes book along with suggestions for each teacher and review follow
 up action on the minutes of the earlier meeting.
- Arrangements for proper feedback to the children and their parents on children performance and school activities.
- The HM is the first teacher and must be sound in academic knowledge by way of reading teacher handbooks, new textbooks and other source books and conduct frequent sharing workshops within the school on teacher readings and other academic issues and concepts.
- The HM should observe the classroom transactions of each teacher and offer further suggestions and guidance for improvement.

Teachers:

- The teachers are responsible for the proper implementation of new textbooks i.e. activities, projects, experiments, field investigations, information tasks etc.
- The exercises given under each unit/lesson are analytical and thought provoking in nature and children should think and write on their own. There shall not copying of answers from the guides, study materials, copying from other children notebooks etc. This is one of the items under formative assessment with appropriate interest and care. Teachers should not encourage purchasing and using of guides, study materials etc.
- The questions in the box items are meant for discussions in the classrooms where children
 express and share their thinking and ideas. The box items are on the contemporary issues
 and situations where children are expected to reflect their experiences and prior ideas. This
 is helpful for application of textbook knowledge in their daily life situations.



- Prepare and implement curricular and co-curricular subjects assigned to them and transact
 in a qualitative way with a focus on interactive teaching, discussions with active participation
 of children. Read resource books and additional reference material to get more clarity on
 concepts and develop teaching notes on each lesson. Thus, add value to the textbooks.
- Teachers conduct formative assessments (internals) and summative assessments and value the children notebooks and other records on regular basis. Give marks and grades based on children performance and maintain evidences of children performances in the form of children notebooks, records and keep ready for the observations of headmaster and moderation committee. The teachers shall take up remedial teaching and support children based on the gaps identified through formative and summative assessments.
- Keep and read the teacher handbook, modules provided during training programmes and
 take up follow up action. Teaching is a profession and teacher is a professional and constant
 updation of knowledge and skills is a must for any profession. Therefore, the teachers
 efforts for self development through reading resource books, magazines, journals, attending
 seminars/trainings, visiting subject specific websites, sharing in teacher meetings etc.
- Develop and use annual and lesson/unit plans and improve over time.
- Furnish children and teacher records pertaining to FA and SA to HM for his verification and for further guidance and suggestions.
- Encourage children for their initiatives and attempts to improve and support them.
- After careful examination of the matter, government here by agreed the proposal of the
 Director SCERT, A.P, Hyderabad as mentioned at Para 2 above, and accord permission
 to the Commissioner & Director of School Education, A.P., and the Director, SCERT for
 the implementation of the examination reforms as mentioned above for classes IX and X in
 all schools in the State i.e. government, local bodies, aided and private recognized schools.
- The Commissioner & Director of School Education, Director, SCERT, Director Government Examinations are requested to take further necessary action accordingly.





VII. Formative Evaluation

From RTE Act - 2009, we know that children should achieve all-round development, and that schools should take responsibility for this. Children should develop physically, mentally, morally and emotionally. For this, children's interests, attitudes and values should be developed along with school subjects.

The curriculum gives equal importance to teaching learning experiences and the evaluation of the achievement of children. If the evaluation conducted in schools evaluate not only the children's ability to construct knowledge, but also their personality development, and is done on a continuous basis throughout the year, it can be called Continuous Comprehensive Evaluation.

Here,

CONTINUOUS means: not limited to any particular teaching learning process or any event or any situation, but to observe all components of learning on continuous basis. This is to say that observing/ evaluating children's physical and cognitive development in an orderly manner on a continuous basis in the school and outside the school without letting them know that they are being evaluated. By identifying the gaps in learning and by taking up remedial measures, the teacher as well as the student should be able to do self-assessment.

COMPREHENSIVE means:

'All-round development'- development in the children's physical, mental, ethical and cognitive domains. For this, equal importance should be given to scholastic and co-scholastic areas in the curriculum without looking at them as two separate areas. This means treating arts, work, values, health and life skills on par with language, mathematics, science and social studies. This way, it looks at the children's development not just from the standpoint of scholastic achievement but also from the view point of their interests, competencies and attitudes too. This is to say that comprehensive evaluation gives equal importance to creativity, analytical skills and rational thinking in addition to knowledge, understanding and application.





The Need for Evaluation

For us evaluation means conducting examinations. Teachers, parents and the society as a whole used to look at evaluation from the examination point of view. Forcing the children to memorize the information given in the textbooks, making them write it in the examinations and finally awarding marks for that has become the main aim of education. These examinations, conducted in the name of evaluation, instead of forming positive attitude towards learning and school, subject children to fear, anxiety and stress.

The marks and ranks that are used to measure the progress of children are putting children continuously under pressure, so their physical and cognitive development is hampered. The teaching learning processes have changed targeting the achievement of marks. Evaluation has become a big examination programme that is conducted ignoring the children's interests, attitudes and competencies. In this mad race for marks, undesirable happenings are taking place giving way to meaningless competition leaving no scope for the children's emotional development and the achievement of life skills. The unit and terminal examinations conducted in the name of evaluation are only good for stamping children 'pass' or 'fail' but not to identify the learning gaps and to remediate them.

The present evaluation system is teacher centered. The information given in the name of 'progress cards' contain evaluation done on scholastic areas only. On many occasions, though we claim to conduct Continuous Comprehensive Evaluation, in fact, only scholastic areas are given importance.

The co scholastic areas like art education, work experience, value education, life skills, etc., are not given due importance. Moreover, we misunderstand that Continuous Comprehensive Evaluation means conducting more examinations. Therefore, there is an urgent need for the policy makers, experts in the field of education and teachers to have a closer look at Continuous Comprehensive Evaluation and try to understand its true meaning.

Aims of Continuous Comprehensive Evaluation

Evaluation is not meant for memorizing information and reproducing it in examinations. It should assess the behavioural changes in children's cognitive, psycho-motor and affective domains which have been brought out by the learning experiences provided in the classroom, and help children to improve. The information given to children in the form of various lessons is not enough for them. NCF - 2005 indicated that it is the responsibility of the school to develop in children the skills and competencies necessary for their future life, like analytical skills, creative thinking, logical reasoning; and life skills, like self-discipline, patience, tolerance, social adjustment and facing and



solving problems with tact. So far these have been treated as extra-curricular activities or cocurricular activities, and little or no importance has been given to them. This is detrimental to the allround development of children. Hence, the state curriculum framework - 2011 has indicated that all these components should be treated as curricular activities, erasing the divide between them. Therefore, it is decided to evaluate the children's physical, cognitive, emotional and social development giving equal importance to each of them. Let us have a look at the objectives of Continuous Comprehensive Evaluation from this angle.

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

Continuous Comprehensive Evaluation should be organized as a part of teaching learning processes. This helps us to know how efficient are the learning experiences provided in the school in developing the children. In Continuous Comprehensive Evaluation, all components are evaluated equally without maintaining the distinction between curricular and co-curricular areas.

The evaluation procedures followed in school as a part of Continuous Comprehensive Evaluation should be such that they observe children completely in all aspects and record them. It is also necessary to assess children through examinations conducted periodically along with the evaluation done through observation of children inside and outside the classroom in tandem with the teaching learning processes. However, whatever may be the evaluation procedure, its results should not be used to compare two children.

Evaluation should not only observe how children learnt, and what was learnt but should also help them retain what was learnt. Interests, attitudes, emotions, special interests, physical growth and health related components should also be assessed along with knowledge, understanding, application, analysis and adjustment to new situations. This evaluation is of two types:

- 1. Formative Evaluation
- 2. Summative Evaluation



1. Formative Evaluation

Working towards improving the children's learning through observing and recording their performance while they are participating in teaching learning processes is called Formative Evaluation(assessment). It is used by the teacher to continuously monitor children's progress in a non-threatening, supportive environment. It involves regular descriptive feedback, rather than marks and grades, which gives a chance for the students to reflect on their performance, take advice and improve upon it.

The teacher can estimate what the children have learnt; and how they are learning based on the discussions in the classroom, their answers to questions in the middle and at the end of the lessons, their notebooks, class work and homework, group activities and project work, etc. This is called formative evaluation.

Formative evaluation gives continuous feedback to the teacher as well as the children all along the teaching learning processes, so it helps them make necessary changes in their teaching/learning strategies. If used effectively, it can improve children's performance tremendously while raising their self-esteem and reducing the work load of the teacher. Let us have a look at the features of this formative evaluation.

Formative Evaluation

- Is a process to observe the progress of the child and how s/he is learning
- Is diagnostic and remedial
- Makes the provision for effective feedback on how children are learning
- Provides the platform for the active involvement of children in their own learning.
- Enables teachers to adjust teaching by taking into account the results of evaluation
- Recognizes the profound influence evaluation has on the motivation and self-esteem of students, both of which are crucial influences on learning
- Recognizes the need for students to be able to assess themselves and understand how to improve
- Builds on children's prior knowledge and experience in designing what is taught.
- Incorporates varied learning styles based on how and what to teach.
- Encourages children to understand the criteria that will be used to judge their work
- Offers an opportunity to children to improve their work after feedback,
- Helps children to support their peers, and expect to be supported by them.



- This is conducted in a natural environment free from stress and fear and without making the children aware of being tested
- The teacher can have an understanding of the children's progress while they participate in teaching learning processes

Students will learn by participating in different learning activities provided in the school. Teacher has evaluate the concepts the students learnt, the learning system, and the way how they are participating is learning processes the formative evaluation. In class 9, 10 formative evaluation has to evaluated through four measures.

- 1) Lab Activities (5 marks)
- 2) Project works (5 marks)
- 3) Note books (5 marks)
- 4) Slip test. (5 marks)

Teacher should conduct the above four tools for every formative assessment. For example in Formative-1 Lab Activity for 10 marks, Project work for 10 marks, Note book for 10 marks, Slip test for 20 marks. After the end of academic year reduce four formative marks for each tool into 5 marks. A student scored 30 marks out of 40 for lab activity calculate these marks for 5.

Let's observe to conduct these measures.

Lab Activity

In the process of formative assessment lab activity is an important tool. Student should participate in lab activity to perform activities which are mentioned in the text book under the title of Lab Activity. Teacher should access student in the following areas.

- Participation in Lab Activities Experiment
- Lab Record

Teacher should absorb students when they are working individually, in groups, how they select and arrange appratous, observations and recordings. Based on their observations student should write their lab record

- Lab record is also a part of 200 pages formative notebook.
- Lab record is also helpful for the student to obsurb how they did the experiment.
- 5 marks is awarded for this lab record.



Items in Lab Record

- Aim: It explains why we perform the experiment.
- Appratous: Here we should mentioned required appratous and materials, chemicals.
- **Precautions :** We should mentioned the precautions that must fallow while performing experiment.
- **Procedures:** Here we should write the process.
- **Reporting:** We should report our observations in the form of table, flowchart etc.
- **Result analysis**: Analyse the above data.
- **Generalisation**: We come to certain conclusion based on the experiments.

Model Report of an experiment

Pratap, Divya, Johnson and me were formed into a group. Myself and Pratap brought the apparatus and chemicals required for the experiment and kept them on the table. Johnson and Divya arranged the apparatus with the help of the teacher. We made a report after observing the results of the experiment. We conducted this lab activity on 18-8-2014.

Aim: To observe the reaction of acids and bases with metals.

Apparatus required: Stand, test tubes, delivery tube, rubber stopper, glass trough, candle, burner.

Chemicals: Zinc granules, dil hydrochloric acid, sodium hydroxide solution.

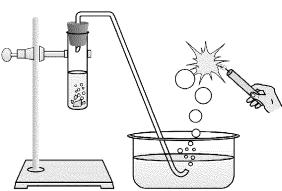
Experimental Method - 1

We took a strong glass test tube. We filled with dil HCl. Fixed it to the stand. Took same zinc granules and put them in dil HCl. Fixed one holed rubber stopper to the test tube. Fixed one end of the delivery tube through the hole. Poured soap water in a glass trough. Kept the second end of delivery tube dipped in the soap water.

Observations: Observed that dil HCl and zinc granules reacted and gas bubbles are formed. The gas thus formed reached soap water and soap bubbles were formed.

Confirmation: When a burning candle was brought hear the bubbles they went off with a pop sound. We identified that the gas released is hydrogen.





Result : Zinc reacts with hydrochloric acid to release hydrogen gas and zinc chloride solution is formed.

$$Zn + 2 HCl \rightarrow aZn Cl_2 + H$$

Experimental Method - 2

We took a strong glass test tube. Filled less than half of it with (10 ml) sodium hydroxide solution. Fixed it carefully to a stand. Put some zinc granules and fixed one holed rubber stopper. Fixed one end of the delivery tube through the hole kept the second end of the delivery tube dipped in the soap water.

Observations: Observed that zinc granules reacted with Na OH and released gas bubbles which reached the soap water through the delivery tube.

Confirmation test: When a burning candle was brought near the gas bubbles, they went off with a pop sound.

Result: Metals like zinc react with acts like HCl, bases like NaOH and release hydrogen gas.

Precautions \rightarrow Test tubes must be fixed to a stand with the help of the clamps so that they do not break.

- HCl and NaOH must be taken first. Zinc granules should be added later.
- Fixing the stopper and delivery tube must be done quickly.
- Do not blow the soap water bubbles immediately one after the other. Take some time.

Displacement reactions:

Discussion points:

- Do metals like copper and iron release hydrogen?
- What happens if soap water is not taken in the glass trough?
- Does the amount of gas released depend on the amount of HCl and zinc granules taken?



Lab Record Assessment

- Experimental process 4 marks
- Lab Record 6 marks

After completion of 4 formative assessment we should calculate 40 marks into 5 marks.

Project works

In the Formative Assessment project work is another tool which contains 10 marks. There are different types of projects in every lesson under the academic standards information skills and projects. So teachers select any type of project from improve your learning or from content. Based on the resources teachers has a choice to select any other topics which is related to content.

Projects are different types.

- Based on members
- Based on project nature
- Based on procedure (by interview, by collecting information, by observing nature)

Steps in writing Project Report:

- Name of the project
- Objectives
- Tool
- Procedures
- Table
- Conclusion
- Resources
- Thanks giving

Project Report Assessment

10 marks are allotted to project report.

- Preparation, conducting project 3 marks
- Project report 5 marks
- Discussion on project 2 marks
- After completion of 4 formative assessment we should calculate 40 marks into 5 marks.



Written Works - Note books

For every student writing skill is very important to express what have understand in their own words. In written form. For this notebooks helps a lot. In constructive evaluation we asses what the children write on their own. Hence, lets know its importance, how to conduct, how to evaluate.

Written Works Importance:

- Now a days though the children understand the theories in science, principles, concepts, they are not able to write in their note books on their own.
- Students of English medium as well as reading in mother tongue instructed schools are not writing properly because both of them lack writing skills.
- They are not able to construct a sentence, and there are language, grammatical errors. They are not able to write what they've wrote because of illegible writing.
- They are not able to write on their own and hence they are habitated to copy down from the guides, question banks and other's note books. Teachers too are encouraging and neglecting it.
- Because of these creativity, writing by thinking on their own are disappearing from the students.
- Keeping the above points in minds in constructive evaluation estimate the students writing there and there and instruct them accordingly. They have to work on writing with their own vocabulary, by using their experiences of what they have understood.

We think that students while writing on their own will write what they think at the moment, their answers will not be clear and straight, and they do not have language proficiency. We suspect them too. We think that their answers will not have standardization as each of them will write in different ways, and it takes much time in their correction and marks allocation. To rectify these doubts we should know what is writing on own? How to inculcate that among the students.

Writing on one's own means writing by understanding the concepts using words, sentences in his/her own style. It's not writing exactly as it is the sentences from the text book. For the explanation of the meaning sentences may increase or decrease. May use own examples. By writing on their own students will have clarity towards the concepts. They understand the content. Hence they can write answers for any type of question.



What should we do for this?

All of sudden students can not write on their own in tenth class. Hence, make them practice to write answers, on their own fro at least five or six question in each lesson. For this teacher has to follow the following steps.

- Write the question or topic on the blackboard.
- Discuss the possible answer for that question.
- Write the key words from the discussion the blackboard.
- With the help of key words ask them to say the answers in sentences.
- Ask two or three students to repeat the answer.
- Finally, ask the students to note down the answers in their notebooks.
- After, all of them completed writing, writer one's answer on the black board, discuss how they wrote, tell them corrections.
- On the basis of this discussion ask the students to correct their answers.

How to conduct the written work?

- Every student have note book.
- Ask them to write list of key words, new words in their notes books for every unit.
- After classroom discussions ask them to write explanation for those words according to their understanding. It helps to content understanding, and after that to write the answers on their own.
- Ask them to write answers on their own for the questions under let's improve learning for every unit.

How to Evaluate the written work?

There are ten marks for written work in constructive evaluation. Teacher should keep the following items in mind while allocating the marks.

- Written work should not be the copy from the book but it should be on his/her own.
- Draw the diagrams wherever necessary.
- Words, sentences should be meaningful without mistakes.



Slip Test

As a part of constructive evaluation teacher should estimate the student's understanding after teaching every lesson. Testing the student's understanding at anytime but not in a specified time and making the students that they are writing an exam is said to be a slip test. It is not like a unit test.

Importance of Slip Test:

- To know har far the students have understand the learnt topic.
- To assess how the students applying the learnt items with the real life.
- To make them overcome the fear of exams and build confidence.
- To participate it continuous teaching learning processes.
- To express their concepts briefly.
- To put them away from rote learning.

How to conduct the slip test?

- Conduct the test without prior declaration after teaching the lesson.
- 20 marks for slip test.
- As part of constructive evaluation at FA times slip should be conducted in any period of 45 minutes duration.
- Questions in the slip test should some of the academic standards and they should write answers on their own.
- Keep 200 page long notebook for slip tests. Four formative slip tests in an academic year should be written in this text book only.
- Basing on the answers, discuss with the children how they are in each academic standard.
 This is the key issue in constructive evaluation and compulsory one too. Just conducting the exams and allocating marks and grades is not enough. By analysing the answers and giving instructions for their improvement is also important.
 - Eg: Do you think that there is relation between respiration and photosynthesis? Why? Questions like these will help them to think and write on their own.
- Enroll the slip tests grades in the register.

Bioscience experiments:

- 1. What is the importance of experiments in bioscience?
- 2. What is the relation between textbook and laboratory?





- 3. How to conduct the laboratory?
- 4. What to do before, while and after the experiment?
- 5. What is the role of the teacher in conducting bioscience experiments?
- 6. What are the required equipment, chemicals to conduct experiments in the lessons of 10th class bio science?

Conducting experiments is science is an important skill process. In science and technological revolution there is an important place for experiments. Experimental results done by the scientists are key for many revolutionary changes in human life. Ronarld Ross found the life history to malaria insect through his experiments. That is why bio science teacher should help the students to do experiments, understand the concepts, principles on their own to construct the bio science knowledge. Through this students build their knowledge. By doing experiments like these students can develop scientific attitude.

In studying bio science there is a specific place for experiments among skill process. To achieve the desired standards, doing the experiments and testing the results on their own with locally available experiments is an experiment. In bio science, it is necessary to observe many items under microscope. So, the teacher has to prepare the students in using the microscope and in making the slides. In bioscience experiments teacher has to train the students including experiments, direct observations (eg: parts of the plant, models of organisms), drawing the diagrams etc.

Importance of experiments:

- 1. Prove and understand bioscience truths, principles, rules.
- 2. Develops the capacity to found solutions for everyday problems.
- 3. Know the answers for the questions like why. What?
- 4. Develop interest towards bio science.
- 5. Prepare to conduct new experiments.
- 6. Learn bio science in natural environment.
- 7. Laboratory helps the students to understand the concepts by doing.

Makes the chance to think of alternatives for the deficiency of resources in everyday life.

A STATE OF

10th class Physical Science - Projects

SI. No.	Name of the lesson	Name of the project	Tools	Project Explanation
%	Chemical reactions	Chemistry in kitchen	Interviewreference bookstiny experiments	• Observing and explaining different activities in kitchen and the chemical reactions behind them. Ex: When onions are cut sulphur in them reacts with oxygen and sulphur dioxide is formed.
4.	Acids bases salts	Material Samples calculating their pH	pH paperUniversal indicator	• To find out which type of food materials are consumed more by calculating the pH value of different food materials to find out the relation between the gastric diseases and the pH of the food taken.
<u>~</u>	Atomic structure	Atomic structure evolution of different theories	InternetChartsReference books	• Writing a report through referring books on the glimpses of lives of the scientists who made discoveries in regard with atomic structure right from Thompson's atomic model to Quantum theory.
9.	Classification of elements	Elementaries of elements	InternetReference books	• Situation when different kinds of elements were discovered surprising characteristics exhibited by certain elements. To write a report on the above.
10.	Chemical Bonding	Hybridisation of different molecules models of those	 Balls and sticks 	• To make atleast shapes of 20 different molecules like NaCl ₂ , NH ₄ , CH ₄ , H ₂ O. Table showing electron configuration and valency electrons must be displayed in association.



SI. No.	Name of the lesson	Name of the project	Tools	Project Explanation
13.	13. Extraction of metals	Metals and their ores methods of extraction	NewspapersReference booksInterviews	 To identify and list out various ores and the metals entracted from them. To make a table with the names of methods of extraction followed to extract those metals.
14.	Carbon	Carbon in daily life Soap making	 1. Carbon in daily iffe 2. Soap making 4. Help of a local expert 6. Material required for the preparation of a soap 	 To prepare a concept map in the form of flow charts about the availability of different forms of carbon in our daily life. Ex: Carbohydrates, hydroxides To prepare a soap collecting & using coconut oil, soap powder, aromatic oil. Adding a comment on identifying the quality of the soap using the details of TMF.



VIII. Summative Evaluation

Evaluating the Total items that the student has learnt through teaching learning process is called comprehensive evaluation. This is the method of testing the students' achievements after completion of the course or after completion of the specified lesson plan. In this method the issues tike what the student has learnt through the course and how far he has learnt are observed. This evaluation should be conducted in the form of written test only. If we observe the nature of the comprehensive evaluation.

- This is the method of evaluating the learning.
- Summative I, II, III tests should be conducted in a academic year.
- Teacher should observe the students' progress based on the academic standars with the question paper he / she has prepared on her / his own.
- Prepare weightage table before preparing the question paper.
- The total questions from the text book in summative III should be based on academic standars.
- The questions in the question paper will be in such a way that by nature they can be written analytically on their own. Hence we should not expect that all students can write same answers.
- After correction of the paper write the achieved marks, total marks, grades in the allotted boxes according to the academic standard.

Academic Standards - weitage table :

- 9th and 10th classes question paper should be prepared according to the academic standards. Observe the weitage table of academic standars.
- Weightage according to the academic standards.
- In every academic standard essay type questions, short answer questions very short answer questions, multiple coice question will be there.





S.No.	Academic Standard	Weightage	Marks
1.	Understanding the content	40%	16
2.	Questioning, making assumptions	10%	4
3.	Experments, Field Trips	15%	6
4.	Information Skills	15%	6
5.	Information transfer through pictures	10%	4
6.	Appreciation, biodiversity, utilising in real use	10%	4

- Question paper should be prepared in order to test how far the student has achieved the specified acadamic standards.
- In preparing the questions equal priority will be given to all the lessons. There should not be division of either essay question from a particular less or short questions from another lesson.

Nature of Questions:

- The questions are prepared according to the academic standards. Questions should be according to academic standars and instructed weitage in the table.
- Every question is arranged in such a way that students can think and write the answers on their own.
- The students can write the answers after reading and understanding the question.
- All are open ended questions.
- The questions under improve our learning in the text book are not taken as it is but are based on the concepts in the lesson. Hence make complete awareness to the students on the nature of the questions.
- The questions in a test will not be repeated in the same form in the next test. The nature
 of the question will be changed according to the concept. Completley avoiding the unhealthy
 habit of making them read important questions is its intention. Not that asked question
 neer the repeated.
- According to the weitage of the academic standards there will be 4 types of questions.
 - 1. Essay type 2. Short Answers 3. Very short answer 4. Multiple Choice.
- Questions are prepared in order to assess the students' creativity, values, aesthetic sense, conservation of natural resources, humanity values, national integrity etc. Hence every student should thank and write the answers on his / her own.





- Questions never be taken from guides, question banks. Hence teacher should make the
 students not to depend on them, make them procure on their own. Teacher should
 concentrate on children to read the concepts from the text book, analys them and write
 on their own.
- Let's observe the weitage according to the nature of questions, marks.

Weitage Table according to the nature of the Questions, Marks

S.No.	Type of Question	No. of Questions	Marks	Total Marks
1.	Essay Type	4	4	16
2.	Short Answer	6	2	12
3.	Very Short Answer	7	1	07
4.	Multiple Choice	10	1/2	05

Long answer / essay type questions:

These questions will help the students to know how far they have understood the learnt content. Four marks are alloted for these. The answers for these questions should be written on their own in 8 to 10 sentences.

- Total long questions will be four and there is internal choice. Total marks sixteen.
- Answers should be analytical without linguestic mistakes and suitable examples should be given. Explanation should be through diagram or graph wherever it is necessary.

Short answers quetions:

- 12 marks are allotted for these. Answers should be clear and specific and should be written in 4 or 5 sentences.
- 2 marks for each question and total questions are six. There will be no choice.

Very Short answers quetions:

- Seven Marks are alloted for these. Answers should be clear and specific in 1 or 2 sentences.
- One mark for each question and total seven questions and there will be no coice.

Multiple Choice Questions:

- 5 marks are alloted. Answers should be written by thnking.
- 1/2 mark is alloted for each question. Total ten quetions and there will be no choice.

There is possibility of these four type of questions in any academic standard.





Test Items

Questions are very important to evaluate the aspects learnt by children in schools. Children face many difficulties to write answers to the questions in order to pass the exam. They follow the methods of copying the answers from guides, mugging up, writing imposition for practice etc. Hence the knowledge acquired was just text book. For example, many amongst us will award marks only to that diagram of electrolysis which literally resembles the diagram given in the text book. There are teachers who insist on the size of the answer equal to the size of the matter in the text book. The questions used to test just the memory power of the children. For example, look at the questions given below:

- What is Electro Motive Force?
- How many types of chemical bonds are there? What are they?
- What is the least distance of distinct vision?

It becomes necessary for the children to mug up in order to write answers to such questions. The reason for this is the strong concpet that you score marks only when you write as it is in text books. Newly designed text books encourage children to learn on their own. They encourage to learn by experience instead of memorising. Thus the academic standards to be achieved can be measured through the methods of continuous comprehensive evaluation. Therefore, there is a need to design questions in such a way that children can write answers on their own. Let us have alook at the type of questions taking the lesson "Atomic Structure" as an example.

Observe the following table. Analyse what you've understood.

n	1	m	Subsheell	No. of orbitals
			rotation	in the subshell
	0	0	4j	1
	1	-1 0 +1	4p	3
4	2	-2 -1 0 +1 +2	4d	5
	3	-3 -2 -1 0 +1 +2 +3	4f	7



- 1. According to the above table which quantum numbers help us to know the number of orbitals in a shell?
- 2. Which subshells can exist in 4th energy level?
- 3. How many maximum electrons can be found in the subshell when the value of n is 4 and l is 2 ?
- 4. Which orbitals lie in the subshell when the value of 1 is 3?
- 5. Which formula / principle did you use to get the answer to Q.No. 4?
- 6. What is the relation between values of n and size of the orbital?

Observe the above questions carefully. Think about the following

- Are all the questions based on the lesson?
- Can answers to these questions be written on own? or do they need mugging up?
- How far the above information is sufficient to write answers to such questions?
- What sort of answers can children write when writing on their own?
- How to overocme the difficulty of valuing the different answers?

Let us now observe the questions from class 10 text book based on different academic standards.

1. Question on Conceptual Understanding:

In this standards, questions can cover the aspect like explaining, classifying, anlysing, giving examples, reasoning and mind mapping.

Model Questions:

- 1. A coil is hung as shown in the figure. A bar magnet with north pole facing the coil is moved perpendicularly
 - (a) how does the magnetic flux passing through the coil change?
 - (b) State the direction of the flow of the current induced in the coil, keeping the direction of bar magnet in views.

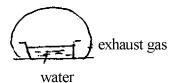
Hullet

- (c) Draw the diagrams showing the magnetic field formed due to bar magnet at the surface of the coil and the magnetic field formed due to induced current.
- (d) Explain the reason for induced current.



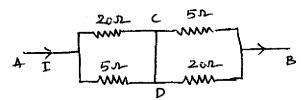


2. You've taken water in vessel at 0° C and closed it with a glass vessel as showin in the figure. You used and created a vaccum inside



- (a) Explain what happens
- (b) A part of water condenses what is the amount of water that gest condensed.

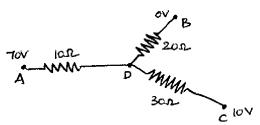
3.



A circuit is shown in the picture. The current passing through A is I

- (a) What is the potential difference between A and B?
- (b) What is the equivalent resistance between A and B?
- (c) What amount of current is flown through C and D?

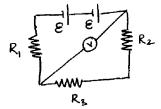
4.



Observe the picture. The potential values at A, B, C are 70V, 0V, 10V

- (a) What is the potential at D?
- (b) Find the ratio of the flow of current in AD, DB, DC.

5.



Observe the circuit $R_1 = R_2 = R_3 = 200 \Omega$. If reading of voltmeter = 100V, resistance of voltmeter = 1000Ω . Find the EMF of the battery.

6. Focal length of a concave mirror is f. The distance from its focal point to the object is P. Find the ratio of heights of image.



- 7. Using biconvex lens, a point image is made on its principal axis S. Let us assume that we know optical centre P and its focus F. We also know PF > PS. Draw the ray diagram to identify the point source and give reasons.
- 8. Radii of biconvex lens are equal. Let us keep an object at one of the centres of curvature. Refractive index of lens is 'n'. Assume lens in the air. Let us take R as the radius of the curvature.
 - (a) How much is the focal length of the lens?
 - (b) What is the image distance?
 - (c) Discuss the nature of the image.
- 9. In the following cases calculate the magnification values for a concave mirror. Give reason
 - (a) When the object is at the focal point of the mirror
 - (b) When the object is between focal point and the pole.
- 10. A circuit is made with a copper wire as shown in the diagram. We know that conductor's resistance is directly proportional to its length. Calculate the equivalent resistance between points 1 and 2.



11. Conductor of length 'l' moves perpendicular to its length with the speed V. Length of the conductor is perpendicular to the magnetic field of the conductor. Let us assume that electrons could move freely in the conductor and the charge of an electron is 'e'.



- (a) What is the magnetic force acting on electron in the conductor
- (b) In which direction does the above force act
- (c) What effect does this force have on motion of electrons.
- 12. Refractive index of a lens is 1.5. When an object is placed at 30 cm, image is formed at 20 cm. Find its focal length. Which lens is it? If the radii of curvature are equal then what is its value?

2 marks

12. Give reasons for using lead in making fuses.





- 13. A fish looks up from the water making a perpendicular angle 45° C. Can the fish see the sky on the surface of water. Explain.
- 14. Assume that an object is kept at a distance of 20cm in front of a concave mirror. If its focal length is 30 cm then
 - (a) What is the image distance?
 - (b) What the magnification of mirror in this case?
- 15. There is an object in front of convex mirror at a distance of 5 cm. If its foacal length is 10 cm then
 - (a) What is the image distance?
 - (b) What is its magnification
- 16. Find the focal length of plane convex lens if its radius of curvature is R and its refractive index is n.
- 17) Kishore wore spectacles. When you saw through his spects the size of his eyes seemed bigger than their original size
 - (a) Which lens did he use?
 - (b) Explain that defect of vision (with the help of a diagram)
- 18. In a classroom, four friends found out the focal length of a lens by conducting an experiment. The value came out to be 12.1 cm, 12.2 cm, 12.05 cm, 12.3 cm. The friends discussed the reasons for the differences or defects. Mention those reasons.
- 19. A student took the same quantity of water and petrol in two different tumblers. He kept them a table when observed after a day there was water in a glass but petrol was completely evaporated. Give reasons why water was not evaporated completely but petrol was completely evaporated.
- 20. Iron of weight 2 kg was supplied with 12000 calories of heat. Initial temperature of iron was 20° C. Its specific heat is 0.1 cal/g-c°. What is the final temperature of iron?



B is a magnetic field acting perpendicular to the surface of the paper as shown in the picture. A charge q rushed perpendicularly into the field with velocity v.

- In which direction would be the direction of force acting on (a) charge q.
- (b) What is amount of the force.
- (c) What would be the work done by the force?

22.

A circuit is shown in the picture. What is the equivalent resistance between A and B.

23.

A circuit is shown in the picture. What is the equivalent resistance between A & B.

1 mark questions

- 24. What is the radius of curvature of mirror if the focal length of convex mirror is 50 cm?
- 25. Focal length of concare mirror in air is f. If this is completely immersed in water, will there be any change in its focal length or not? why?
- Kishore's mother gave tea in a cup to his father. Kishore's father asked Kishore to cool the 26. tea. Kishore kept tea under a moving fan and cooled it. What aspect did Kishore keep in view when he kept hot tea under a fan. Can you say?
- 27. Ramu and Sudha went to a picnic to a hilly area. They wanted to boil some food materials but they couldn't. State the reasons why the food material didn't boil.
- There is 4 kg water. Let us say it is at 100° C. How much of heat energy is required to 28. evaporate 4 kg water completely.

			900			
29.	_	of concare mirror is distance, image distance of image.		owing questions		
30.	In which condition	are incident ray and	refracted ray equal	?		
31.	Prove, using Snell's is parallel to angle of	law, that the light ray of emergence.	falling on a glass d	isc with some angle	e of incide	nce
32.	When light is incid Mention the reason	ent on small air bubb for this.	oles formed in wate	er, it is diverged by	the bubb	les.
33.		agh a wire as show it. Draw the direction pped in the wire.	-		-	
$\frac{1}{2}$ n	nark questions					
34.	The minimum distar focal length of conda) f	nce between the real in cave mirror is f b) 2f	mage formed by con	cave mirror and ob	ject()
35.	S_A , S_B respectively a) $S_A > S_B$ b) $S_A = S_B$ c) $S_A < S_B$	resistances A, B are then the following ex $\mathbf{S}_{\mathrm{A}} \text{ and } \mathbf{S}_{\mathrm{B}} \text{ cannot be}$	planation is correct			are
36.	V then the electric	vith electric energy P _o energy absorbed by	the bulb, P =		ed to a volt	tage)
	a) $\frac{V_o}{V}P_o$	b) $\frac{V}{V_o}P_o$	c) $\left(\frac{V}{V_o}\right) P_o$	$d) \left(\frac{V_o}{V}\right)^2 P_o$		
37.	•	projected towards e gnetic field will be b) towards south		-	(orth.





38.	If a resistor is added to a battery, temperature of the resistor increases. Wh				the follor	wing
	values does not cha	ange.			()
	a) electron drift vel	ocity	b) specific resistan	ce		
	c) resistance		d) electron density			
39.	Equivalent resistan	ce between A & B			()
	a) R/2	b) R/2	c) 2R	d) 2R		
40.	Different gases are	at same temperature	e which value will be	same for all gase	es ? ()
	a) mass	b) speed	c)	d) average kir	etic ener	gy

II. Questioning and making hypothesis

To assess the standard of questioning and making hypothesis, the following fundamental aspects must be kept in view to frame the questions.

- to ask thought provoking questions on various concepts
- for collecting information
- while observing
- Questionnaire prepared to interview someone
- In the context of conducting an experiment
- to procure suggestions

Hypothesis

- prediting the results
- predicting the influential factors
- guessing the reasons for the problem
- imagining about future

Let us see the model questions.

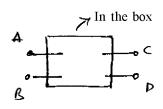
4 marks

- 41. What questions will you ask to confirm the aspects to be known to draw the ray diagrams of a mirror.
- 42. Kumar told his teacher that he was not able to differentiate between evaporation and boiling. The teacher then asked him some questions. By answering those questions Kumar was able to tell the difference. What questions might the teacher have asked Kumar?

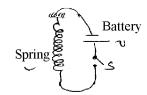


2 marks

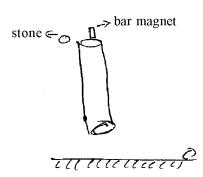
43. Two resistors were connected in a box, but, how were they connected was not known. Values of resistance were equal. 10V battery was kept between A & B. When voltmeter was kept between C and D it showed 5V. Then 10V battery was kept between C & D and Voltmeter reading was taken for A & B. The reading was 10V. State the way in which the resistors are connected to get the above values.



- 44. Sukumar wanted to see his complete image in the mirror. As such he made some hypotheses. Write what those could be.
- 45. A spring is hung as shown in the figure. Battery switches are joined between the two ends of the spring as shown in the figure. Imagine what happens if the switch is closed / off.



46. Take a long cylindrical copper tube. Hold it perpendicular to the stone is dropped from the outside and bar magnet is dropped from inside of the tube as shown in the picture. Which of the two will touch the surface of the earth first. Guess why and say. Give logical reasons.



1 mark

47. An object was kept at the distance of 10 cm from a convex lens whose focal length is 20 cm. What is the image distance. Suresh solved the above question as follows:

Focal length of the lens f = -20 cm

object distance u = 10 cm

from lens formula =
$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$-\frac{1}{20} = \frac{1}{v} - \frac{1}{10}$$

$$\frac{1}{10} - \frac{1}{20} = \frac{1}{u}$$

$$\frac{20-10}{20\times10} = \frac{1}{v} \implies u = \frac{10\times20}{10} = 20 \text{ cm}$$

- 48. We frequently come across the boards saying "Danger High Voltage". Why the boards don't say "Danger High Electricity". Guess and write the answers.
- 49. Nani and Anil are friends. They are waking on a tar road in the afternoon. Anil saw images of water on road. He showed them to Nani and asked him to guess the reason for their formation. What guess would you make?
- 50. Surya got up at 12 O' clock in the night and switched on the tubelight in his room. He felt difficulty in opening his eyes. Imagine the reasons for the above.

$\frac{1}{2}$ mark questions

- 51. In a glass vessel water was poured first; then a liquid less denser than water was poured taking care that two liquids are not mixed. A glass tube is immersed. When seen from sides the glass tube was not visible in the upper liquid. What could be the reason? Guess. ()
 - a) Speed of light is more in liquid than in water.
 - b) The person who is seeing has defective vision.
 - c) The refractive index of glass and the upper liquid are equal
 - d) all the above
- 52. Assumption (A): Light changes its direction when refracted (when angle of incidence is not 0°)

Reason (R): When light travels from one medium to another it changes its speed (

- a) A incorrect; R correct
- b) A, R correct: Hence R is the correct explanation for A.
- c) A, R correct: Hence R is not the correct explanation for A.
- d) Both A & R are incorrect.
- 53. A 10 cm long wire is connected to a battery with EMF \in . Then the wire was cut into 5 parts of equal length. Battery was connected to the edge formed by joining the parts parallely. Electric energy supplied by battery is more in the second case. The following are correct
 - a) The flow of electric current is 25 times more in second case than in first case.



- b) The electric energy utilised is 10 times less in second case than in first case.
- c) The electric energy utilised is 25 times more in second case than in first case.
- d) Resistance in second case is 25th part / quarter of the first case.

III. Experiments - Field Observations

The questions will be in the following form in regard with the standard of experiments field observations.

- conducting experiments
- observing experiments
- inferring
- selection of tools
- recording
- generalising
- understanding tools
- analysing
- conducting an experiment to prove
- conducting an experiment for a result
- conducting an experiment changing variables
- identifying the defects

Model questions

4 marks

- 54. Rama thought of using a lid made of the metal having higher specific heat. What equipment does she need to findout experimentally the speicifi heat of copper and aluminium. How should the experiment be conducted?
- A company wanted to use such a material in making the transparent part of the helmet whose refractive index is almost equal to the refractive index of air. So they wanted to find out refractive indices of different material through experiment. What shape of the material must be taken to find out their refractive indices. How to find out their refractive indices experimentally?
- 56. The focal length values of concave mirrors in a lab what do we need to find their focal lengths in the lab itself? How to calculate the focal length of the mirrors?



57. What tools do we need to prove that magnetic lines of force are closed circuits. What precautions are to be taken?

2 marks

- 58. List out the tools needed to prove through an experiment that heat flows from a hot body to a cold body.
- 59. Suggest an experiment to show that light rays that reach us from the longest distances are lamost parallel. Write its stages in the form of a flow chart.
- 60. Explain the need for using semicircular glass plate to know the relation between angle of incidence and angle of refraction through an experiment.
- 61. Mention the method of preparing a solnoid with copper wire on a wooden plant to find out the electric field formed by a solenoid.

1 marks

- 62. Mention the tools needed to conduct an experiment to identify the relation between length of the conductor and resistance.
- 63. How will you arrange water, tray and mirror to see different of sunlight in your classroom.
- 64. What did you come to know by the experiment in which you observed the stone under water through the lens immersed in water.
- 65. What important thing did you observe in the experiment of observing the complete process of melting ice i.e from melting of ice to turning of it into water.

$\frac{1}{2}$ mark questions

- 66. The aspect you confirmed through the experiment of keeping the completely filled and tightly closed glass water bottle in fridge for few hours. ()
 - a) If the temperature is decreased the glass contracts and breaks.
 - b) If the temperature is decreased the glass expands and breaks
 - c) The bottle breaks as the volume increases as the water condenses
 - d) The bottle breaks as the volume decreases as the water condenses.



- 67. Which of the following characteristics did the image possess when you conducted experiment by keeping an object between focal point and the centre of curvature on the principal axis of concave mirror.
 - a) the image is bigger than the object
- b) reverse image is formed

c) real image is formed

- d) all the above
- 68. In the experiment conducted with a metal disc in water and straws hanging over it, to study the refraction, when did two straws form a straight line?
 - a) when the straw in water was kept perpendicular to the surface of the water (when kept along 0° angle)
 - b) when the straw in water was kept parallel to the surface of the water
 - c) when the straw in water was kept along 45° angle.
 - d) under no situation two straws form a straight line.
- 69. What did you observe in the experiment where the two poles of horreshoe magnet were kept on both the sides of electric wire to observe the force of the direction.
 - a) the electric wire moved towards north pole of the magnet
 - b) the electric wire moved towards south pole of the magnet
 - c) there is no movement in the electric wire
 - d) the wire moved in the direction as told by right hand rule.

IV. Information Skills

There are two important aspects in the academic standard, collecting information - projects.

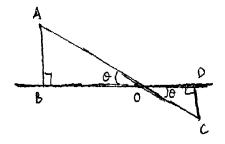
- 1. Collecting information
 - i) collecting and analysing information
 - ii) Prepare reports by filling the tables
- 2. Analysing information
 - i) Analysing the prepared tables on their own
 - ii) Preparing tables classifying the information



Model questions

4 marks

- 70. Whom do you meet to collect the information about the common defects of vision and their preventive measures? What questions do you ask? Write a model table to record the information you've collected.
- 71. Sudhakar has tabulated the flow of electricity of using different voltages, material (in the form of a wire), ammeter and voltmeter. The graph based on the table is shown in the picture. He measured voltage (V) in volts and electricity (J) in amperes. Answer the following questions based on the graph.



- (a) What kind of material is taken by Sudhakar?
- (b) What is the resistance orf the material taken?
- (c) If a potential difference of 20V is applied between the ends of the wire, how much electric energy is used by the wire.
- (d) State the rule the graph has.
- 72. A student conducted experiment with biconvex lens and prepared the following table.

Object distance (u) (cm)	70	60	50	40	30
Image distance (V) (cm)	14.5	15.2	16.2	17	20
Focal length (f) (cm)	12.01	12.12	12.13	11.92	12

Answer the following questions based on the information given in the above table.

- (a) What is the reason you think for different values of focal length in the above table?
- (b) How do you decide the focal length of the above lens?
- (c) Can you conduct an experiment to measure the image distance when the object distance is made 10 cm? Why?
- (d) What relation have you identified among u, v and f?



73. A student took cuboidal rod and applied the same potential difference between its two ends. He calculated the following electric energies for length, breadth and height

Measurement to which potential difference is applied	electric energy
Length	2A
Breadth	4A
Height	6A

Based on the above information find the ratio of length, breadth and height in the three situations.

2 marks

- 74. Sarita read the following in a book Induced EMF generated in a coil does not depend upon the resistance of the coil. How will you prove that the above information is correct by analysing.
- 75. Once while a heart surgery was going on, a fine tube was sent to see the internal parts of the heart on a computer screen Suresh came to know that the tube they used is optical fibre. State how the optical fibre works.
- 76. Apparna gave the following information to Papaiah. The magnetic flux passing through a closed surface of a magnetic field is zero. How do you support this?
- 77. Your friend told you the formula given below.

$$\frac{1}{f} = (n-1) \left[\frac{1}{R_1} - \frac{1}{R_2} \right]; \quad \frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

He asked you

- (a) What precautions should be taken in using the above formula?
- (b) In which situations should we use the above two formulae.
- 78. While experimenting with lenses, we cannot decide the image distance when virtual image is formed.

Is the above information correct? or not? Explain with reasons.

79. Ganesh told you that you can catch virtual image on a screen. How do you analyse this.



1 marks

80. Observe the following table

Material	Specific heat in Cal/g-c°
glass	0.031
brass	0.092
iron	0.115
aluminium	0.21
kerosene	0.5
water	1

Let us assume that above materials are taken in same mass and supplied the same rate. Which one of the above materials gets heated quickly and which one gets heated slowly. Why?

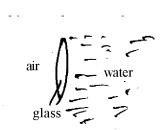
81. Observe the following table

Material	Refractive index
Ice	1.31
Water	1.33
Benzene	1.5
Carbon disulphide	1.63

Based on the above values, in which material is the speed of light the least?

82. Lens is arranged as shown in the figure care was taken to see that water is one side of the lens and air the other side.

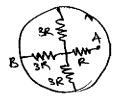
Can we use the formula to find $\frac{1}{f} = (n-1) \left[\frac{1}{R_1} - \frac{1}{R_2} \right]$ to find out the focal length of lens.



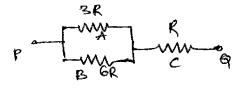
$\frac{1}{2}$ mark questions

- 83. Your friend has arranged circuit as shown in the picture. He measured the potential difference between A and B with the help of volt meter. ()
 - a) Potential difference is equal to zero.
 - b) Potential difference is equal to '∈'
 - c) Potential difference is equal to $2 \in$
 - d) Potential difference shows the value of 'e' for some time and "zero" for sometime.
- 84. A student connected Ammeter, Volt meter in a series. The readings are A, V. If a resistance is connected to volt meter parallely.
 - a) both A & V increase

- b) both A & V decrease
- c) A increases, V decreases
- d) A decreases V increases
- 85. Observe the circuit. Resistance of ring shaped conductor is zero. Equivalent resistance of A and B is
 - a) 2R
- b) 4R
- c) 7R
- d) 10R



86.



The resistances of A, B and

C are 3R, 6R and R respectively. Voltage is connected between P and Q. The ratio of electric energies (liberated in the form of heat) utilised by

A, B and C.....

- a) 2:3:4
- b) 2:4:3
- c) 4:2:3
- d) 3:2:4
- 87. Student: What happens to resistance if temperature is increased.

Teacher: Resistance decreases if temperature is decreased.

Which of the following statement, supports the above information.

- a) Electron density increases if the temperature increases
- b) Charge on each electron increases
- c) Mass of each electron increases
- d) the number of collisions increases



- 88. If the power of lens = -10 is used for the defect of vision of a person then the following is true
 - a) Hypermetropia Convex lens; focal length = 100 cm
 - b) Myopia Concave lens; focal length = 150 cm
 - c) Hypermetropia Convex lens; focal length = 50 cm
 - d) Myopia Concave lens; focal length = 50 cm

V. Drawing pictures, graphs making models

To assess the above standard, the following aspects must be kept in view to design the questions.

- Drawing pictures
- identifying the parts in a picture
- Drawing the picture showing the arrangement of tools
- Block diagrams
- Flow charts
- Bar graph
- Pie graphs
- Drawing creative pictures
- Making alternate tools / equipment

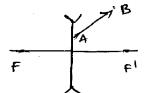
Model questions

4 marks

- 89. Draw a ray diagram for the virtual image formed when an objet is kept on the principal axis of concave mirror.
- 90. Ravi said that convex lens changes all the three rays i.e., parallel rays, convergent rays and divergent rays into convergent rays. Khader thought that what Ravi said was not correct. Draw ray diagrams to show whose opinion is correct.
- 91. Chandraiah, having defective vision consulted an eye doctor who suggested him to use concave lens. Draw the pictures showing the defect of chandraiah's vision and the related corrections by using a concave lens.



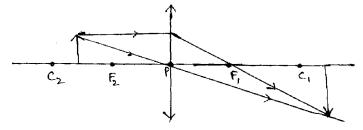
- 92. Draw the circuit diagram showing different electric appliances in your house are connected write names for the symbols used in the circuit.
- 93. Compare by drawing the diagrams of lines of force formed by bar magnet and lines of force formed by solenoid.



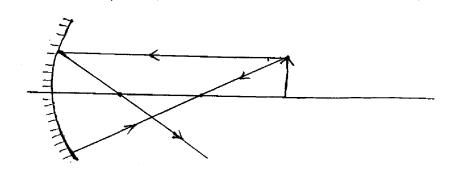
Ray AB is emergent ray. Complete the ray diagram based on this. Write explanations.

2 marks

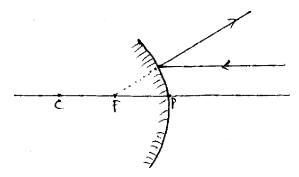
- 95. Draw the diagram showing place of image formed for a point object due to plane mirror.
- 96. Draw a diagram showing the position of an object to find out the perpendicular shift formed by a glass slab.
- 97. Discuss the nature of the image given in the following diagram.



- 98. Show with the help of a diagram how to arrange a circuit to compare the resistances of different materials having same length and cross section area.
- 99. Identify pole, focal point, centre of curvature and image position in the following diagram.

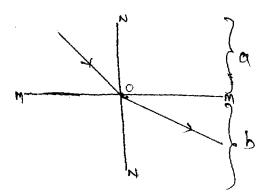






What does the above picture suggest.

101.



In the adjacent figure MM is the surface that separates two media. NN is a perpendicular drawn at the point 'O' of the surface MM. Of the media present in a, b areas on both sides of MM, which is the denser medium?

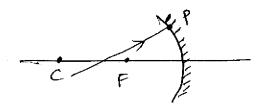
102. Write the names of the lens shown in the figure.





- 103. If white light is incident on a prism, it emerges 7 colours. Draw the diagram showing the above information.
- 104. Sukumar saw his face in the side mirror of a car. His image seemed smaller in the mirror.
 - (a) Which mirror is that?
 - (b) What is the nature of the image he saw?
 - (c) Draw a ray diagram showing the above image
- 105. a) Which mirror is used in the headlights of a car.
 - b) Where is the bulb kept in car in regard with mirror?
 - c) The light emitted by the bulb in the headlight of a car reflects when falls on a mirror. Draw a ray diagram showing the same.



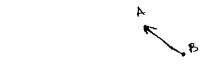


A light ray ws incident on a concave mirror as shown in the picture. The ray reflects. Write answers to the following questions.

- i) Which way does the light ray travelling parallel to the principal axis go when it is reflected by a concave mirror
- ii) Which way does the light ray travelling through focal point go when reflected by a concave mirror
- iii) Draw the reflected ray to the ray at point P based on the answers to the above questions.
- 107. If the bar magnet is moved towards the coil as shown in the picture, electricity induced in the coil.



- a) What is the direction of induced current?
- b) draw the magnetic field due to a bar magnet; the direction of magnetic field due to induced current.
- 108. Observe the picture. Eye plays an important role in seeing object image of AB in a plane mirror. Draw a ray diagram and shade the part where the eye has to be



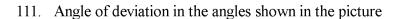
MIMMINITE

$\frac{1}{2}$ mark questions

- 109. Which one of the following is correct in regard with the tools connected in the circuit in the adjacent picture ()
 - a) In the circuit battery is connected in series with voltmeter and in paralled with ammeter.
 - b) In the circuit battery is connected in parallel with voltmeter and in series with ammeter.
 - c) Both ammeter and voltmeter are connected in paralled in the circuit.
 - d) Both ammeter and voltmeter are connected in series in the circuit.



- 110. The defect of vision shown in the picture
 - a) Short sight
 - b) long sight
 - c) presbyopia
 - d) No defect

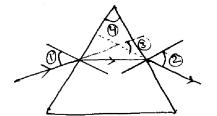


a) 1

b) 2

c) 3

d) 4



VI. Aesthetic sense / Appreciation / Values

Some fundamental aspects are identified to assess this standard. This standard can be easily assessed through these aspects. The child should not be asked "How do you appreciate" for all questions.

- situations for congratulating
- Appreciation
- Identifying the things in nature
- Appreciating the efforts of scientists
- Planning to participate in science clubs and seminars
- writing slogans, preparing pamphlets
- writing songs and poems
- writing essays about scientific concepts on special days.

VII. Concern to biodiversity / Application to daily life

This academic standard is achieved by the student when she/he applies the learnt things in her/his daily life. The following must be kept in view while assessing this academic standard.

- Recognising the importance of biodiversity
- Working towards conservation of biodiversity
- Principle of live and let live





- Daily life application of scientific rules
- Daily life application of tools and processes.

Let us see how to question in different academic standards based on a concept.

Model questions

4 marks

- 1. Phani's grandfather wass not able to read news paper. Phani gave a lens to his grandfather to read.
 - a) which lens did he give?
 - b) mention the reasons for giving that lens take help of a diagram for clarity
- 2. Lavanya is playing a plane mirror. She looked at her image in the mirror.
 - a) what is the reason for that image
 - b) she kept the mirror in sunlight. When she touched it afterwards it was hot. What is the reason for that?
 - c) she observed from a distance that the mirror was shining in sun light. What is the reason behind?
- 3. Your friend needed a resistance of 10Ω . He asked you. But you have resistances of 40Ω
 - i) What is the least number of resistances your friend will ask for?
 - ii) How to connect those resistances?
 - iii) Show that their equivalent resistance is 10Ω
- 4. How will you appreciate the working of lens in an eye and the role played by ciliary muscles.
- 5. Madhu went on a family picnic. They lit camp fire at the picnic spot. Madhu's sun Surya observed that the smoke was seen blue or dark colour when there were trees in the background. Similarly when the sky was the background the smoke was seen yellow in colour. Surya asked his father, Madhu about the difference in colours of smoke. Madhu answered. What is the answer?

2 marks

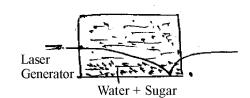
- 1. Why is tungsten used as a filament in bulbs?
- 2. More fog is found around an iceberg. Discuss.
- 3. Clouds are formed over hills. Why?



- 4. Car headlights use 40W energy when less light is emitted; 50W energy when more light is emitted. In which case is the resistance of headlights more? Discuss.
- 5. You are travelling in a bus on the road by the side of lake. A fountain is spilling water in the lake. You saw a rainbow through the spilled water. The rainbow was not seen after a distance. How do you explain this?

1 marks

1. There is an aquarium in Taj's house. There are no fish in that. When the laser light was sent through water, spilling sugar into the water, the laser travelled as shown in the picture. What is the reason for that.



)

- 2. What are the reasons for starts to twinkle?
- 3. Water in pot are cool. What is the reason?
- 4. Pigs roll in mud. Why?

$\frac{1}{2}$ mark questions

- 1. Which is not correct for an electric circuit used at home (
 - a) All electric appliances are connected in parallel
 - b) If a switch is connected in parallel to an electric appliance, electricity is consumed by that appliance when the switch is made on or off
 - c) If switch is connected in parallel to the electric appliance and is put off the fuse melts.
 - d) Switch can be connected either in parallel or in series to the electric appliances.
- 2. In the method of electric supply AC is convenient than DC because
 - a) you can rectify AC
 - b) AC can be easily produce
 - c) thin conductors can be used
 - d) It is safe
- 3. If the length of the filament in a heater is decreased by 10%, the electric energy consumed by it.
 - a) increases by 9% b) increases by 4% c) increases by 19% d) increases by 10%



- 4. Two bulbs A and B are made to work at the same voltage. Their electric energies are identified as $P_A > P_B$. If P_A , P_B are connected in series with V volts.
 - a) A will consume more energy then B
 - b) B will consume more energy than A
 - c) The ratio of energies consumed by them depends on V
 - d) A and B will consume the same energy.
- 5. Related to a battery in a circuit
 - a) Battery supplies electron to the circuit
 - b) Battery pushes the electrons towards high potential
 - c) Battery pushes the electrons towards low potential
 - d) Battery accelerates the speeds of electrons.

Let us prepare questions same concepts in different academic standards considered heat - temperature as an example.

Conceptual Understanding

- 1. Convert the following temperatures into degrees
 - a) 0 K
- b) 25 K
- c) 100 K
- d) 210 K
- 2. Objects A, B, C are in thermal equilibrium. What is the temperature of object C if the temperature of object 'A' is 30° C? What is the amount of heat transferred from A to B?
- 3. The temperature of burning flame of a candle is almost 100° C. When you more your finger through it, your finger is not injured / burnt. Explain with reasons.
- 4. A human's healthy temperature is 37° C approximately. Let us assume the surroundings with a temperature of 25° C. Why is that human temperature does not become equal to the temperature of the surrounding.

Questioning - Making hypothesis

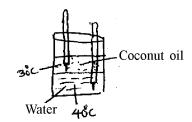
5. Kishore, a class 10 student, observed that the temperature of the whole system decreased when glucose was added to a glass of water. He asked his mother to know the reasons. She asked him some questions. As a result he understood the above process. What questions did she ask? When you write answers to them you should reach the conclusion, Kishore has reached.



6. When a cup with hot water was kept outside for sometime, the temperature of the water became equal to the atmospheric temperature. Prepare questions using the concepts of heat and temperature to make your friend know that temperature of hot water becomes equal to the temperature of the atmosphere.

Experiments

- 7. Write in your own words the experiment to differentiate between temperature and heat.
- 8. What precautions should be taken to get the accurate result in the experiment that measures the temperature at equilibrium, after taking water and coconut oil at different temperatures as show in the picture?



Information skills

9. A and B are two substances. Their temperatures are given in different cases.

	1	2	3	4	5
Substance A	30° C	50° C	-273° K	10 K	30 K
Substance B	30° C	30° C	0 K	20° C	30° C

Answer the following questions based on the above information.

- a) In which cases are A and B in thermal equilibrium? Why?
- b) In which cases does the transfer of heat takes place from A to B?
- c) In which cases does the transfer of heat takes place from B to A?
- 10. The temperature of vessel made of aluminium is 30° C. This is filled with hydogen gas at 80° C. Answer the following questions based on the above information.
 - a) If a hydogen molecule collides the wall of the vessel with certain velocity, then how will the velocity change. Compare the after collision with its initial velocity and say.
 - b) What will be the direction of heat transfer.
 - c) After sometime temperature of both substances reached 45° C. If the kinetic energy of H₂ molecule is 20 units what would be the average kinetic energy of free electrons in the metal?



Drawing Pictures

11. As shown in the picture in one of the similar vessles less oil is poured and in the other oil is poured in much large quantity. Two thermo meters kept in the vessels are showing the same temperature.





- a) Whose internal energy is more.
- b) What can you inter from the picture.

Identify and correct the mistake in the picture. Mention reasons for the mistake.

Appreciation - Daily life application

- 12. Cap is worn in cold countries. What is the reason for that?
- 13. Let us assume that you are in a cold country. You kept your body warm by wearing woollen clothes. How does the woollen cloth help to keep your body warm.

Model Questions in Chemistry

4 marks questions

- 1. If the pH values of solutions x, y and z are 13, 6 and 2 respectively then (AS1)
 - a) Which solution is a strong acid? Why?
 - b) Which solution contains ions along with molecules of solution?
 - c) Which solution is a strong base? Why?
 - d) Does the pH value of a solution increase or decrease when a base is added to it? Why?
- 2. If the electronic configurations of atoms A and B are 2, 8, 3S², 2 S², 2P⁶, 3S², 3P¹ and 2,
 - $61 S^2$, $2P^4$, respectively, then (AS4)
 - a) which atom forms negative ion?
 - b) which atom forms positive ion?
 - c) what is the valency of atom A?
 - d) what is the molecular formula of the compound formed by atoms A and B?
- 3. Observe the following equation which shows the action of heat on Calcium Nitrate (AS1)

$$2 \text{ Ca } (\text{NO}_3)_2 \rightarrow 2 \text{CaO} + 4 \text{ NO}_2 + \text{O}_2$$





- a) How many noles of NO₂ are formed when a nole of 2 Ca (NO₃)₂ is decomposed?
- b) What is the volume of NO₂ produced when 164 gm of Ca (NO₃)₂ is heated at constant temperature and pressure.
- c) Calculate the mass of Calcium Oxide formed when 82 gm of Ca (NO₃)₂ is heated.
- d) What is the quantity of Ca (NO₃)₂ is required to produce 5 moles of products.
- 4. The results of reactions of metals A, B, C, D, E with different solutions are given in the table below. Observe the table and write answers. (AS4)

Metal			Solution		
	Fe SO ₄₄	Cu SO ₄	Zn SO ₄	Ag NO ₃	Al (SO ₄) ₃
A	No reaction	No reaction	No reaction	A layer is formed	No reaction
В	an ash coloured substance settled on the metal	a light brown layer is formed on the metal	No reaction	A layer is formed	No reaction
С	No reaction	No reaction	No reaction	No reaction	No reaction
D	No reaction	-	No reaction	A layer is formed on the metal	No reaction
Е	-	a light brown layer is	fresh layer is formed	fresh layer is formed	No reaction

- a) Which is the highly reactive metal? Why?
- b) Which is the least reactive metal? Why?
- c) Which metals form brown layer?
- d) Arrange the metals A, B, C, D, E in the order of their reactivity?



5. Identify the functional groups in the following compound and write IUPAC names. (AS5)

b)
$$CH_3$$
 - CH - C - CH_3 CH_3 O

- 6. Solution x turned blue litmus red and Solution y turned red litmus blue. (AS1)
 - a) What products could be formed when x and y are mixed.
 - b) Which gas is released when we put magnesium pieces in solution x
 - c) Will any chemical reaction take place when zinc pieces are put in solution y?
 - d) Which of the above solutions contain more hydrogen ions?
- 7. A student was given the following substances and was asked to show types of chemical reactions through experiment. Write how he would have done that? (AS3)

Copper sulphate solution, barium chloride solution, ferrous sulphate crystals, iron hails, calcium oxide, water.

- 8. The electronic configuration of an atom is as follows $1S^2 2S^2 2P^2$ (AS1)
 - a) which element's atom is it?
 - b) which orbital is the last electron in?
 - c) when excited what could be the number of lone / single electrons in this atom.
 - d) what is the value of principal quantum numbers of two electrons in the first box ?
- 9. Some elements belonging to second period of periodic table, and their atomic radii are given below. Observe them and write answers. (AS4)

2nd peirod elements	В	Be	О	N	Li	С
Atomic radii	88	111	66	74	152	77

- a) Write the elements in the ascending order of their atomic radii.
- b) Which of the 2nd period elements closer to the configuration of inert gas.
- c) Which is the outermost orbit of all these elements?
- d) Which elements atomic size bigger, Beryllium or Carbon? Why?

10.	Group→	1	2	13	14	15	16	17	18
	Period ↓								
	3	X		В	С	D	Е		
	4	Y							
	5	Z							

Refer the above part of periodic table and answer the following questions. (AS4)

- a) Element with the least atomic size.
- b) Write the electronic configuration of the elements B and E.
- c) Identify the elements that have similar physical and chemical properties as the element Y.
- d) Arranged elements increasing order of their electro negativity values.
- 11. Referring the part of periodic table given below answer the questions that follow. (AS1)

Li	Be	В	С	N	О	F
Na	Mg	Al	Si	P	S	Cl

- a) What happens to the atomic size if moved from left to right? Support your answer?
- b) What changes do you observe in the metallic properties of the elements when moved from left to right?
- 12. The electronic configurations of elements X, Y, Z are as follows: (AS4)

X:2

Y: 2, 6

Z: 2, 8, 2

- a) Element belonging to second period?
- b) Element belonging to eighteenth group?
- c) valency of element Y is?
- d) Write the formula of compound formed by the elements Y and Z.
- 13. The electronic configuration of atom A is 2, 8, 6 (AS1)
 - a) What is the atomic number of element A
 - b) State whether the atomic size of element A is bigger or smaller than the atom having atomic number 14. Why?





- c) Which of the elements exhibit similarity in chemical properties as element A O(8), C(6), N(7), AV(18). Why?
- d) How the element is formed innert gas configuration?
- 14. Mendeleef classified the then known 63 elements in the form of a periodic table. Mention any two things that benefitted study of chemistry, to support the above statement. (AS1)
- 15. Explain what the reactions are called in which both oxidation and reduction take place? (AS1)
- 16. Haven't you observed that different colours are emitted when crackers are burnt on Deepavali? Write reasons for the emission of these colours. (AS1)
- 17. Draw the structure of butanoic acid $C_3 H_7 COOH$. (AS5)
- 18. Draw the structures of isomers of butane. (AS5)
- 19. Explain the role of misily is cleaning of cloths with the help of a diagram. (AS1)
- 20. If the structure of ester is

Explain the associated structures of its alcohol and acid and draw their structure. (AS5)

- 21. Draw the structures of the following (AS5)
 - a) Ethavoic acid
- b) Propanol
- c) Propene
- d) Chloropropene
- 22. Draw electron dot structures of ethane and chlorine (AS5)
- 23. Draw the structures of the following compounds (AS5)
 - a) 2 bromopentane

b) 2 - methyl propane

c) butanol

- d) 1 hexine
- 24. Draw the electron dot structures of ethanoic acid and ethyne (acetylene). (AS5)
- 25. Draw and explain the diagram of micille. (AS5)
- 26. Write the molecular formula of the first four compounds of the homologous series of aldehydes.
 (AS5)



- 27. How many isomers can be drawn for pentane with molecular formula $C_5 H_{12}$? what are they? Draw their structures and mention their common names. (AS5)
- 28. a) Draw the electron dot structures of Sodium, Oxygen and Magnesium. (AS5)
 - b) Show in the form of a picture, the formation of Na, O and MgO.
- 29. Silicon is a metalloid. How do you support this? (AS1)
- 30. Why do we colour things made of iron. (AS1)
- 31. What is done to prevent rancidity of some food materials? (AS1)
- 32. What do you do to prevent rusting of copper and silver articles. (AS1)
- 33. Mention any four effects of oxidation, you have observed in daily life and discuss the results.

 (AS6)
- 34. Discuss briefly the examples showing the importance of pH in daily life. (AS6)
- 35. How do you appreciate the importance of electronic configuration in periodic tables. (AS6)
- 36. Write your argument on the position of Hydrogen in the modern periodic table? (AS2)
- 37. We write symbol of water as H₂O. State why should not we write it as HO₂. (AS1)
- 38. How do you appreciate the role of esters in daily life. (AS6)
- 39. Mention the most important metals and non metals from the following products. (AS1)
 - a) Annapurna salt
 - b) Liquid used in thermo meter
 - c) lead of the pencil
 - d) Chlorophyll
 - e) filament in electric bulb
 - f) enamel layer on teeth
- 40. How do you regard the role of Octave theory about chemical properties of elements. (AS6)

How to assess the answers?

Summative evaluation is a test that observes children's progress in fixed standards. So based on the weightage of questions and academic standards questions can be given anywhere from the





text book. There is no need to prepare primary "Key", because the questions, by nature facilitate answering on own and analysing. Hence we should not be under the impression that all the students will write the same answers. Sometimes the child may write the answer different from the text book depending upon his own thought and experience. If it is correct, then it should be considered. Teachers may correct the papers and award marks as they have been doing till how. But the answers vary from student to student hence they should be careful in awarding marks.

There will not be any division of marks based on the number of points or pages. The answers written by students are also not routine. Hence there will be chaos on how to correct the papers observe the following academic standardwise assessment indicators (value points) to get a clear idea.

Conceptual Understanding

40% of weightage is there for Conceptual Understading. There will be essay, short, very short and multiple choice questions. 16 marks in all will be there for this standard. The questions will cover the aspects like explaining, comparing, differntiating, giving reasons, analysing. Similarly the questions will not be direct but thought provoking. Look at the question below.

A person reached a fixed distance once by walking and next time by running. When do his legs ache? Why? The same question may be asked why do legs ache when we run? Observe the following points to assess the answers to such questions.

- 1. Information written by students should be relevant and sufficient.
- 2. Check the relevance of the answer to the question, though the child has written the answers on his own.
- 3. Have they drawn pictures wherever necessary?
- 4. Have they explained with examples.
- 5. Did they write similarities and differences in the form of a table.
- 6. Have they mentioned proper reasons?
- 7. Identify whether the answer is mugged up taken from guide. Give importance to the answers written on their own.

Questioning - Making hypothesis

This standard develops the nature of questioning and imagining to make hypothesis among students. The student has to write thought provoking questions on different concepts as answers.



So they get a chance to write different questions. Similarly a student has to write her/his imaginations under hypothesis. If a question has many aspects to and as its answer it becomes a hypothesis.

Suggestions to assess this standard

- 1. Identify logic and rationality in the questions written by the students.
- 2. Identify clarity in the things imagined than ambiguity.
- 3. Marks should be awarded based on quality of the questions and not on quantity (number of questions)
- 4. Answers to be written by children are mostly.
- 5. Give more importance to the questions written on their own.
- 6. The correct answer must be identified even in objective and multiple choice questions.

Experiments and field trips

Experiments and field trips are very important in teaching of science. This standard helps the student to develop scientific vision and scientific attitude and curiosity to learn science. Hence, if this standard is assessed specifically and the results ar analysed, it helps in increasing the experimental skills among students.

Suggestions to assess

- 1. Is there any importance to scientific aspecs in the things written by the student.
- 2. Have they written according to the steps like objective, arrangement of tools, observation, result, precautions (All the experiments may not have these steps)
- 3. Have they written the result and commented on it?
- 4. Have they drawn the diagram to explain (diagram must be given due importance)
- 5. Have they written what the result could be if they change the variables. Observe.

Information Skills

In the academic standard information skills and project works, project works are not given in the written exam. Only information skills will be tested. Even in this there will not be questions ending with collect the information. Hence we consider two aspects while assessing this standard

- 1) Collecting the information
- 2) Analysing the information





Things to be observed to assess

- 1. Have they prepared tables according to the given information.
- 2. Have they written the method of collecting information in detail?
- 3. Have they entered the classified information in the tables?
- 4. Is the method of analysing the information correct?
- 5. Have they written, numbers, data, principles / formulae and scientific words without any mistakes?
- 6. Have they followed scientific method while commenting on the information? Have they written on their own.

Drawing pictures, graphs / making models

- 1. There should be clarity in pictures, diagrams microscopic pictures, whatever they draw.
- 2. Do not find the mistake in the children's own drawings with the feeling that the diagram should be like the one in the textbook.
- 3. Consider whether the picture drawn is conveying the information or not.
- 4. Do not give much importance to the artistic skills.
- 5. Proper marks should be alloted to the information if asked to write along with the diagram.
- 6. Diagram should be labelled.
- 7. Check whether drawing and commenting on the graphs are as per the proofs.
- 8. Symmetry of tools must be considered when their diagrams are drawn.

Aesthetic Sense / Appreciation / Values, Daily life Application

This academic standard is useful in making the children persons with scientific vision. The questions in this standard provide scope for writing a variety of answers.

- Mostly the answer will be written on their own. Check the standard related to the topic asked.
- Understand the answer form. Understand the productive form of the answer and give importance to it rather than the direct answer.
- Only true things must be written when writing about scientists.
- Desired feeling must be assessed when cartoons and satirical pictures are drawn.



- Slogans must not be less than five as per marks.
- Observe the conversations written in order / sequence without any disorder or messing up.

Teacher's role in Assessment

Continuous Comprehensive Evaluation is a special method. Formative and Summative Evaluations take place separately. Since summative evaluation is a written the following are the special suggestions for teachers to correct the answer scripts.

- Teachers need subject knowledge, tactics and patience.
- Spontaniety is needed to assess the answers written by the students.
- Answers written by children on their own must be assessed carefully. Do not think that they must have written some stories. Children may at loss if you assume in such a way.
- Observe whether the answers are in accordance with the question or not. If associated questions are given, allot proper marks to them.
- See whether the diagrams drawn by students are sufficient to give the information. There is no rule that they should draw the pictures exactly as given in text book.
- Should develop an understanding in the following aspects reading the reports, analysing them, writing tables, bar graphs, pie charts etc.
- Should have an understanding about writing the flow chart, reading it and writing a report about it.
- The answers written to the questions in the last standard are of more linguistic native. Help of language teachers can be taken while assessing poem / song / short story / conversation / essay / slogan etc.

Assessing as per the type of questions. The following are the type of questions as per the proposed reforms in class 10 examinations.

- 1. Essay type questions
- 2. Short answer questions
- 3. Very short answer questions
- 4. Multiple choice questions.

To assess answers to these questions a special method has to be followed. The answer scripts must be evaluated as per the alloted marks.

- 1. Essay type questions 4 marks
- 2. Short answer questions 2 marks



3. Very short answer questions - 1 mark

4. Multiple choice questions - 1/2 mark

Suggestions to correct essay type answers.

- 1. Since they are essay type they must be complete. Approximately 10-12 sentence should be there.
- 2. Answers should give complete knowledge of the topic.
- 3. Observe whether scientific terminology is used or not while writing answers to such questions.
- 4. Even though the child is writing own answer check whether the concepts are related to the answer.
- 5. Check whether a sequence is followed iin writing answers.
- 6. Do not give much importance to spelling mistakes.
- 7. Award full marks to the pictures if drawn where needed.
- 8. Experiments must be written as per the steps.
- 9. Tabular form should be given importance while writing the comparisions, differences & similarities.
- 10. While assessing the answers written to questioning 6th & 7th academic standards, there should be a fine observation.

Short answer questions

- 5-6 sentences in an answer are enough.
- Correct the answers to questions like commenting the pictures or looking at the pictures in accordance with the questions.
- Even if the question is complicated / twisted the answers must be direct.
- The answers must be assessed as per the academic standard.
- Even the rough diagrams must be considered where diagrams are asked.

Very Short answer questions

The answers to these questions should be in 2-3 sentences. They will be direct questions.
 Children should try to give direct answers. While assessing we must check whether they have answered briefly and appropriately.

Multiple choice questions

- Answers to the multiple choice questions must be identified and written in the brackets.
- Though only 1/2 mark questions the answers will not be direct.





GENERAL SCIENCE PAPER-I Physical Science (English Version)

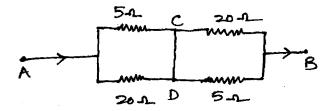
Time: 2.45 mts. Maximum Marks: 40

SECTION - I

 $(4 \times 4 = 16)$

Instructions:

- i) Answer all the questions.
- ii) Each question carries Four marks.
- iii) There is internal choice for each question. Only one option from each question is to be attempted.
- iv) Answer each question in **8 to 10** sentences.
- 1. A circuit is shown in the picture. Let us assume that electric current of 5 amperes has entered the circuit at A.



- i) What is the electric current at point B.
- ii) Are the electric potential equal in above and below paths. How can you say?
- iii) What is the resultant resistance of the circuit?
- iv) Calculate potential difference between 5Ω and 5Ω

(OR)

Let us assume that we made a small magnet (M) to fall through the metallic ring

- i) Explain the direction of flow of current induced in the metallic ring as a result of movement of the magnet.
- ii) We know that acceleration due to gravity is g. How will the magnetic acceleration when the bar magnet comes near or moves away from the ring?
- iii) What changes you observe when the magnetic poles inverted.





2. A balanced equation of action of heat on Calcium nitrate is given

$$2 \text{ Ca(NO}_3)_2 \xrightarrow{\Delta} 2CaO + 4NO_2 \uparrow + O_2 \uparrow$$

164 and 56 are the masses of Ca (NO₃), and CaO respectively

- (i) How many moles of NO₂ is released when one mole of Ca (NO₃)₂ is decomposed?
- (ii) What is the volume of O_2 formed at STP when 65.6 gm of Ca $(NO_3)_2$ is heated?
- (iii) What mass of Ca (NO₃)₂ is required to produce 5 moles of gaseous products.

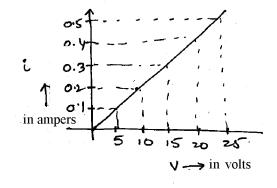
(OR)

1S²2S²2P⁶3S¹ and 1S²2S²2P⁴ are the electronic cofigurations of atoms X and Y respectively.

- 1. Which atom can form anion? Why?
- 2. Which atom can form cation? Why?
- 3. Which block in the periodic table do the elements X and Y belong to?
- 4. Write the formula of the molecule formed by the atoms of the elements X and Y.
- 3. Madhu draw a graph taking flow of current on Y axis and voltage on X axis. The got the values by using a wire, voltmeter and ammeter

Answer the following questions based on the graph

- i) What kind of wire was it?
- ii) Find the resistance of the wire.
- iii) How much of electrical energy is used by the wire when a potential difference of 20V is supplied between the ends of the wire.



iv) Which rule / principle does the above graph show?

(OR)

A student conducted experiment with a biconven lens and prepared the following table

Object distance in cm	70	60	50	40	30
Image distance in cm	14.5	15.2	16.2	17	20
Focal length in cm	12.01	12.12	12.13	11.92	12



- i) What could be the reasons for different focal lengths in the above table?
- ii) How will you decide the focal length of the above lens? What is its value?
- iii) Can you measure the image distance making the object distance 10 cm? Why?
- 4. A carbon compound A (formula C₂H₆O) is extensively used as a solution in preparing medicines. When this compound is heated along with potassium permanganate it gets oxidised and finally a carbon compound B is formed compound B turns blue litmus red.
 - i) Write the chemical name and formula of compound A.
 - ii) Write the chemical name and formula of compound B.
 - iii) What is the nature of compound B (acid/base) salt.
 - iv) Write chemical equation indicating the intermediate product.

(OR)

A student was given the following chemicals by his teacher and was asked to conduct an experiment to show types of chemical reaction. Explain writing chemical equations, how he must have done the experiment.

- 1. Copper sulphate solution
- 2. Barium chloride solution
- 3. Iron nails
- 4. Ferrous sulphate crystals
- 5. Calcium oxide
- 6. Water

SECTION - II

 $(6 \times 2 = 12)$

Instructions:

- i) Answer all the questions.
- ii) Each question carries two marks.
- iii) Answer each question in 4 to 5 sentences.
- 1. i) Give reason whether the following group is a Dobernair's triad or not. Na, Si, Cl (Atomic weights of Na, Si, Cl are 23, 28, 35.5 respectively)
 - ii) What is the atomic weight of Se. If S, Se, Te are Dobernair's triad. (32, 125)





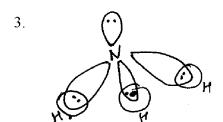
- 2. The pH values of solutions X, Y, Z are 13, 6 and 2 respectively.
 - i) Which solution is a strong acid?
 - ii) Which solution is a strong base?
 - iii) If a base is added to solution Z with the pH value of that solution increases or decreases.
- 3. What questions will you ask to know more information about furnaces in regard with extraction of metals.
- 4. Draw the ray diagram of image of an object which is at the C of concave mirror.
- 5. Explain the reasons why Led is used in fuse.
- 6. Explain the importance of ciliary muscles in the eye.

SECTION - III

 $(7 \times 1 = 7)$

Instructions:

- i) Answer all the questions.
- ii) Each question carries One marks.
- iii) Answer each question in 1 to 2 sentences.
- 1. A student couldnot differentiate between acetic acid and ethyl alcohol solutions in a lab. How can he identify with the help of Na₂ CO₃ available.
- 2. Two students, while walking on the road in the afternoon found image of water on the road. When they went near nothing was found. Guess what could be the reasons for this.



When the teacher asked "How many bonds are there in ammonia?" The student, looking at the diagram answered "There are 3 bonds". Explain the bonds in this molecule as per hybridisation.

- 4. Though ethyle alcohol is very useful to human beings. It has a bad influence on the social behaviour of human beings. Give 2 reasons stating your opinion on this.
- 5. Woollen clothes do not allow the body temperature to decrease. Suresh mentioned the reason for this and appreciated the role of woollen cloth. What the reason might be ? How will you appreciate it.





- 6. If you kept a pencil far from the fixed mirror. Image of the pencil was not been in the mirror. But he observed that when the pencil was brought nearer the image looked bigger after a certain point/place. Draw the ray diagram indicating that.
- 7. What precautions must be taken while conducting the experiment angle of vision of eye.

SECTION - IV

Instructions:

- i) Answer all the questions.
- ii) Each question has Four choices. Choose the correct answer for each question and write the relevant alphabet (A, B, C, D) against the question number in your answer booklet.
- iii) Each question carres 1/2 mark.
- 1. The four quantum numbers of an electron in an atom are as follows.

n	1	m	S
1	0	0	$\frac{-1}{2}$

What is its electronic configuration?

- (a) $2 S^1$
- (b) $2 S^2$
- (c) $1 S^1$
- (d) $2 S^2$
- 2. Three students measured the pH values of water, limejuice and sodium bicarbonate. The descending order of those pH values.
 - a) Water > lemon juice > sodium bicarbonate
 - b) lemon juice > Water > sodium bicarbonate
 - c) sodium bicarbonate > Water > lemon juice
 - d) Water > sodium bicarbonate > lemon juice
- 3. What is the electronic configuration of the 4th element of 2nd group in the periodic table of elements.
 - a) $1S^2 2S^2 2P^6 3S^2$
- b) $1S^2 2S^2 2P^6 3S^2 3P^6 4S^1$
- c) $1S^2 2S^2 2P^6 3S^2 3P^4$
- d) $1S^2 2S^2 2P^6 3S^2 3P^6 4S^2$
- 4. The following group contains the compounds of a homologous series in order. Find out the compounds in the series

homologous series: CH₃ OH

C,H,OH

C₃H₇OH

(a) $C_5H_{11}OH$

(b) C_4H_9OH

(c) both a and b

(d) none

- 5. Irrelevent to thermal equilibrium
 - a) the temperatures of objects must be the same at thermal equilibrium
 - b) There will not be any heat transfer between objects at thermal equilibrium
 - c) Heat travels from the object of larger mass to the object of lesser mass at thermal equilibrium.
 - d) Average kinetic energy of molecules in all the substances is equal.
- 6. A student saw the marks 120V; 60V on a bulb. To check whether the values are correct or not he has to
 - a) use the formula $R = \frac{V^2}{P}$ and find the resistance.
 - b) measuring resistance with the help of a multimeter.
 - c) compare the value found out through multimeter with $R = \frac{V^2}{P}$
 - d) take the filament supply different voltages identify the ammeter reading and it on a graph; decide the resistance based on the graph.
- 7. The magnification value m of a concave mirror is negative if less than 1. The correct answer for this information
 - a) the object is beyond C, image formed is reverse and small.
 - b) the object between C and F, image formed is reverse and big.
 - c) the object is at F, image is at infinite.
 - d) the object is between F and P, image formed is long and in the mirror it is big.
- 8. If the temperature is increased, then the resistance of conductor also increased. The reason is
 - a) collision of electrons
 - b) Change in the mass of electrons

- c) expansion of conductor
- d) decrease of time of collision between electron and : increase of vibrations of ions having.
- 9. The suitable formula to find out the focal length of an eye

a)
$$\frac{1}{f} = (n-1) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$

$$b) \qquad \frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

- c) a & b
- d) cannot be confirmed.
- 10. Elements and their electronic configurations of 2nd series are given

Atom: Li Be B C N O
152 111 88 72 74 66

The one that has the least ionisation energy

- a) Li
- b) Be
- c) N
- d) O



10th Class - Physical Science

Blue print for model paper

Marks for Questions A.S.	4 m	2 m	1 m	$\frac{1}{2}$ m	Total Marks
I	2 (8 m) P-1, C-1	-	3 (3 m) P-2, C-1	10 (5 m) P-5, C-5	16
II	-	2 (4 m) P-1, C-1	-	-	4
III	1 (4 m) P	-	2 (2 m) P-1, C-1	-	6
IV	-	2 (4 m) P-1, C-1	2 (2 m) P-1, C-1	-	6
V	-	2 (4 m) P-1, C-1	-	-	4
VI	1 (4 m) C	-	-	-	4

No. of questions

4

(6)

 $\overline{7}$

(10)

27) 40 m

P - Physics

C - Chemistry



GENERAL SCIENCE PAPER-I Physical Science (English Version)

Time: 2.45 mts. Maximum Marks: 40

SECTION - I

 $(4 \times 4 = 16)$

Instructions:

- i) Answer all the questions.
- ii) Each question carries Four marks.
- iii) There is internal choice for each question. Only one option from each question is to be attempted.
- iv) Answer each question in **8 to 10** sentences.
- 1. Heat is liberated in the reactions where water was added to calcium oxide and hydrochloric acid was added to zinc pieces. Ramu said hence they are same type of chemical reactions. Eshwar was of opinion that the reactions were not similar. What is the basis of Eshwar's opinion. Write equations for the above reactions.

(OR)

Instead of using just plain water to clean clothes, why do we use detergent? How dies it remove dirt in clothes? Explain.

2. "Efforts of Mendeleev in regard with classification of elements are outstanding". Do you agree or disagree with the above statement. Explain with proper reasons.

(OR)

We see many combustion and oxidation reactions in our daily life. Among them every combustion reaction is an oxidation reaction. But not all the oxidation reactions are combustion reaction. Do you agree or disagree with the statement. Explain with proper reasons.

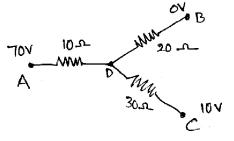
- 3. We kept an object at one of the centre of curvatures of equal radii of a convex lens. Refractive index of the lens is n. If the lens is in the air explain the following
 - a) What is the focal length?
 - b) What is the image distance?
 - c) Discuss the nature of the image.





(OR)

Observe the picture. The values of potential differences at A, B, C are 70V, 0V and 10V respectively.



- a) What is the potential at D?
- b) Find the ratio of the flow of current in AD, DB, DC
- 4. Values of focal lengths are not written on the concave mirrors you have. What tools do you need to find their focal lengths experimentally. How do you conduct the experiment?

(OR)

Rama wanted to prepare lid with high specific heat to use on cooking utensil. What tools does she need to find the specific heat of aluminium and copper? How should she conduct the experiment.

 $(6 \times 2 = 12)$

Instructions:

- i) Answer all the questions.
- ii) Each question carries two marks.
- iii) Answer each question in <u>4 to 5</u> sentences.
- 5. A mettalic spring is hung to heat resistant material. Imagine what happens if the two ends of the vertically hanging spring are connected to a battery and switch in a circuit and the switch is put on.
- 6. Substance A turned blue litmus paper to red Substance B turned red litmus paper to blue. What products could for in a reaction between A and B. Give reasons.
- 7. The electromotive force generated in a coil does not depend on the resistance of the coil. Rayudu read this in a book. How do you analyse whether the above information is correct or not.
- 8. a) CH₃ CH₂ CH₂ CH₃ b) CH₃ CH CH
 CH₃



We can see that number of carbons and hydrogens is same in both the substances shown above. What do you understand by the given shapes. Explain.

- 9. Show with the help of a diagram, how to form a circuit to compare the resistances of different materials of same length and cross section area.
- 10. Show with the help of a diagram, a molecule in which porbitals of one of the atoms form covalent bond with S orbitals of other atoms.

SECTION - III

 $(7 \times 1 = 7)$

Instructions:

- i) Answer all the questions.
- ii) Each question carries One marks.
- iii) Answer each question in 1 to 2 sentences.
- 11. 4 kg of water is at 100° C temperature. How much heat energy is required for the whole water to evaporate (water's latent heat of evaporation is 540 cal/gm)
- 12. In which condition the incident ray and refracted ray are equal?
- 13. You have conducted experiments in which a piece of Zn reacts with HCl and NaOH separately. What is the common aspect you've observed in the experiment.
- 14. What is the main thing you've observed in the experiment to observe the process of melting of ice i.e from melting of ice till it became water.
- 15. Based on the following electronic configuration choose the atom that forms an ion. Give reason.
- 16. Observe the following table.

Material	Ice	Water	Benzene	Carbondisulphide
Refractive index	1.31	1.33	1.5	1.63

Based on the above values mention the material in which light has the least speed.

17. Observe the following table.

Atom of element	Sodium	Aluminium	Potassium
Atomic number	11	13	19

Based on the information above what can you say about the size of the atoms?



SECTION - IV

 $(10 \times 1/2 = 5)$

Instructions:

a)

c)

i)	Answer	all	the	questions.

- Each question has Four choices. Choose the correct answer for each question and write the relevant alphabet (A, B, C, D) against the question number in your answer booklet.

iii)	Each	question carres 1/2 mark.								
18.	Wh	Which one of the following true for two materials at same temperature in different vessels.								
	a)	a) they are in thermal equilibrium								
	b)	the value of their heat content is equal.								
	c)	We can say the value of their heat contents and masses based only on specific heat.								
	d)	If 100 ml water is added to same.	to two ve	ssels, then after some time their temperature will be						
19.		at of resistance increases by a sonot change.	adding res	sistance to a battery. Which of the following values						
	a)	electron drift speed	b)	specific resistance						
	c)	resistance	d)	electron density						
20.		us assume that a common eighting its resistance could be		alb has a resistance of 240Ω . After 30 minutes of the same and the same and the same are same as a second sec						
	a)	240Ω	b)	$<$ 240 Ω						
	c)	$> 240 \ \Omega$	d)	the above information is not sufficient						
21.		•	_	ated to north due to the effect of magnetic field. As of magnetic field is towards						
	a)	west	b)	south						
	c)	up	d)	down						
22.	Wh	ich of the following gets hea	ated most	slowly						

Which one of the following liquids is acetic acid? 23.

Water (specific heat 1 cal/g-c°)

Kerosene (specific heat 0.5 cal/g-c°)

liquid with sweet smell liquid with pungent smell b) a) liquid with out smell liquid with foul smell c) d)

b) Ice (specific heat 0.5 cal/g-c°)

d) Sea water (specific heat 0.95 cal/g-c°)



24.	Ther	re are 12 protons in the ator	n of an e	lement. Which period and group does the element				
	belo	ng to						
	a)	3rd period 2nd group	b)	3rd period 3rd group				
	c)	2nd period 3rd group	d)	2nd period 2nd group				
25.	Stud	ents a, b, c and d measured	the pH v	values of water, sodium bicarbonate and lemonjuice				
	and	wrote them in descending o	rder. W	ho among them has identified correctly				
	a)	a) Water > lemon juice > sodium bicarbonate						
	b)	Lemon juice > water > so	dium bic	carbonate				
	c)	Sodium bicarbonate > wa	ter > len	non juice				

Water > sodium bicarbonate > lemon juice

Which of the following does not have ionic bond

b) HCl

Chemical combination

Chemical displacement

In which of the following reactions only one product is formed.

b)

d)

c) MgCl,

Chemical decomposition

d) BaCl,

Double decomposition

d)

a)

c)

a)

NaC1

26.

27.



IX. Teacher's Readiness

Readiness to do a job and believing in oneself are essential for a person to do a job successfully. No job will be successful when the people involved in doing it are not ready for it. That is why we often say that only those jobs / assignments will be successful which are done with commitment in word and deed. This can be called 'readiness'.

Why Readiness?

When we want to go to another place or when we want to conduct a programme either in the school or in the house, we plan for it at least two or three days in advance. We look for answers to questions like How to conduct? What do we need? Who to meet? How to sequence various activities? Which place is suitable? etc. Then, we make a list of all that has come out of this planning and thinking. Shall we call it readiness?

In the same way, as a teacher of physical science, we too need such readiness. Let us have a look at the present state of affairs in our schools. On the pretext of heavy syllabus, and showing the urgency of covering the syllabus within the allocated time, the science teacher is attending the class without any plan or schedule. That is why the teaching learning activities are 'passive' and teaching is restricted to 'lecturing'.

Experiments in laboratory or classroom has become a rare sight in our schools, so the teaching learning process is not able to develop in children any scientific outlook. In the name of science, children's brains are filled in with information. No opportunities are given to them for knowledge construction. It is high time that the physical science teacher learnt how to get ready to face these challenges and be an effective teacher.

Readiness in the teaching of Physical Science"

- Teaching Physical science without readiness is useless
- Since readiness is essential, the Physical science teacher should get ready in the following way. S/he should:
 - Read the lesson to be taught thoroughly





- Prepare plans according to teaching strategies/methods (year plan, unit plan and lesson plan)
- Have complete understanding of the nature of children in class and their strategies of learning
- Design teaching learning activities to develop required process skills and to achieve targeted academic standards
- Get ready to elaborate on key concepts, mind-mapping, activities and experiments in the lesson
- Get ready with all the materials and resources required to conduct activities, experiments, field visits, projects identified fort the lesson
- Get ready to demonstrate the experiment and then guide children to do it either in groups or individually.
- See that children analyze the results of the experiments, make generalizations and thus construct knowledge
- Encourage and give suitable instructions / precautions to children when they are involved in doing activities and experiments
- Develop in children good comprehension of the key concepts through thought provoking questions. While preparing these questions the teacher should keep in view the previous knowledge of children and the phenomena they come across in day to day life.
- Encourage children to collect information / write answers on their own for questions given under the heading 'Think & Discuss'
- Make children read the contents of 'Do you know' and encourage them to collect and exhibit similar information in the classroom
- Do the experiments beforehand to make sure everything goes well
- Get ready with all the required materials to teach the lesson before going to the class
- Raise awareness in children about biodiversity and lead them to appreciate her/his surroundings and the beauty and diversity embedded in them
- Identify the possible project work / field visit in the lesson and get ready with worksheets / instruction sheets / information
- Check the observations sheets / worksheets and records of children regularly
- Get ready with assessment tools to check whether the targeted academic standards have been achieved in the classroom or not
- Inform children about their performance soon after marking the answer papers
- Develop /design remedial measures and additional teaching learning activities for slow learners



- Keep pace with the changes in the fields of science and technology and adapt his teaching accordingly
- Collect additional information through internet and reference books and pass it on to children

Let us hope that teachers will get ready to teach as shown above, and try to give children quality education, which brings out the creativity in children and make them future scientists

Additional activities to be taken up by the Physical science teacher

The teacher should:

- Get the laboratory ready to conduct experiments
- Get the classroom ready to conduct experiments If there is no laboratory or if it is not in a good condition
- Exhibit the photographs of scientists in the laboratory and celebrate their birthdays
- Conduct school exhibition, science quiz and science day during every academic year without fail
- Visit the place selected for field visit at least a few days in advance, collect required information and obtain necessary permissions
- Work as a guide in conducting project works by dividing children into groups and giving them suitable instructions / worksheets/ material
- Collect the names, addresses and phone numbers of important people in the society around
 the school with a view to make them partners in school development. The teacher should also
 establish science club in the school and conduct interesting programmes to arise curiosity and
 the zeal to learn among children



X. Physics Laboratory

Physical Science experiments:

- 1. What is the importance of experiments in Physical science?
- 2. What is the relation between textbook and laboratory?
- 3. How to conduct the laboratory?
- 4. What to do before, while and after the experiment?
- 5. What is the role of the teacher in conducting physical science experiments?
- 6. What are the required equipment, chemicals to conduct experiments in the lessons of 10th class physical science?

Conducting experiments is science is an important skill process. In science and technological revolution there is an important place for experiments. Experimental results done by the scientists are key for many revolutionary changes in human life. JJ. Dhavan found the Electron history to malaria insect through his experiments. That is why physical science teacher should help the students to do experiments, understand the concepts, principles on their own to construct the physical science knowledge. Through this students build their knowledge. By doing experiments like these students can develop scientific attitude.

In studying physical science there is a specific place for experiments among skill process. To achieve the desired standards, doing the experiments and testing the results on their own with locally available experiments is an experiment. In bio science, it is necessary to observe many items under microscope. So, the teacher has to prepare the students in using the microscope and in making the slides. In bioscience experiments teacher has to train the students including experiments, direct observations (eg: parts of the plant, models of organisms), drawing the diagrams etc.

Importance of experiments:

- 1. Prove and understand bioscience truths, principles, rules.
- 2. Develops the capacity to found solutions for everyday problems.





- 3. Know the answers for the questions like why. What?
- 4. Develop interest towards bio science.
- 5. Prepare to conduct new experiments.
- 6. Learn bio science in natural environment.
- 7. Laboratory helps the students to understand the concepts by doing.

Makes the chance to think of alternatives for the deficiency of resources in everyday life.

Textbook - Laboratory

Tenth class bioscience text book is like laboratory manual. It helps to study the science in scientific methods of experiments, activities, field trips etc. Almost in every lesson there are experimental activities, if there are no lab activities is some lessons this text book help the teacher to make the activities in the text book as lab activities. Teacher, thinking on his/her own or collecting make the students to do new variety of experiments which are not mentioned in the text book.

For example, there is no lab activity in the lesson reproduction - generating system to observe mitosis. But the activity of observing mitosis in the roots of anion with the help of microscope can be change laboratory activity. Text provides the teacher the convenience that if there is any problem to do the laboratory activity, it makes the students to think an alternative for it and do the activity with the locally available resources. A scientist can not work to solve the determined problem. At some situations when he goes on with his work some new findings occur. Some new problems arises. This happens naturally, liberally, creatively without any restriction. Keeping this is mind the activities in this textbook are framed. Every lesson divides into as classroom teaching, laboratory activity. This means that laboratory activity lies internally in the lesson. So, make the children to do the laboratory activities compulsory. Don't think that they can be done after completion of the lesson. Train the children to follow scientific slips while doing the laboratory activities. Make the children to prepare report on laboratory activities and exhibit them.



XI. Science Resources

Science changes constantly i.e., develops. This development helps to improve the human life style, conserve nature and utilise it properly. Hence a science teacher needs to understand the changes that take place in science and the aspects related to it. In addition to this he/she had to depend on many resources. Reference book is important among them.

Works of Galileo and Kepler were the reason for the discovery of Law of Gravitation by Newton. Books written by Rieman were behind Einstein's discovery of theory of relativity. Books must not only be used to understand the topics but also to find the scope of science, to search for answers to unexplained and unknown aspects. There are many aspects in the reference book that question you. If you understand them and use them in teaching learning process, you get good results. Various organisations, schools, governments, persons are trying to make science reach everyone. There are many websites designed for making the latest information, conducting experiments, making the tools available. There are some good magazines that are working in this direction. There resources help to increase your thirst for knowledge and also to guide you. So the lists of some resources are given.

Physical Science - 10th Class - Resources

1. Heat

- 1. Box containing pieces of ice, piece of wood, iron screw or sheet
- 2. Glass tumblers, thermometer
- 3. Glass tumblers, wood colour
- 4. Beakers
- 5. Glass trough, test tubes, retort stands
- 6. Big beakers, small beakers, tripod, Bumen burner, spirit lamp
- 7. Dropper
- 8. Glass tumbler
- 9. Bottles with lids
- 10. Chemical substances: Coconut oil, spirit





2. Chemical reactions - equations

Dry, wet

Sodium sulphate

Barium chloride

Hydrochloric acid

granules of zinc, zinc powder

aluminium metal

iron pieces

magnesium ribbon

calcium carbonate

lead nitrate

graphite bars

silver bromide

copper sulphate

lead iodide

potassium nitrate

copper wires

tongs

rubber corks

retort stand

clamps

rubber tubes

plastic mugs

9 volt batteries

iron screws

china dish

iron screws

cotton

3. Reflection of light

Pinhole camera

mirror

drawing paper

alpins

clamps

scales

penails

rubber pieces

foam pieces

curved mirrors

plane mirrors

candles

concave mirrors

'V' stand

4. Acids - Bases - Salts

hydrochloric acid

sulphuric acid

nitric acid

acetic acid

sodium hydroxide

calcium hydroxide

magnesium hydroxide

Ammonium hydroxide

Potassium hydroxide

methyl orange indicator

phenophthalein solution

clove oil

vanilla

sodium carbonate

copper oxide

glucose

alcohol

copper sulphate granules

watch glasses

blue litmus papers

red litmus papers

cloth pieces

match boxes

thistle funnel



bulbs

copper wires

230 Volts battery

delivery tubes

pH scale

5. Refraction of light at plane surfaces

shallow glass troughs

coins

torch light

laser light

semicircular glass disc

cuboidal glass disc

6. Refraction of light at curved surfaces

Sketch pens

biconvex lens

biconvcave lens

plano convex lens

plano concave lens

concavo convex lens

convex lens

concave lens

7. Human Eye

a long stick

PVC pipes

clamps

model of an eye

alpins

scale

protractor

dissection tray

mirror

socium thiosulphate hypo

8. Atomic structure

electro magnetic spectrum chart

hydrogen spectrum chart

bohr, sommerfield atomic models chart

geometrical shapes of different orbits chart

moeller's diagram chart

cupric chloride

strontium chloride

platinum wire

9. Classification of elements Periodic

table

Pictures of Mendeleef, Newland,

Dobernair Mosely

Mendeleef periodic table chart

Modern periodic table chart

10. Chemical Bonding

Ball and stick models to explain structure

of molecules

Chart showing molecular structures in

Lewis dot method

Models of molecules of methane water

ammonia, barium chloride, boron

trifluoride

11. Electric Current

Batteries

switches

bulbs

electric wires

copper wires

nylon wires

wollen thread

ammeter



voltmeter

multimeter

LED

bulbs

iron wires of uniform thickness

12. Electromagnetism

bar magnets

magnetic compass

coils

solenoid

wooden disc

electric motor

soft iron cylinder

copper wire

galvanometer

electric generator

13. Metallurgy

Chart showing metals and their ores map showing availability of ores in India. Pictures or models of reverbatory furnace and open hearth furnace.

14. Carbon and its compounds

Coal, graphite, chart showing hybridisation of carbon. Models of diamond, Buckminister pullerena and graphite, chart showing different functional groups of carbon compounds, chart showing chemical names and formulae/symbols of different carbon compounds, absolute alcohol solution acetic acid.



TEACHERS' RESOURCE BAG

Some Resource Books that Help make Science Fun

- 1 The Third Book of Experiments, Leonard De Vries, Carousel Books
- 2 Science Works, Ontario Science Centre, Ontario
- 3 Toying Around with Science, Bob Friedhoffer, Franklin Watts, New York
- 4 The Science Explorer, P. Murphy, E. Klages, L. Shore, An Owl Book
- 5 700 Science Experiments for Everyone, Compiled by UNESCO, Doubleday
- 6 100 Amazing Science Fair Projects, Glen Vecchione, Goodwill Publishing House, New Delhi
- 7 365 Simple Science Experiments with Everyday Materials, Richard Churchill, Sterling Publishers
- 8 The Book of Experiments, Leonard De Vries, Carousel
- 9 Joy of Learning, (Standards 3 to 5), Center for Environmental Education, Ahmedabad, India
- 10 Experiments for You, John Tollyfield, Evans Brothers, London
- How to Turn Water Upside-Down, Ralph Levinson, Beaver Books, London
- 12 Experiments with Everyday Objects, Kevin Goldstein-Jachson, Granada Publishing, New York
- 13 Simple Science Experiments, Batstord, Hans Jurgen Prees
- 14 Let's Discover Science, David Horsburgh, Oxford University Press
- 15 Chai Ki Pyali Mein Paheli, Partho Ghosh & Dipandar Home (Hindi) National Book Trust, New Delhi 110016
- 16 UNESCO Source book for Science in the Primary School, Harlen & Elstgeest, National Book Trust, New Delhi 110016
- 17 Soap Bubbles, C.V. Boys, (Eng/Hin), Vigyan Prasar, C-24 Qutub Institutional Area, New Delhi 110016
- The Chemical History of a Candle, Michael Faraday (Eng/Hin), Vigyan Prasar, New Delhi, info@Vigyanprasar.gov.in
- 19 Science in Everyday Life, J.B.S. Haldane, Vigyan Prasar, New Delhi, info@Vigyanprasar.gov.in
- VSO Science Teacher's Handbook, Andy Byers, Ann Childs, Chris Lane (Hindi) Eklavya, Bhopal, pitara@eklavya.in
- 21 Environment & Self-Reliance, Yona Friedman, Eda Schaur (Eng/Hin), Vigyan Prasar, New Delhi





- 22 Energy & Self-Reliance, Yona Friedman, (Eng/Hin) Vigyan Prasar, New Delhi, info@vigyanprasar.gov.in
- 23 The Story of Physics, T. Pammanabhan (Eng/Hin) Vigyan Prasar, New Delhi,info@vigyanprasar.gov.in
- On the Various Forces of Nature, Michael Faraday, Vigyan Prasar, New Delhi, info@vigyanprasar.gov.in
- 25 The Insect World of J. Henri Fabre, Vigyan Prasar, New Delhi, info@vigyanprasar.gov.in
- 26 The Autobiography of Charles Darwin, Vigyan Prasar, New Delhi, info@vigyanprasar.gov.in
- 27 The Bicycle Story, Vijay Gupta, Vigyan Prasar, New Delhi, info@vigyanprasar.gov.in
- 28 Aakash Darshan Atlas, Gopal Ramchandra Paranjpe, NCERT, Sri Aurobindo Marg, New Delhi 110016
- 29 Preparation for Understanding, Keith Warren, illus. by Julia Warren, UNESCO
- 30 Resonance Journal of Science Education, Indian Academy of Sciences
- 31 Balvignanic, Eklavya, Bhopal

Courtesy: Aha! Activities, Eklavya, Bhopal

Websites & E-Resources for Middle and Primary School Science

- 1. LET'S DISCOVER SCIENCE PART I By David Horsburgh (out of print but downloadable as a pdf file from the link:
 - http://vidyaonline.org/arvindgupta/david1.pdf)
- 2. LET'S DISCOVER SCIENCE PART II By David Horsburgh (out of print but downloadable as a pdf file from the link:
 - http://vidyaonline.org/arvindgupta/david2.pdf)
- 3. LET'S DISCOVER SCIENCE PART III By David Horsburgh (out of print but downloadable as a pdf file from the link:
 - http://vidyaonline.org/arvindgupta/david3.pdf)
- 4. LET'S DISCOVER SCIENCE PART IV By David Horsburgh (out of print but downloadable as a pdf file from the link:
 - http://vidyaonline.org/arvindgupta/david4.pdf)
- 5. LET'S DISCOVER SCIENCE PART V By David Horsburgh (out of print but downloadable as a pdf file from the link:
 - http://vidyaonline.org/arvindgupta/david5.pdf)





- 6. LEARNING ABOUT LIVING PART ONE By David Horsburgh (out of print but downloadable as a pdf file from the link: http://vidyaonline.org/arvindgupta/D6.pdf)
- 7. LEARNING ABOUT LIVING PART THREE By David Horsburgh (out of print but downloadable as a pdf file from the link: http://vidyaonline.org/arvindgupta/D7.pdf)
- 8. THINKING AND DOING By David Horsburgh (out of print but downloadable as a pdf file from the link: http://vidyaonline.org/arvindgupta/ thinkanddo.pdf)
- 9. SMALL SCIENCE for Classes I to V (with the accompanying Workbooks and Teachers' Books) Homi Bhabha Centre for Science Education, TIFR, Mumbai. http://www.hbcse.tifr.res.in/smallscience.
- 10. http://www.arvindguptatoys.com/ contains an enormous list of books on enlivening science learning, rated by Arvind Gupta. Many of them can be downloaded for free.
- LOW COST EQUIPMENT FOR SCIENCE AND TECHNOLOGY EDUCATION Vol.
 Compiled by UNESCO
 - http://unesdoc.unesco.org/images/0010/001023 /102321eb.pdf Provides ideas on how to make school science equipment using inexpensive materials.
- 12. LOW COST EQUIPMENT FOR SCIENCE AND TECHNOLOGY EDUCATION Vol. 2 Compiled by UNESCO
 - http://unesdoc.unesco.org/images/0007/000728/072808eb.pdf Provides ideas on how to make school science equipment using inexpensive materials.
- 13. http://www.exploratorium.edu/ is a fascinating website with tons of resources, activities and continuous updating to reflect the latest developments in the field.
- 14. http://www.johnkyrk.com/ has links to animations of cell structure, cell biology, DNA, etc.
- 15. http://www.bbc.co.uk/schools/scienceclips/ages/8_9/circuits_conductors_fs.shtml has an interactive tutorial on conductors.
- 16. http://www.primaryschool.com.au/science results.php?kla=Science%20and%20Technology&unit=Switched%20On has links to several interactive lessons like the one above.
- 17. http://www.juliantrubin.com/bigten/pathdiscovery.html allows the user to simulate online repetitions of famous experiments or inventions.
- 18. http://www.freeindia.org/biographies/greatscientists/has biographies of Indian scientists.
- 19. http://www-gap.dcs.st and.ac.uk/~history/Indexes/Indians.html has info on ancient Indian mathematicians.





- 20. http://www.calcuttaweb.com/people/snbose.shtml has some more biographies of Indian scientists.
- 21. http://www.shodor.org/succeed/curriculum/FOR/observation.html contains an interactive module to test one's observation powers.
- 22. http://www.scienceclass.net/PowerPoints/NOS_Test_Review.ppt contains a PPT that talks of the nature of science.
- 23. http://www.scienceclass.net/PowerPoints/NOS_Test_ReviewGT.ppt contains a second such PPT.
- 24. http://www.scienceclass.net/Teachers_Lessons.htm contains many valuable links to lessons on science topics for middle school level.
- 25. http://www.science-class.net/TAKS/taks.htm has many links to PPTs that elaborate specific concepts for middle school.
- 26. http://teachers.net/lessons/posts/1228.html (a website leading from http://www.curriki.org/xwiki/bin/view/Coll_rml ucas/LabClassificationofShoes?bc=;Coll_rmlucas.10 Classification) describes an activity wherein children have to classify shoes, so as to understand the importance of classification. (Useful in all branches of science, particularly chemistry and biology.)
- 27. http://www.encyclomedia.com/videoarctic food chain.html has a video on the arctic food chain.
- 28. http://www.kbears.com/ocean/octopus/index.html has a presentation and info on the octopus.
- 29. http://magma.nationalgeographic.com/ngexplorer/0309/articles/mainarticle.html contains rich info on underwater life.
- 30. http://www.seaworld.org/animal-info has a plethora of links and info on animals.
- 31. http://www.seaworld.org/fun-zone/coloringbooks/pdf/emp-penguin.pdf has a colouring page for kids to have fun, when learning about animals.
- 32. http://kids.nationalgeographic.com/Animals/CreatureFeature/ is a superb site where you can click on an animal to find out more about it. The 'more' includes facts, a video with sound, a map of places where it can be found, etc.
- 33. Resources for Teaching Middle School Science (1998) http://books.nap.edu/catalog.php? record_id=5774 (ISBN 0309057817) National Science Resources Center of the National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and the Smithsonian Institution
- 34. Resources for Teaching Elementary School Science (1996) http://books.nap.edu/catalog.php? record_id=4966 (ISBN 0309052939) National Science Resources Center of the National Academy of Sciences and the Smithsonian Institution
- 35. http://www.exploratorium.edu/explore/handson.html contains many online as well as hands on activities for children of this age group and younger.





- 36. http://fi.edu/tfi/activity/act-summ.html contains many online as well as hands on activities for children of this age group and younger.
- 37. http://www.bbc.co.uk/schools/scienceclips/ages/10_11/science_10_11.shtml contains activities listed alphabetically, topic wise.
- 38. http://www.bbc.co.uk/schools/scienceclips/ages/9_10/changing_sounds.shtml contains simple sorting and tabulation exercises for Class V and below.
- 39. http://www.bbc.co.uk/schools/scienceclips ages/10_11/forces_action.shtml contains more complicated tabulation and interpretation exercises for Class VI/VII.
- 40. http://www.bbc.co.uk/schools/teachers/ks4/bitesize_chemistry.shtml contains chemistry assessment worksheets for Classes VIII and IX.
- 41. http://www.bbc.co.uk/schools/gcsebitesize/chemistry/classifyingmaterials/ contains exercises for assessing classification of matter, atomic structure, bonding and formulae/equations for Class VIII and above.
- 42. http://www.bbc.co.uk/schools/gcsebitesize/physics/electricity/ has some thinking-type questions for Class VIII and above.
- 43. http://www.bbc.co.uk/schools/gcsebitesize/physics/forces/ has excellent questions for Classes VII, VIII and above.
- 44. http://cse.edc.org/products/onlinecurr/catalog.asp has an online catalogue of web-based resources for middle and elementary school science.
- 45. http://www.explorelearning.com/index.cfm? method=cResource.dspView&ResourceID=491 has a beautiful animation of the photoelectric effect, can be shown to Class VIII.
- 46. http://www.explorelearning.com has a number of interactive simulations to learn science, appropriate for this age group.
- 47. http://cse.edc.org/products/onlinecurr/WBMISearchResults.asp has a complete list of topics and the modules available therein, for students of this age group and a little older as well.
- 48. http://www.blupete.com/Literature/Biographies/Science/Scients.htm has links to biographies of scientists.
- 49. http://www.juliantrubin.com/bigten/pathdiscovery.html is a website with a collection of links for discovery and invention.
- 50. http://www.fordham.edu/Halsall/science/sciencesbook.html is an Internet Sourcebook for the History of Science.
- 51. http://www.middleschoolscience.com/tunefork.htm has a good activity for learning about the tuning fork and sound vibrations, suitable for Classes VII and VIII.





- 52. http://www.pbs.org/benfranklin/exp_shocking.html has a lovely interactive simulation of the kite experiment performed by Benjamin Franklin.
- 53. http://www.pbs.org/teachers/sciencetech/ has grade-wise, topic-wise lesson plans for middle and primary school science teaching.
- 54. http://www.learner.org/resources/series90.html has a set of videos on the science of teaching science.
- 55. http://www.outlookindia.com/scriptur11w2.asp?act=sign&url=/full.asp?fodname=20050328& fname=Science&sid=1 has Nobel Prize-Winning Science Discoveries made palatable for children.
- 56. http://www.teachernet.gov.uk/teachingandlearning/subjects/science/science_teaching_resources/provides links to a number of e-teaching learning resources for primary science.
- 57. http://www.firstscience.com/home/ is a leading online popular science magazine featuring articles on important breakthroughs, the latest science news, video clips, blogs, poems, facts, games and a whole lot more science-related content.
- 58. Chakmak: Science magazine for children http://www.eklavya.in/go/index.php?option=com content&task=category§ionid=13&id=57&Itemid=84
- 59. Sandarbh: A resource bank for teachers http://www.eklavya.in/go/index.php?option=com content&task=category§ionid=13&id=51&Itemid=72
- 60. Srote: Science and Technology features -http://www.eklavya.in/go/index.php?option=com content&task=category§ionid=13&id=56&Itemid=81
- 61. http://www.gobartimes.org/20090315/20090315.asp is a bi-monthly children's magazine high-lighting news and views on environment and development through comic strips, cartoons, quizzes, essay competitions and interactive pages. It also serves as a useful teaching aid in classroomsfor teachers.
- 62. http://edugreen.teri.res.in/index.asp is a website for children that makes environmental learning fun
- 63. http://www.nuffieldcurriculumcentre.org/go/Default.html provides links to websites of various science projects that undertake to enliven science teaching
- 64. http://www.exploratorium.edu/ifi/resources/workshops/teachingforconcept.html provides a link to the paper "Teaching for Conceptual Change: Confronting Children's Experience; Watson, Bruce and Richard Kopnicek; Phi Delta Kappan, May 1990".





Some Important Organisations in Science Education

S.No.	Name of the Organisation	Contact Details
1.	Agastya International Foundation	Address: Kataria House, 219 Kamaraj Road, Bangalore - 560042. Phone: 080-25548913-16 Website: www.agastya.org E-Mail: Maagastya@vsnl.com
2	Avehi-Abacus Project	Address: Third floor, K.K. Marg Municipal School, Saat Rasta, Mahalaxmi, Mumbai- 400 011 Phone: (022)2307 5231, (022)2305 2790 Website: http://avehiabacus.org E-mail: avcab@vsnl.com
3	Bangalore Association for Science Education (BASE)	Address: Jawaharlal Nehru Planetarium, Sri T.Chowdaiah Road, High Grounds, Bangalore-560001 Phone: 080-22266084, 22203234 Website: http://www.taralaya.org E-Mail: taralaya@vsnl.com
4	Bharat Gyan Vigyan Samiti/ Indian Organisation for Learning and Science	Address: Basement of Y.W.A. Hostel No. II, Avenue - 21, G-Block, Saket, New Delhi-110 017. Phone: 011-2656 9943, Website: http://www.bgvs.org E-Mail: bgvs_delhi@yahoo.co.in, bgvsdelhi@gmail.com
5	Center for Environment Education	Address: Nehru Foundation for Development, Thaltej Tekra, Ahmedabad - 380 054, Gujarat Phone: 079-26858002 Website: http://www.ceeindia.org E-Mail: cee@ceeindia.org
6	Center for Science and Environment	Address: 41, Tughlakabad Institutional Area, New Delhi-110062, INDIA Phone: 011-29955124/25, 29956394, 29956401, 29956399 Website: http://www.cseindia.org E-Mail: cse@cseindia.org
7	C.P.R. Environmental Education Centre (CPREEC)	Address: The C. P. Ramaswami Aiyar Foundation No.1, Eldams Road, Alwarpet, Chennai Tamilnadu-600 018 Phone: 044-24337023, 24346526, 24349366 Website: www.cpreec.org E-Mail: cpreec@vsnl.com, ecoheritage_cpreec@vsnl.net
8	Eklavya	Address: E-10, BDA Colony, Shankar Nagar, Shivaji Nagar, Bhopal - 462 016 Madhya Pradesh, India Phone: 0755-267 1017, 255 1109 Website: http://eklavya.in





S.No.	Name of the Organisation	Contact Details
9	Eklavya Institute of Teacher Education (EI)	Address: Eklavya Education Foundation, Core House, Off. C.G.Road, Ellisbridge, Ahmedabad-6 Phone: 079-26461629, Website: www.eklavya.org E-mail: eklavya@ekalavya.org
10	Homi Bhabha Centre for Science Education Research,	Address: Mr. H C Pradhan, Tata Institute of Fundamental V.N. Purav Marg, Mankhurd, Mumbai, 400088 Phone: 022-25554712, 25580036 Website: www.hbcse.tifr.res.in E-Mail: postmaster@hbcse.tifr.res.in
11	Indian Science Congress Association	Address: 14, Dr. Biresh Guha Street, Kolkata - 17 Phone: 033-2287 4530 Website: http://sciencecongress.nic.in E-mail: iscacal@vsnl.net
12	Kalpavriksh Environment Action Group	Address: 134, Tower 10, Supreme Enclave, Mayur Vihar, Phase 1, Delhi 110 09 Phone: 011-22753714 Website: http://www.kalpavriksh.org
13	Kerala Sastra Sahitya Parishad	Address: Parishad Bhavan, Chalappuram PO, Kozhikkode - 673 002, Kerala, India Phone: 0495-2701919, 9447038195 Website: http://www.kssp.org.in E-Mail: gskssp@gmail.com
14	National Council for Science & Technology Communication (NCSTC)	Address: Department of Science & Technology Technology Bhavan, New Mehrauli Road, New Delhi-11001 Phone: 011-26567373, 26962819 Website: www.dst.gov.in E-Mail: dstinfo at nic dot in
15	Navanirmiti	Address: Navnirmiti, 301,302,303, 3rd floor, A wing, Priyadarshani Apartment, Padmavati Road, IIT Market Gate, Powai, Mumbai- 400 076. Phone; 022-25773215, 25786520 Website: www.navnirmiti.org E-mail: contact@navnirmiti.org
16	Nuffield Foundation	Address: 28 Bedford Square London WC1B 3JS Phone: 020 7631 0566, 020 7580 7434 Website: www.nuffieldfoundation.org E-mail: info@nuffieldfoundation.org



S.No.	Name of the Organisation	Contact Details
17	Rajiv Gandhi Foundation	Address: Jawahar Bhawan, Dr. Rajendra, Prasad Road New Delhi - 110 001, INDIA Phone: 011-23755117, 23312456 Website: www.rgfindia.org E-mail: info@rgfindia.org
18	State Institute of science education	Address: S.I.S.E (Rajya Vigyan Sansthan), P.S.M Campus, Jabalpur, M.P. 482001 Phone: 0761-2625776 Website: http://sisejbp.nic.in
19	Sutradhar	Address: 59/1, 3rd Cross, 10th A Main, Indiranagar 2 Stage, Bangalore 560038. Phone: 080-25288545 Website: www.sutradhar.com E-Mail: sutra@vsnl.com
20	Tamil Nadu Science Forum	Address: Balaji Sampath, C2 Ratna Apts. AH 250, Shanti Colony, Annanagar, Chennai-600040, TAMIL NADU Phone: 044-26213638 Website: bsampath@eng.umd.edu
21	Tamil Nadu State Council for Science and Technology,	Address: Directorate of Technical Education Campus, Chennai 25. Phone: 022-22301428 Website: www.tanscst.org E-mail: enquiry@tnscst.org
22	Vidya Bhawan Society	Address: Fatehpura, Udaipur, Rajasthan 313001 Phone: 0294 2450911 Website: http://www.vidyabhawan.org E-Mail: info@vidyabhawan.org, vbsudr@yahoo.com
23	Vikram A Sarabhai Community Science Center	Address: Opp. Gujarat University, Navrangpura, Ahmedabad - 380 009 Phone: 079-26302085,26302914 Website: www.vascsc.org, E-Mail: info@vascsc.org