# APPENDIX

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Appendix I

ACHIEVEMENT TEST IN SCIENCE

Name : Max.Marks :
School : Class :
Date :

I. Choose any one alternative among the following. Each question carries half a mark.

(36×\frac{1}{2}=18)

1. Which one among the following has a high photosynthetic rate?
   a. Banana leaf   b. Tamarind leaf
   c. Lilly leaf   d. Hydrilla leaf

2. Biogas is a mixture of
   a. carbon dioxide, methane   b. carbon dioxide, ethane
   c. carbon monoxide, methane   d. carbon dioxide, nitrogen

3. What happens when a bar magnet is freely suspended in air?
   a. it comes to rest in north-west direction
   b. it comes to rest in north-south direction
   c. it comes to rest in north-east direction
   d. it comes to rest in east-west direction.

4. Desert plants are most likely to have
   a. large flat leaves   b. short root system
   c. reduced leaves   d. large number of stomata

5. Which one among the following shows the decreasing order of reactivity in metals?
   a. Mg>Fe>Na>H>Pt   b. Na>Mg>Fe>H>Pt
   c. Fe>Pt>H>Na>Mg   d. H>Fe>Pt>Mg>Na
6. A man weighing 50 kgf is standing on a wooden plank of 1m X 0.5m. Find the pressure exerted by the board on the ground?
   a. 10kgf/m²  
   b. 100 kgf/m²  
   c. 10kgf/m  
   d. 100kgf/m

7. Why is it easier to cut with a sharp knife than a blunt one? As
   a. it can exert less pressure with small applied force  
   b. it can exert great pressure with comparatively small applied force  
   c. it cannot exert pressure on objects  
   d. it doesn't get rusted.

8. The alignment of domains in a magnet is arranged as

   ![Diagram of domain alignment]

   a.  
   b.  
   c.  
   d. None of them

9. Why are trees in coniferous forest conical in structure?
   a. it is to avoid spoilage of leaves  
   b. it is to increase water logging on leaves  
   c. it is to permit light to reach the plants growing under the trees  
   d. it is to add the beauty to the trees

10. One ampere, which is unit of current, is equal to ______ per second.
    a. 2 coulombs  
    b. 3 coulombs  
    c. 1 coulomb  
    d. 6 coulombs

11. Many plants and animals have become extinct due to
    a. over exploitation of forests  
    b. forest fire  
    c. deforestation  
    d. all the above
12. The nuclear reaction that leads to energy production in sun is
   a. fusion                b. fission
   c. combination           d. decomposition

13. Which one among the following does not belong to the group?
   a. Nictitating membrane  b. Legs of a man
   c. Vermiform appendix    d. caudal vertebrae in man

14. Which metal will be the most economical in getting nickel from nickel sulphate?
   a. Sodium                b. Aluminium
   c. Iron                  d. Lead

15. Which one among the following is the meaning of conservation?
   a. Judicious and wise use of natural resources
   b. Rare use of natural resources
   c. Unlimited use of natural resources
   d. Indiscriminate use of natural resources.

16. Lines of force of a bar magnet are
   a. crowded near the center   b. crowded near the poles
   c. crowded in the vertical plane d. uniform throughout the field.

17. Why is gold used in jewellery and is very costly?
   a. as it has good metallic luster
   b. as it does not react with oxygen and water
   c. as it is ductile
   d. all the above.
18. Why should we conserve wild life?
   a. as animals have their own rights to live
   b. to maintain ecological balance
   c. to prevent the animals from becoming extinct
   d. all the above.

19. Mechanical energy is converted into electrical energy in
   a. accumulator               b. electric bell
   c. hand dynamo               d. voltmeter

20. You are given two bulbs and some wires. You have to connect them in such a way that even if one bulb burns out, the other should glow. How will you connect it?
   a. in series         b. in parallel
   c. either a or b    d. neither a nor b

21. Resources, which cannot be produced by man, are called
   a. unlimited resources   b. limited resources
   c. renewable resources   d. nonrenewable resources

22. Which important features of pigeon's body structure help it to fly in air?
   a. light bones               b. stream lined body
   c. feathers and wings   (modified forelimbs) d. all the above

23. Nose bleeding is quite commonly seen when the pressure inside the body becomes ____________ to atmosphere.
   a. equal                     b. higher
   c. lower                    d. none of the above
24. The continuous process of gradual change from simple forms of life into complex organisms is called __________.
   a. variations  b. reproduction  
   c. adaptation  d. organic evolution

25. A metal that burns vigorously with a bright light producing ash and is partially soluble in water is
   a. aluminium  b. copper  
   c. sodium  d. magnesium

26. The organs, which are structurally similar but functionally different from each other like forelimbs of frog and wings of a bat, are called
   a. homologous organs  b. analogous organs  
   c. vestigial organs  d. none of the above

27. Why is a thin sheet of mica is used in iron box?
   a. as it is a good conductor of electricity  
   b. as it is an insulator  
   c. as it has magnetic properties  
   d. as it has high melting point

28. Why plants like bamboo and eucalyptus must be planted? It is because
   a. they give us shade  b. they look beautiful  
   c. they make the soil fertile  d. they help as soil binders

29. Cutting down of forests and starting industries leads to
   a. soil erosion  b. erratic climatic changes  
   c. imbalance in natural environment  d. all the above.
30. An electric fuse is a short piece of wire of
   a. high melting point  
   b. low melting point  
   c. either a or b  
   d. both a or b

31. In desert plants like cactus, opuntia, etc., the stomata are _______ in number.
   a. lesser  
   b. greater  
   c. limited  
   d. none of the above.

32. Which one of the following is a renewable source of energy?
   a. petroleum  
   b. electricity  
   c. sun  
   d. coal

33. You would like to measure the potential difference between two points in an electric circuit. Which one among the following will you use?
   a. Galvanometer  
   b. Voltmeter  
   c. Ammeter  
   d. Rheostat

34. The bucker seems lighter as long as it remains immersed in water but suddenly felt heavier when it has emerged above the water surface, because
   a. liquid exerts an upward force on objects  
   b. liquid exerts a downward force on objects  
   c. of the gravitational pull  
   d. of the buoyancy.

35. You are given an electric stove and coils of different lengths. Which of these would you use to get more heat?
   a. the longest coil  
   b. the shortest coil  
   c. the medium sized coil  
   d. none of the above.
36. Power crisis can be reduced best by
   a. use of solar energy for street lights
   b. use of atomic energy for power generation
   c. use of generators every house
   d. restricting the usage of electricity by each individual.

II. Fill in the blanks. Each question carries one mark.  

   (8X1=8)

1. The only metal that is in liquid state is ________________.

2. Division of magnet into number of pieces will produce ____________.

3. WWF stands for ____________________.

4. Plants growing in open and dry environment have compound leaves to minimize ________________.

5. __________________ acts as an anode in a dry cell.

6. The development of characteristics, which help an organism to survive in a particular environment, is known as ________________.

7. __________________ is the ancestor of elephant.

8. The natural magnet is known as ________________.

A-7
III. Answer the following questions

1. Here are given few characteristic features of aquatic plants that help in floating. Tick the right ones. (2 marks)
   
   a. bulb like structure present in a leaf
   b. well developed stout stem
   c. texture (waxy coating) of the leaf
   d. stomata found on both sides of the leaf
   e. wavy nature of the stem
   f. well developed root system
   g. poorly developed root system
   h. storage of water in the leaves.

2. Tick the magnetic substances from the following. (2 marks)

3. Classify the following into renewable and non-renewable sources of energy.
   Hydro energy, Wind energy, Fossil fuels, Tidal energy, Nuclear power, Geothermal energy

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4. Classify the following substances into conductors and insulators. (2 marks)

Silver, Tap water, Ebonite rod, Human body, Pure water, Mica, Gold, Plastics

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5. You are given three cells and one bulb. How will you connect them and glow the bulb. Draw the circuit diagram. (2 marks)

6. Why do most of the submerged plants have lacy, finger like or ribbon like leaves? (2 marks)
7. List out practical applications of thrust and pressure in your daily life.

(2 marks)

8. Why does aluminium vessels become dull grey very soon after use?

(2 marks)

9. A family of four individuals use daily refrigerator (for 24 hrs), 2 fans (16 hrs), geyser (2hrs), 6 bulbs (8hrs), washing machine (1 hr), electric stove (1hr) etc. Suggest four ways of reducing power consumption.

(4 marks)
10. Here is a diagram of archaeopteryx given below and list down any two reptilian and bird features.

(2 marks)

11. Here are two cases A and B wherein farmer A is practicing crop rotation and using green manure to replace the nutrients. Farmer B was continuing with the same crop year after year and using larger amounts of fertilizers. In which case the fertility of soil maintained and why?

(2 marks)
12. From the below given figure, what do you understand? (1 mark)

13. Below is given an electric circuit which is wrong. Correct the circuit diagram. (1 mark)

14. Look into the diagrams given below and identify them. What are they used for? (2 marks)
15. What will happen to the seeds if they are sown in a small place and why?  

(3 marks)

16. Identify the missing part, draw and label it.  

(1 mark)
Scoring Key for Achievement test in Science

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II. 1) Mercury
2) Small magnets
3) World Wildlife Fund
4) Transpiration rate
5) Carbon rod
6) Adaptation
7) Wooly mammoth
8) Lode stone or magnetite

III. 1. a, c, e, g.
2. Iron nails, copper, Aluminium, paper clips
3. Renewable: Hydro energy, Wind energy, Tidal energy, Geothermal energy.
   Non renewable: Fossil fuels, Nuclear power
4. Conductors: Silver, Tap water, Human body, Gold
   Insulators: Pure water, Mica, Ebonite rod, Plastics
5. [Diagram of a circuit with a light bulb and connections]
6. The most adverse affect that the submerged plants have to deal with is the 
water current. The plants have lacy, finger like or ribbon like leaves in 
order to allow the water currents to just pass through without damaging 
them.

7. Applications of thrust and pressure:
   a. The base of the walls of a building is made wider to reduce pressure 
      exerted by the building.
   b. All cutting and piercing tools like needles, knives etc. have sharp 
      points so that they can exert great pressure with comparatively small 
      applied force.
   c. The tyres of buses and trucks have broad and double wheels so that 
      the pressure on the tyres is reduced and they do not burst. The bigger 
      the wheel, the less is the pressure on them and so they can carry 
      greater weight.

8. Aluminium is a fairly reactive metal; a fresh surface of aluminium gets quickly 
covered with thin layer of aluminium oxide when exposed to air. Thus it 
loses its shine so soon after use and becomes dull grey due to its oxide.

    2. Careful handling of electrical appliances.
    3. by switching off the refrigerator one hour a day, and
    4. restricting the usage of two-three bulbs.


Reptilian features: a long tail and teeth in the mouth

Avian features: Wings and traces of feathers, legs, and head bent back.

11. As farmer A is practicing crop rotation and using green manure to replace 
the nutrients, the fertility of the soil is maintained naturally. If the same 
crop is grown repeatedly year after year, the soil gets depleted severely of 
specific nutrients. For example maize and wheat are grown alternately with 
groundnut, as the groundnut plant with its nitrogen-fixing bacteria enriches 
the soil with some nutrients that are beneficial for wheat.
12. The pressure exerted by a liquid increases with increasing depth inside the liquid.

13. a. Bat wing, b. Bird wing. They are analogous organs, which have different structural plans but perform common functions. They are used for flight.

15. When many seeds are sown in a small place, the plants that come out will struggle for space and nutrients. This is known as struggle for existence. Only few plants grow healthy, remaining gradually perish. The plants that get adapted to environmental changes, they survive. This is called as survival of the fittest. That means nature controls the environment and selects the individual, which can survive in it. This is known as natural selection. Charles Darwin proposed this theory of natural selection.

16. The missing part is zinc rod inside the porous pot which acts as cathode.
Appendix II

PERCEPTION OF NATURE OF SCIENCE TEST

Name:  
Gender: Male/Female  
State:  
School:  
Class:  
Date:  

I. Read the question carefully and choose any one alternative among the following. Each question carries one mark.  

(16X1=16)

1. Discoveries made by the scientists are most likely to be true because

   a. they are experts  
   b. the discoveries are the results of repeated experiments  
   c. they never make mistakes  
   d. they are the expected results

2. In scientific investigation one should

   a. have clear aim/objective in mind of what is to be achieved  
   b. repeat the experiment number of times  
   c. draw conclusions only on the basis of experimental findings  
   d. do all the above things

3. Science discoveries involve

   a. performing experiments  
   b. making observation  
   c. testing hypotheses (tentative guess)  
   d. all the above
4. Science and technology are different in the sense that technology deals mainly with
   a. scientific facts  c. scientific laws
   b. scientific applications  d. scientific theories

5. When a corked bottle is opened under water, water rushes in. This may be due to low pressure inside the bottle. This possible explanation is called
   a. conclusion  b. generalisation
c. hypothesis  d. description

6. Scientific law can be stated as the laws which involves
   a. observation of a scientific experiment
   b. the laws which clarify all natural events
c. the law which rule nature all the time
d. the law which describe the natural phenomenon.

7. Before the scientists accept the results of an experiment, the experiment
   a. is repeated many times
   b. is published in journals
c. is communicated to the public
d. is tested for its application

8. Science and technology leads to
   a. harmful and evil effects in human life
   b. personal satisfaction
c. the improvement of man’s quality of life
d. economic imbalance.

9. A true scientist works day and night
   a. in pursuit of knowledge  c. for getting popularity
   b. for getting awards  d. as a hobby
10. Which is not the right source of collecting scientific information?
   a. from books and journals   b. by observation
   d. from other scientists   d. from beliefs

11. The study of science helps in developing
   a. a questioning mind   b. critical thinking
   b. interest in natural phenomena   d. all the above

12. A discovery in science
   a. is always true
   b. may change in light of new evidence
   c. may change according to the changes in society
   d. remain same as long as it appeals to the scientist

13. Scientific method can be used
   a. to solve the problems in daily life situation
   b. in discovering new things
   c. to solve some problems in society
   d. all the above

14. A scientist uses a hypothesis (tentative guess)
   a. with a view to test it
   b. as a routine step in solving a problem
   c. to satisfy himself
   d. as it is a easy way of solving the problem.
15. Which among the following statement is correct about the scientific experiment?
   a. scientific experiment based on single observation is considered to be valid.
   b. scientific experiment repeatedly performed are considered to be valid
   c. scientific experiment approved by other scientists is found to be valid
   d. scientific experiments based on earlier finding is considered to be valid.

16. Which one among the following is the characteristic feature of a scientific experiment?
   a. it deals with living beings only
   b. it is only possible with sophisticated apparatus
   c. it is done only in a laboratory
   d. it is systematic investigation.

II. Below are given ten statements related to what "Science is" and "Science is not". Tick the right ones with (√) and the wrong statements with (X). (5marks)

1. Science is a way of thinking. ( )
2. Science builds up strength in us to solve problems. ( )
3. Science is just a collection of facts/information. ( )
4. Science can answer all the questions. ( )
5. Science is based on subjective knowledge of some individuals. ( )
6. Science encourages to search for an evidence/proof. ( )
7. Scientific knowledge is subject to review and change. ( )
8. Human progress is always seen through scientific discoveries. ( )
9. Science always have an adverse effect on human values. ( )
10. Science builds up courage to question beliefs and practices. ( )
III. Read the following passages and answer the questions given below:

a. Aristotle had observed a leaf and a stone falling on the ground. He hypothesized that a light body falls more slowly than a heavy one and made generalization accordingly. Galileo doubted the findings of Aristotle and in turn felt that it is not just the weight but air resistance, which made the objects fall down with different speeds.

The story perhaps became a legend. Galileo dropped two balls of unequal weights from the famous Leaning Tower of Pisa. The crowd including faculty of University found that unequal weights hit the ground at the same time. He performed the experiment number of times and noted down the results. Aristotle proved to be wrong and Galileo continued with his work later.

1. What made Aristotle generalize that light objects fall slowly than the heavier objects? (1mark)

2. How did Galileo prove that Aristotle was wrong? (1mark)

3. Why did he repeat the experiment number of times? (1mark)
b. Cowpox was a disease that affects the cows and was caught by humans from cows. It was observed that the people who were injected by cowpox were never attacked by smallpox. Dr. Edward Jenner was very curious and enthusiastic and interested to know the strange matter of cowpox-smallpox disease. He was encouraged by his old teacher Dr. Hunter who said "Try, be patient and be accurate" good advice for any investigator. He investigated 27 cases and published the results. He injected smallpox fluids into the arms of the people who had cowpox and later found that they did not contact smallpox disease. Finally he came out with a vaccination, which can eradicate smallpox disease. It was tried upon his own son and succeeded.

From the above passage

1. What do you conclude about the qualities of scientists? (1mark)

2. Describe the steps followed by the scientist in the above investigation? (2marks)

IV. Answer the following question.

1. How can understanding of science make a person better farmer, nurse etc? (2marks)
Scoring key for Perception of nature of science test

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Appendix III

SCIENCE PROCESS SKILLS TEST

Instructions:

There are 36 items in this test. For each item four responses are given. Read each item carefully and tick the most appropriate response. It is necessary to answer all the items in the test.

1. Which one among the following is a lever of second class?
   a) Seesaw   b) Pulley   c) Scissors   d) Bottle opener

2. Why does euglena comes under both plant and animal kingdom?
   a) as it has both chloroplast and flagella
   b) as it has only flagella
   c) as it has only chloroplast
   d) None of the above.
3. Among the following group of cells, only one group differs from the remaining groups. Find out that group?

![Image of cells]

a) Nerve cell  
b) Red blood cells  
c) Muscle cells  
d) Columnar cells

4. If you were to hold a piece of paper by each corner and blow across the top of the paper, what would happen to the paper?

a) Paper will fall down  
b) Paper will move downwards  
c) Paper will move upwards  
d) Paper will not move at all

5. In all the climbers there are thread like structures called tendrils. How do they help the plant?

a) They help the plant in climbing  
b) They help the plant in protecting itself  
c) They help the plant in storing food  
d) They do not perform any function

6. Find out the group of dicots from the examples given below

a) Bengal Gram, Beans, Groundnut, Green Gram  
b) Maize, Wheat, Rice, Millets  
c) Ragi, Mustard, Bengal Gram, Tamarind  
d) Tomato, Spinach, Lady’s Finger, Peas
7. What do you think will happen if you heat the nail and try to put it through the eye screw again?

   a) The nail will not enter the eye of eye screw
   b) The nail will enter the eye screw
   c) The nail will become loose and fall down from the eye screw
   d) None of the above.

8. In which case, the ball travels more distance?

   a) Sand bed       b) Cement floor   c) Ice       d) both a & c

9. What do you notice about the movement of the smoke, when a newspaper is lighted and held by an open window?

   a) The smoke will move out of the window as the room is warmer
   b) Smoke will spread off in the room
   c) Smoke raises up and touches the roof
   d) Smoke gets accumulated at one place
10. Observe the structure of a banana leaf. The leaf has a network of veins with a central mid rib. What will happen if there would not have been veins in the leaf?
   a) There would not have been proper shape to the leaf
   b) The plant would have stunted growth
   c) The leaf would have been thin and transparent
   d) The leaf would not perform its function properly

11. Among the following animals which one is an aquatic mammal?
   a) Eel    b) Shark    c) Tortoise    d) Whale

12. Here is pyramid, which represents a number of plants, herbivorous and carnivorous animals. What do you infer from this pyramid?
   a) Carnivores are more in number than herbivores and plants.
   b) Plants are more in number than carnivores and herbivores
   c) Carnivores are less in number than herbivores and plants
   d) Plants are less in number than herbivores and carnivores

13. Light travels faster than sound. This can be inferred from which of the following statements?
   a) Thunder clap and lightening occurs simultaneously
   b) Thunder clap is heard after seeing lightening flash
   c) Lightening flash is seen after hearing thunder clap
   d) Lightening flash is produced near to observer.
14. It is advisable to sleep under a tree during night because
   a) there will be accumulation of oxygen
   b) there will be accumulation of carbon dioxide
   c) branches of the tree may fall
   d) water droplets would fall from the tree

15. In order to withstand the high temperature and scarcity of water, the desert plants should have
   a) a deep rooted system
   b) reduced leaves
   c) very less number of stomata
   d) all of them

16. What do you think will happen to light rays, if you shine them on a reflecting surface in a manner similar to the way you throw the ball?
   a) Light rays reflect with same angle
   b) Light rays may be absorbed by the reflecting surface
   c) Light rays reflect with different a different angle
   d) Light rays get scattered

17. When any object is thrown up, it falls down. This may be due to
   a) shape of the earth
   b) density of the object
   c) mass and size of the object
   d) earth's gravitation
18. Bread mould, Mushroom, etc live on the dead and decaying substances, as they cannot prepare their own food material. What do you conclude from this?

   a) All are autotrophs  
   b) All are saprophytes 
   c) All are parasites  
   d) All are carnivores

19. How should the sun, moon and earth be arranged for a solar eclipse to occur?

   a) Sun, earth and moon  
   b) Earth, moon and sun 
   c) Moon, sun and earth 
   d) None of the above

20. What would happen if all the people start cutting trees for their domestic purposes?

   a) carbon dioxide percentage will increase in the atmosphere 
   b) oxygen percentage will decrease in the atmosphere 
   c) soil erosion takes place 
   d) All of them

21. A person had pressed two pins $P_1$ and $P_2$ with equal force. Which pin will pierce a pile of papers first?

   a) P1 
   b) P2 
   c) both the pins pierce at the same time 
   d) none of them

22. Many animals like rats, ants, crabs, etc live inside the burrows and holes because

   a) to escape from the enemies 
   b) to avoid the heat of the sun 
   c) to store the food 
   d) all the above
23. Which one of the following materials is most likely to be corroded?
   a) a wooden plank       c) a steel chair
   b) an exposed iron rod   d) an iron rod coated with oil

24. Look at the diagram below. There is a board with three rubber bands of different lengths tied to three pins. Which rubber band would you pluck to get lowest note or sound?
   a) Rubber band A
   b) Rubber band B
   c) Rubber band C
   d) None of them

25. In plants growth takes place in three phases. Observe the following graphical representation plotted rate of growth versus time. In which phase the rate of growth is very rapid?
   a) Phase I
   b) Phase II
   c) Phase III
   d) In all the phases the rate of growth is same

26. In the following figure, joints are labeled as A, B, C and D Which one among them is not a movable joint?
   a) A
   b) B
   c) C
   d) D
27. Here is a table, which shows the population of human beings per square kilometer in a country in different years. What do you conclude from this table?

<table>
<thead>
<tr>
<th>Year</th>
<th>Population per Square kilometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1801</td>
<td>232</td>
</tr>
<tr>
<td>1811</td>
<td>221</td>
</tr>
<tr>
<td>1821</td>
<td>176</td>
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<tr>
<td>1831</td>
<td>142</td>
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<td>1841</td>
<td>117</td>
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<tr>
<td>1851</td>
<td>100</td>
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<td>1861</td>
<td>90</td>
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<td>1871</td>
<td>81</td>
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<tr>
<td>1881</td>
<td>70</td>
</tr>
<tr>
<td>1891</td>
<td>52</td>
</tr>
</tbody>
</table>

a. as the year advances there is an increase in population
b) as the year advances there is a decrease in population
c) as the year advances there is no increase or decrease in population
d) in the beginning and at the end of the year there is increase in population and in between there is a decrease in population.

28. The terminal end of the cow's tail has a bunch of hair, This is to

a) protect its calf
b) protect its body from insects and birds
c) increase the beauty
d) attract other cows to follow her
29. What will happen if a burning candle is covered by a glass tumbler? The candle
   a) continues to burn  b) is put off after some time
   c) burns less brightly  d) burns more brightly

30. Mohan is looking towards the sun. His shadow falls
   a) in front of him  b) behind him
   c) towards left  d) towards his right

31. Reptiles are often referred as 'cold blooded animals'. As their
   a) body temperature is always lower than the external temperature
   b) body temperature varies according to the change in the external
      temperature
   c) body temperature is always higher than the external temperature
   d) body temperature remains constant.

32. People spray kerosene to stagnant water as it
   a) doesn't allow mosquitoes to increase in number
   b) smell is not liked by mosquitoes
   c) makes the mosquitoes unconscious for some time
   d) attracts the mosquitoes.

33. As you know pollution of various kinds have affected and degraded our
    environment. Below is given a graph showing the different type of pollutants
    and their increasing rate.
What do you infer from this?

a) the rate of increase in air pollution is higher than the other types of pollution  
b) the rate of increase in thermal pollution is higher than the other types of pollution.  
c) The rate of increase in air pollution is less than the land pollution  
d) The rate of increase in all types of pollution is same.

34. Many of the desert plants have reduced leaves. Leaves are modified into thorns etc. This is to

   a) increase photosynthetic rate  
   b) decrease transpiration rate  
   c) increase transpiration rate  
   d) increase the beauty of the plant.

35. Here are two carton boxes with grass and without grass respectively. When water is poured to both the carton boxes, which carton box will lose more soil?

   a) Carton box A  
   b) Carton box B  
   c) both Carton boxes will lose same amount of soil  
   d) both of them do not lose soil
36. Here is a table showing five small fields of same size are selected and for each field different amounts of fertilizers are supplied. After harvestation, the average crop yields of each field were measured.

<table>
<thead>
<tr>
<th>Amount of fertilizer (kg)</th>
<th>Average crop yield (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>125</td>
<td>8</td>
</tr>
<tr>
<td>114</td>
<td>7</td>
</tr>
<tr>
<td>90</td>
<td>5</td>
</tr>
<tr>
<td>81</td>
<td>3</td>
</tr>
<tr>
<td>70</td>
<td>2</td>
</tr>
</tbody>
</table>

What do you conclude from the table?

a) as the amount of fertilizer increases, average crop yield increases  
b) as the amount of fertilizer increases, average crop yield decreases  
c) as the amount of fertilizer decreases, there is no change in the average crop yield  
d) none of the above.
Scoring key for Science process skills test

1) d
2) a
3) d
4) c
5) a
6) a
7) a
8) c
9) a
10) a
11) d
12) b
13) b
14) b
15) d
16) a
17) d
18) b
19) b
20) d
21) a
22) d
23) b
24) a
25) b
26) d
27) b
28) b
29) b
30) b
31) b
32) a
33) a
34) b
35) b
36) a
Appendix IV

SCIENTIFIC ATTITUDE SCALE

Name: 
School: 
Class: 
Date: 

Section - I

Instructions:

There are 22 items in this section. For each of these items three possible answers are given as a, b and c. Read each item carefully and tick the answer which you think most rightly applied to you. There is no right or wrong answer. These answers indicate how you would behave in certain situations.

1. Imagine that you are the leader of your class and you have been asked to decide upon a place for picnic. How will you decide?
   a) By tossing
   b) I will choose the place of my interest
   c) I will discuss with my friends and then decide.

2. If you want to verify Newton's third law: "Action is equal and opposite to reaction", how would you do it?
   a) I will just try once to verify it.
   b) I will not do it all since the proof is already provided in the text book
   c) I will make a number of observations and through them I will verify it.

3. Imagine a situation where in your teacher tells you about the reasons for occurrence of earthquakes and she stops in the middle of her explanation as the bell rings. What will you do?
   a) I will be curious to know more and go in search of complete information further.
   b) I will wait for my teacher to continue with explanations in the next class.
   c) I will ignore it, as it is not important for the examination.
4. Suppose if the other group in the football game defeats you, how will you behave with them afterwards?
   a) I will not talk to them and try to take revenge of this event.
   b) I will take clues and try to improve upon the skills in future.
   c) I will congratulate them for their wonderful game.

6. Lunar eclipse occurs when
   a) A snake swallows the moon.
   b) Something bad is going to happen.
   c) Earth comes in between sun and moon.

7. Imagine that one of your classmates is ill treated by everybody in your class. You have heard many rumors about him. How would you behave with him?
   a) I will believe the rumors about him.
   b) I will not believe the rumors till I get evidence for them.
   c) I will also believe them and ill treat the boy like others.

8. The most intelligent decisions are based on
   a) Evidence
   b) Friends advice
   c) Other experiences

9. You must have observed some children who are deaf as well as dumb from the birth itself. This may be due to
   a) I will work hard day and night and try to complete it.
   b) I will try to finish for the sake of completion.
   c) I will not try at all and leave it as such.
10. When you are given two options as solutions for a problem, how will you decide to select one among them?
   a) I will write one of the options hoping that it will be all right.
   b) I will think the pros and cons of both options and then I will decide.
   c) I will ask opinions of others and follow them.

11. Suddenly one day you happen to see that many of your favorite plants were wilting off in your back yard. What would you do?
   a) I will find out the cause for it and try to give appropriate remedy.
   b) I will ask the gardener to take care of them.
   c) I will leave them as such.

12. What will you do when one of your classmates disagreed with what you have said during a discussion in the classroom?
   a) I will listen to what he says and discuss my differences with him.
   b) I will not allow him to speak at all as he disagreed with my ideas.
   c) I will allow him to speak but I will not listen to him.

13. Imagine that you saw an accident while you were waiting for the bus. Police arrived and started enquiring about the incident. What will you do?
   a) I will run away from the scene thinking about the troubles.
   b) I will reveal whatever I have seen.
   c) I will reveal the things in such a way that I will not put myself in risk.

14. Which of the following evidences would you take to decide about the winner in a running race?
   a) I will believe the words of the runners.
   b) I will believe the words of the witness.
   c) I will believe the recording, which shows the results of the race.
15. Suppose a new boy has joined your school and you felt that he was arrogant boy on the first day. Later you found him polite, friendly and cooperative. How will you react to it?

   a) I will not change my opinion, as first impression is the best impression.
   b) I will change my opinion accordingly.
   c) I will not bother about it.

16. In the newspaper, there is a column for weekly fortune predictors. Imagine that, for your zodiac sign it is predicted that you are going to win money on lottery ticket ending with number four. What will you do?

   a) I will ignore the information given, as I do not believe in luck.
   b) I will buy a lottery ticket for fun sake.
   c) I will buy a lottery ticket ending with number four, as I believe in the information given in newspaper.

17. Imagine you are involved in a group project with your friends in which maximum work had done by one of your friend. Your project won the first place in the competition. How will you react to it?

   a) I will feel happy and proud of my group.
   b) I will take the credit to me alone for the success.
   c) I will feel jealous of my friend because of whom the project was successful.

18. Suppose you have elected your best friend for the post of class representative in your school election and found that he is not a good leader. Then how would you react?

   a) I will repent for having him selected as class representative.
   b) I will take it casually as he is my close friend.
   c) I will not leave him as such but try to help him in correcting himself as and when situations arise.
19. Imagine you had an argument with your friend regarding the discovery of small pox vaccine. You argued with him saying that it was Alexander Fleming who discovered the vaccine. Later you found that it was Edward Jenner who discovered the small pox vaccine. What would you do in such a situation?

   a) I would be happy that my friend challenged me as it gave chance to find the truth.

   b) I would not tell my friend about it, as I would not like him to know that I was wrong.

   c) I would not mind if my friend comes to know about it.

20. Imagine a situation where in you and your friend were trying to solve a problem in mathematics. You got a wrong answer while your friend could find right answer. What will you do?

   a) Since I would like to know the correct answer I would try to solve the problem on my own.

   b) I will just copy it.

   c) I will ask my friend to explain me how he had solved the problem.

21. Newton had a pet dog named 'Diamond'. One day a sudden movement by the dog caused a burning candle to fall on the valuable manuscripts that were soon turned into ashes. These manuscripts were the record of twenty years of his research. All Newton did was, he stroked the dog gently and said, "Oh! Diamond you do not know what mischief you have done". What would you do if you were in his place?

   a) I would beat the dog and send her away.

   b) I would have felt that it was my carelessness and not the dog's mistake.

   c) I would curse my fate and calm down.
22. Suppose there is an announcement on radio about the solar eclipse, which is going to occur shortly. It is also announced that the schools will be closed on that day and people should remain indoors. What will you do in this situation?

a) I will remain indoors fearing about the ill effects of solar eclipse.

b) I will make arrangements for viewing the solar eclipse.

c) I will discuss with my science teacher about the solar eclipse and get the doubts clarified.
**Section II**

**Instructions:**

There are twenty-two items in this section. Each item is followed by five responses ranging from Strongly agree (S.A), Agree (A), Undecided (UD), Disagree (D) and Strongly disagree (S.D). Read each item carefully and tick the response, that you feel most appropriate to you.

<table>
<thead>
<tr>
<th>Sl.no.</th>
<th>Statements</th>
<th>S.A</th>
<th>A</th>
<th>U.D</th>
<th>D</th>
<th>S.D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Our success depends on our efforts and abilities.</td>
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<tr>
<td>2</td>
<td>We should never forgive our enemies.</td>
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<td>3</td>
<td>We should associate ourselves only with those, whose ideas are similar to ours.</td>
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<td>4</td>
<td>We should not waste our time in solving the problems after many trials.</td>
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<tr>
<td>5</td>
<td>We should be ready to change our decisions if our ideas were proved to be wrong.</td>
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<tr>
<td>6</td>
<td>Ganga water cures the illness of a person if he drinks it.</td>
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<td>7</td>
<td>There is nothing wrong in accepting the new ideas, which are beneficial than the old ones.</td>
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<td>8</td>
<td>After a solution of a problem has been found, it is waste of time to verify it.</td>
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<td>9</td>
<td>Knowing the reasons behind scientific issues is very interesting to me.</td>
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<td>10</td>
<td>One should show willingness to have his ideas questioned.</td>
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<tr>
<td>11</td>
<td>It is not right to doubt the facts published in books.</td>
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<tr>
<td>12</td>
<td>Sneezing before starting any work indicates that the work started will not be completed in time.</td>
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<tr>
<td>13</td>
<td>One should have faith in the possibility in solving the problems.</td>
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<tr>
<td>14</td>
<td>We should always believe in the saying &quot;Where there is a will, there is a way&quot;.</td>
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<tr>
<td>15</td>
<td>Natural calamities like floods, storm, earthquakes etc., take place due to gods' curse.</td>
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<tr>
<td>16</td>
<td>One should show respect for the ideas of others.</td>
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<tr>
<td>17</td>
<td>It is not necessary for a student to discover the reasons behind the natural events.</td>
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<tr>
<td>18</td>
<td>Ghosts are nothing but an imaginary phenomenon.</td>
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<tr>
<td>19</td>
<td>We should not jump into hasty conclusions about anything or anybody without proper evidence.</td>
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<tr>
<td>20</td>
<td>We should accept and follow whatever our traditions and customs say without questioning.</td>
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<tr>
<td>21</td>
<td>We should never give up any work but should complete it, in spite of several failures.</td>
<td></td>
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<tr>
<td>22</td>
<td>If luck favours, any student can pass an examination in the first division without hard work.</td>
<td></td>
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</tr>
</tbody>
</table>
### Scoring key for Scientific attitude scale

<table>
<thead>
<tr>
<th>Item no.</th>
<th>a b c</th>
<th>Item no.</th>
<th>Type of item</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>1 0 2</td>
<td>11</td>
<td>positive</td>
</tr>
<tr>
<td>2</td>
<td>1 0 2</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>3</td>
<td>2 1 0</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>4</td>
<td>0 1 2</td>
<td>4</td>
<td>negative</td>
</tr>
<tr>
<td>5</td>
<td>1 0 2</td>
<td>5</td>
<td>positive</td>
</tr>
<tr>
<td>6</td>
<td>1 2 0</td>
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<td>negative</td>
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<tr>
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<tr>
<td>22</td>
<td>0 2 1</td>
<td>22</td>
<td>negative</td>
</tr>
</tbody>
</table>

1 * Moderate Scientific attitude  
2 * High Scientific attitude  
0 * Low Scientific attitude
Appendix V

ATTITUDE TOWARDS SCIENCE SCALE

Name: 
Class: 
School: 
Date: 

Instructions:

There are forty-eight items in this scale. Each item is followed by five responses ranging from strongly agree (S.A), agree (A), undecided (U.D), disagree (D) and strongly disagree (S.D). Read each item carefully and tick the response, that you feel most appropriate to you. It is necessary to answer all the items. There is no time limit and no right or wrong answers. In case you have any difficulty with regard to the instructions, please get them clarified before answering the items.

<table>
<thead>
<tr>
<th>Sl.no.</th>
<th>Statements</th>
<th>S.A</th>
<th>A</th>
<th>U.D</th>
<th>D</th>
<th>S.D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>It is exciting to watch science films.</td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>I hate science class.</td>
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<tr>
<td>3</td>
<td>I am sick of attending science class.</td>
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<tr>
<td>4</td>
<td>Science is man's worst enemy.</td>
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<tr>
<td>5</td>
<td>It is boring to do science projects at home.</td>
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<tr>
<td>6</td>
<td>I prefer to watch a movie rather than science specials on television.</td>
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</tr>
<tr>
<td>7</td>
<td>I would enjoy being a scientist.</td>
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<td>8</td>
<td>Life without science is incomplete.</td>
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<td>9</td>
<td>I loose my interest when my friends raise issues on science.</td>
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<td>10</td>
<td>Listening to news on new inventions and discoveries is mere waste of time.</td>
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<td>11</td>
<td>It is exciting to participate in a science fair.</td>
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<td>12</td>
<td>Science is fascinating and fun.</td>
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<td>13</td>
<td>It is enjoyable to do science experiments.</td>
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<td>14</td>
<td>Science is one of my favorite subjects.</td>
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<td>15</td>
<td>Watching science specials is one of my favorite leisure time activities.</td>
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<td>16</td>
<td>I would never take up science in my future.</td>
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<td>17</td>
<td>Talking about science events makes me feel great.</td>
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<td>18</td>
<td>Science programs develop positive feelings towards environment in us.</td>
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<td>19</td>
<td>Science lectures are very boring.</td>
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<td>20</td>
<td>Reading autobiographies of scientists is waste of time.</td>
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<td>21</td>
<td>Science is a subject, which builds up an inquisitive mind in us.</td>
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<td>22</td>
<td>I enjoy discussing science with my friends.</td>
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<td>23</td>
<td>Learning scientific facts is a real burden for me.</td>
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<td>24</td>
<td>Science is not only interesting but also informative.</td>
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<td>25</td>
<td>I hate to study science out of doors.</td>
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<td>26</td>
<td>I wish I could watch science related programs daily.</td>
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<td>27</td>
<td>I feel like daydreaming during science class.</td>
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<td>28</td>
<td>I hate watching science films.</td>
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<td>29</td>
<td>I would like to devote more time in learning science.</td>
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<td>30</td>
<td>I wish science class last the whole day.</td>
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<td>31</td>
<td>I like to experiment and discover new things.</td>
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<td>32</td>
<td>Science films bore me very much.</td>
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<td>33</td>
<td>I am not interested in making science drawings.</td>
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<td>34</td>
<td>I would like to know reasons behind scientific events.</td>
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<td>35</td>
<td>It is very interesting to participate in a science quiz.</td>
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<td>36</td>
<td>Science should be avoided wherever possible.</td>
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<td>37</td>
<td>Sharing science facts that I know make me feel great.</td>
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<td>38</td>
<td>I find science subject very tough.</td>
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<td>39</td>
<td>Participating in a debate on science topic is very exciting.</td>
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<td>40</td>
<td>I would like to spend my leisure time in collecting pictures.</td>
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<td>41</td>
<td>There is no special use of science in our daily life.</td>
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<td>42</td>
<td>Learning scientific facts is very boring.</td>
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<td>43</td>
<td>Reading science articles in newspaper is very boring to me.</td>
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<td>44</td>
<td>I never miss science programs on television at home.</td>
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<td>45</td>
<td>It is most exciting to learn science.</td>
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<td>46</td>
<td>I am sick of 'hows' and 'whys' of science.</td>
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<td>47</td>
<td>I don't mind doing an experiment several times to check the answer</td>
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<td>48</td>
<td>Science specials are not only informative but also entertaining.</td>
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## Scoring key for Attitude towards science scale

<table>
<thead>
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<th>Item no.</th>
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Appendix VI

REACTION SCALE

Name : School :
Class : Date :

Dear Student,

You have been taught science through constructivist approach by the researcher. You were involved in many activities like role-play, group discussions, projects, assignments, field trip, film show etc. During this programme you have done the activities both individually as well as in a group. You were given daily assignments, which included collecting more information about the learnt, drawing concept maps, description of concept maps, etc. You were also given periodical tests after completion of every unit. I would like to know your reactions about the programme that you underwent in science for last five months. Your answers will be kept confidential and will not be revealed. There is no right or wrong answer for all the questions asked below. There fore feel free and comfortable in giving your responses. For every question there are three alternatives namely, 'Yes', 'No' and 'Sometimes'. Tick any one that expresses your reaction about the science teaching through the new method.

❖ The researcher had used different methods of teaching where in all of you had participated for past five months

1. Which method of teaching do you like the most among the given two? •
   a. teaching through regular method.
   b. Teaching by the method used by the researcher.

2. Do you think that you have learnt the science content meaningfully through the method followed? Yes/No/Sometimes

3. Were you involved in locating the material/information for the lessons learnt? Yes/No/Sometimes
4. Did the teacher's questions help you in seeing relationship between the concepts learnt earlier and the present ones? Yes/No/Sometimes

5. Was the teacher acting as one among you during the conduct of activities? Yes/No/Sometimes

6. Did you get certain questions in your mind when the teaching was going on? Yes/No/Sometimes

7. Could you prove any time that your ideas were correct in the class? Yes/No/Sometimes

8. Did you enjoy drawing concept maps in the class? Yes/No/Sometimes

9. Did you get distracted when the teacher developed concept map on the black board while teaching? Yes/No/Sometimes

10. You were doing many activities both individually as well as in groups. Which one among the following do you find it interesting and useful?

   a. Individually
   b. In a group

11. Did this method help you in understanding each other in a better way? Yes/No/Sometimes

12. Did this method help you in building self-confidence? Yes/No/Sometimes

13. Did this method inspire you to learn further at home? Yes/No/Sometimes

14. If yes, what steps did you take up to learn further?

   a. Library resources
   b. Discussion with peer group
   c. Discussion with parents
   d. Discussion with other teachers.
15. Do you want the lessons taught by the researcher, to be repeated by your regular teacher again?  
Yes/No/Sometimes

One important condition for any event to take place successfully is the environment surrounding us, i.e. Classroom atmosphere.

1. In whose class were you free and frank in giving responses and enjoyed the lesson?
   a. Regular science teachers
   b. Researcher's class

2. Were you given freedom to ask questions in the class?  
Yes/No/Sometimes

3. Were your ideas encouraged and accepted by the teacher?  
Yes/No/Sometimes

4. Did the teacher use the ideas and experiences given by you in the class?  
Yes/No/Sometimes

5. Were you given the opportunities to express your doubts and get clarification from the teacher?  
Yes/No/Sometimes

6. Was there any scope for you to discuss with one another in the class?  
Yes/No/Sometimes

7. Did you have any experience of discussion with the teacher in the class?  
Yes/No/Sometimes

8. Were you given an opportunity to conduct experiments in the class?  
Yes/No/Sometimes

9. Did you take initiative to plan and perform the activities in the class?  
Yes/No/Sometimes

10. Did the classroom environment help you in learning better?  
Yes/No/Sometimes
11. Did the classroom environment help you in building good relationship with the teacher?  
Yes/No/Sometimes

12. Were you given freedom to change the seating arrangement whenever required?  
Yes/No/Sometimes

During this programme you were given daily assignments, project works - both group and individual works, and also unit wise tests.

1. Did the daily assignments help you in learning better?  
Yes/No/Sometimes

2. Were you seriously involved in the group works?  
Yes/No/Sometimes

3. Did you enjoy answering the test items given in every unit test?  
Yes/No/Sometimes

4. Did you find it challenging while answering the test paper?  
Yes/No/Sometimes

5. Did you enjoy answering the items involving concept maps in the test?  
Yes/No/Sometimes

6. Did the group discussions and group work helped you in understanding the lesson better?  
Yes/No/Sometimes

7. You have been asked to do certain activities like
   a. daily assignments
   b. project works
   c. field trips
   d. role-play
   e. presenting the papers
   f. group discussions
   g. drawing concept maps
   h. conducting experiments
i. List out the activities that you like the best and felt that you have learnt something among the above.

ii. List out the activities through which you did not learn much.

- Write the differences in the teaching methods to science between your regular science teacher and the researcher.

- What your science teacher (researcher) is and what you want your science teacher to be

- What your classroom is now and what you want your classroom to be

- In what way the test paper given by researcher is different from that of your regular tests.
Appendix VII
Lesson plan - 1
MAGNETISM

Concepts / Teaching Points

❖ Magnetic Substances : Substances, which are attracted by a magnet, are called Magnetic Substances.

❖ Non-Magnetic Substances : Substances, which are not attracted by a magnet, are called non-magnetic substances.

❖ Natural Magnet : The magnets, which are found in nature and have low magnetic power.

❖ Artificial Magnet : The magnets, which are made by man and have high magnetic power.

❖ Poles of magnet : The two ends of a magnet where the magnetic force is greatest.

❖ Magnetic Induction : The phenomenon by which an ordinary piece of iron acquires magnetic properties temporarily due to the presence of another magnet near it.

❖ Self demagnetization : The tendency of magnet to become weaker after some time is called self-demagnetization.

❖ Electromagnet : The magnets produced with the help of electricity are called as Electromagnets.

❖ Magnetic Compass : It is a simple device, which has a magnetic needle that is free to rotate, and rests in north-south direction.
Instructional Objectives

The student at the end of the unit will be able to

- recall the name of the rock from which magnet was derived.
- define a magnet.
- classify magnetic and non-magnetic substances.
- differentiate natural magnet from artificial ones.
- identify the attractive property of a magnet.
- identify the poles of a magnet.
- explain, through an activity that like poles repels and unlike poles attract.
- prove that magnetic poles exist in pairs.
- explain the process of magnetic induction.
- develop a concept map showing the properties and types of magnets.
- given the materials, student magnetizes an ordinary needle.
- explain the two methods of making a magnet by artificial means.
- list the methods of demagnetization.
- recall the test for magnetism.
- reason out why we should store the magnets when they are not in use.
- define an electromagnet.
- explain the process of making an electromagnet.
- differentiate temporary and permanent magnets through a concept map.
- list the application of electromagnets in our daily life.
- describe a magnetic compass.
- reason out why do we call earth as a magnet.
- state the uses of a magnet.
Process skills to be developed

Observing, Identifying, Classifying, Experimenting, Hypothesizing, Inferring, Drawing

Attitudes to be developed

Understands the history of magnet and Appreciates its power, Curiosity, Open-mindedness and Cooperation etc.

Concept and Related Concepts:

Magnetic and Non-magnetic substances

Activities: Concept Attainment game

Materials or resources used

Magnet, metal pieces, plastic materials, rubber, sand, chalk piece, gold, etc.

Stage of Exploration

Teacher's instructions to the students: "Here are some substances and a wonderful rock, try to classify the substances into two groups. Once you classify them, try to name and define them and also write the properties of the wonderful rock."

(Children observe, feel and experiment with the materials given to them.)

St1: Hey! let me see this wonderful rock.

St2: Why did madam called it as wonderful rock? (curiosity)

St1: Maybe.

(Suddenly, he sees that the rock attracted the metal pieces)

St1: Yes. It is a magnet.

St4: How do you know that it is a magnet?

St1: See here, it is attracting the metal pieces.
St5 and St 6 find that it is not attracting sand and chalk piece.

Why is it like this? (Experimenting with other objects)

St3: May be it is having some unnatural power (hypothesising)

St10: I don't think so

St1: May be it attract only metals (hypothesizing)

St12: But see here it is not attracting gold.

Students in the group separated the materials, which are attracted by the magnet from the others. They cross checked with each other.

Tr: Which substances does the magnet attract?

Students’ make a list of the substances like iron nail etc that are attracted by the magnet.

Tr: All of you have seen a magnet and its power of attraction, Do you know who and how it was discovered?

St9: I know the story of discovery of a magnet. Five thousand years ago a shepherd Magnus lived at Magnesia in Asia Minor. He noticed that the nails fixed to his shoes were attracted by a piece of stone. The stone had the magic property of attracting iron. Then it was named as Magnetite, a wonderful rock that is an ore of iron (Fe3O4). Sailors used magnets to navigate their ships especially during cloudy weather. Chinese called them Leading tone; presently it is called a Lode Stone. So these two are called as Natural Magnets as they are available in nature. (History of science)

Tr: Are all magnets naturally available or are there any man made magnets?

St10: Yes they can be artificially made. Like horseshoe magnet, Bar magnet, Magnetic needle.

(Teacher shows natural and man made magnets to the class)
Tr: Is there any difference between natural and artificial magnets.

St6: Natural magnets are naturally available, whereas man makes artificial magnets.

St8: Natural magnet does not occur in any regular shape; whereas artificial magnets have regular shape and required strength. They are named on the basis of their shapes.

Tr: Which magnet has high magnetic power?

St7: Artificial magnets have high magnetic power than that of natural ones.

Tr: Very good.

St4: That's great. (Appreciation)

St5: You know our earth is also like a magnet.

St7: Yes. Any thing thrown up falls down. i.e. it attracts every object towards itself.

St9: It is gravitational pull.

**Stage of Explanation**

Using the ideas and word of students the teacher helps, constructs and explains that magnet is a rock which attract some of the metallic substances and its power was found to be more at the edges. Shows the students that the magnet mainly attracts the substances made of iron. A key question used by the teacher "Which are the regions where the magnetic power is high"? The answer was two free ends of the magnet. The teacher replaces the word free ends by poles. The free ends of the magnet where the attraction is maximum are called the poles of a magnet. Every magnet has two poles of North and South. These point to the north and south directions.
Stage of Expansion

Tr: We have seen that magnet attracts some substances and does not attract some. Can you give a term for the substances, which are attracted by a magnet?

St2: Magnetic substances.

St7: The substances, which were not attracted by the magnet, can be called non-magnetic substances.

St3: North and south poles attract and north and north poles move away from each other.

Tr: How would you experimentally identify the north and south poles of a magnet?

St4: Like poles attract and unlike poles go away

Teacher restructures the statement as "Like poles repel and unlike poles attract".

(Students repeat the statement given by the teacher).

Tr: Do you know why the magnets attract substances made of iron?

St1: I think atoms of iron might have magnetic property. (Hypothesising)

Tr: Very good. You are correct. Iron has magnetic properties.

Teacher gives explanation with the help of a diagram showing the domains in iron rod and that of the magnet and explains how magnet attracts the iron pieces.

![Diagram showing domains in iron rod and magnet](Iron Magnet)

A - 60
As you are aware of, every substance is made up of molecules. We call them small units or domains. In the same way iron is also made of atoms, which move in a random way. Where as in the case of a magnet they move in one particular direction either from north to south or from south to north.

When a magnet is subjected towards the metal iron, all the domains of iron change their direction towards the magnet. Thus the iron gets attracted towards magnets.

Tr: Well, we had learnt the nature of magnet till now. Do you know where we use magnets in our daily life?

St4: Toys.

Tr: Do you know how cranes lift heavy loads?

St2: No

Tr: Big magnets are made use of in the cranes for lifting heavy loads.

St8: We can separate iron pieces from non-magnetic substances with the help of a magnet.

St7: It is having such a great power of attraction. That's really wonderful. (appreciates)

Tr: It is so useful to mankind. Thanks to science and technology that brought the magnets into use in many fields like medicine, extraction of metals etc.

(The students appreciate the usefulness of magnets and the technology of making use of it in a variety of purposes)

Stage of Evaluation

The teacher gives a prediction sheet containing different substances; the students were asked them to classify them into magnetic and non-magnetic substances.

Tr: O.k. students you have identified magnetic and non-magnetic substances
with the help of a magnet. Can you identify the poles of a magnet and explain how it attracts ferrous substances.

Students explain the attractive power of a magnet by demonstrating an experiment.

Tr: Good.

Teacher draws a concept map with the help of students and adding few more points showing the properties of magnet and its types.

**Magnet and its properties**

![Concept Map](image)

Teacher asks a pupil to explain the properties of magnet seeing the concept map.

Tr: Did you all enjoy drawing this concept map?

St5: Yes.
Home Assignments / Activities:

- Differentiate between (a) Magnetic and Non-Magnetic substances, (b) Natural and Artificial Magnet.
- Write any 3 examples of Artificial Magnet.

Concept & Related Concepts

Properties of a Magnet

Materials or resources used

Iron fillings, magnet, stand, magnetic compass

Stages of Exploration & Explanation

Tr: All of you have seen a magnet in the last class and you have also identified magnetic substances from their counterparts. Today we will discuss its properties.

Tr: Can you tell the properties of a magnet?

St2: It attracts the metal pieces.

Tr: How do you know that it attracts the metallic pieces?

St8: Yesterday, when I kept few metallic pieces near magnet, it attracted the pieces.

Tr: Yes, very good. Magnet has an attractive property. It attracts the metallic substances.

Teacher places few iron filings on a white paper and brings a magnet near the filings. Teacher asks the students to observe the activity.

Tr: What do you observe?

St10: Iron fillings are attracted towards the two ends of a magnet. What do you infer from this?

Magnets attract the iron filings.
Tr: In which part of the magnet do you find more iron filings?

St19: Poles - North and South poles.

Tr: In what direction do the magnet rests when it is suspended?

St26: They hang the magnet with a thread to the stand (Experiments and observes)

![Diagram of magnet with thread and poles]

St4: Madam, it rests in N-S direction.

Tr: Why does it rest in N-S direction? (Group Discussion)

St8: Earth has a large magnetic field around it. The south pole of the magnet is attracted with the North Pole of the earth and vice versa.

St3: The South pole points towards geographical North Pole and North Pole towards geographical south. That is the reason why the magnet rests in N-S direction.

Tr: Draws the diagram and explains again to the class.

Tr: This property of magnets is called as Directional Property. Where is this property of magnet made use of?

St9: In making magnetic compass.

Tr: Now students you have learnt that a magnet has two poles and it rests in N-S direction. Now let us see what will happen when two magnets are brought near each other?

St4: Takes two magnets and brings them near each other and observes that North pole repels with North pole of other magnet and North pole attracts with South pole of magnet. South and South poles repel with each other.

Tr: What do you infer from this?
St11: Like poles repel and unlike poles attract (inferring).

St2: Like poles repel and unlike poles attract each other.

Tr: What will happen if a magnet is broken in pieces accidentally?

St20: Each piece will act as an individual magnet.

Tr: What do you conclude from this?

St21: Poles exist in pairs. The poles of a magnet can never be isolated.

Tr: Day before yesterday when I was collecting the magnets, iron fillings, etc. from the lab, accidentally I had kept an iron nail along with a magnet. Can you guess what has happened to the iron nail? (Hypothesizing)

St7: Iron nail becomes a magnet.

Tr: restructures the sentence and says that the iron nail behaves as a magnet.

Tr: What might be the reason for this?

Stage of Expansion

St2: Iron nail acquired magnetic properties from the magnet (reasoning).

Tr: How?

St5: -----

Tr: The magnet has the property of inducing magnetism to the iron nail. This property is called as Induction. Do you know how this induction takes place?

S13: No.
Tr: When we observe a magnet under a microscope, it consists of small regions called as domains. Each of these acts as tiny magnet and they point in the same direction (draws on BB). But in case of iron, they are in different directions.

When a magnet is brought near the iron nail, slowly the domains turn and align themselves in the same direction. So it acts as a magnet temporarily.

Tr: Now let us try with other objects.
Tr: Students try with screws, pins, etc. (experiments)
Tr: What did you observe?
St3: Even these materials are acting as magnets.

Stage of Evaluation

Teacher draws a concept map with the help of the students on blackboard showing the properties of a magnet.

Home Assignment:

v What will happen to the domains of iron fillings when a magnet is brought near it?

v List out the properties of a magnet.

Concept & Related Concepts

Magnetic induction, electric bell

Materials or resources used

Magnets, 6V battery, copper wire, iron rod and electric bell

Stage of Exploration

Tr: Yesterday we have seen how a magnet induces an iron nail? How a temporary magnet is made by the process of magnetic induction? Can you tell me any other methods of making artificial magnets.
Tr: There are 3 more methods of magnet making.

(i) Single Touch Method and Double Touch Method - Mechanical method

(ii) Electromagnet - Electrical method.

**Stages of Explanation & Expansion**

Teacher demonstrates the methods of magnetic induction in the class. The students were asked to note down and draw the diagram showing the process of magnetic induction.(draws)

![STEEL NEEDLE](image1.png)

**STEEL NEEDLE**

Single touch method

Double touch method

Tr: O.k. Students, you have seen both the single and double touch methods of making artificial magnets. What is the difference between the above two methods?

St12: Only one magnet is used in single touch method.

St5: Magnet is moved along the needle in one direction.

Tr: Very good.

St9: In the double touch method two magnets were moved in opposite direction i.e. one in north and the other in south direction.

Tr: Do you know any other method of making artificial magnet?

St13: Magnets are also made by using electricity.
Tr: Very good. Do you know how it is done?

St2: By supplying current.

Teacher demonstrates the process of making electromagnet. The teacher takes an insulated copper wire and wounds around the iron rod and then connects the two ends of a copper wire to a 6V battery. When the electric current passes through the copper wire, the iron rod behaves like a magnet. Then the iron rod attracts the pins, clips, etc. like that of a magnet.

Students observe the process of making of an electromagnet.

Tr: What happens to the magnet when the supply of current is stopped?

St15: The iron rod loses its magnetic properties as soon as the current in the copper wire is switched off.

St8: Tries to find out what happens to iron bar, when current is stopped (experimenting).

St9: Because current is the main component to induce magnetic nature in iron.

Tr: Yes. Rightly said.

Tr: What do you call this type of magnet?

St6: Temporary magnet.

Tr: Yes. On what factors the magnetism produced in the iron rod depends on?

St11: Amount of Current supplied. (Predicting)

Tr: Then……

St: ----- 

Tr: There is one more important factor apart from the amount of current flowing through the wire. That is the number of turns the wire was wound on the soft iron rod.

St12: That means more the number of turns wound around the iron rod, more the magnetism produced. (hypothesizing)
Tr: Yes. In this case the current carrying wire behaves like a magnet. In which devices do you make use of this principle?

St25: We don't know.

Tr: An electric bell and loudspeaker used in public functions use this property. An electric bell has an iron hammer around which a wire is wound. When we press a button of the electric bell current begins to flow through the wire, turning it a temporary magnet. This temporary magnet attracts the iron hammer, which strikes the metallic bell to produce sound. (Teacher explains this by showing an electric bell) (Observing)

Tr: O.K. You have seen the three types of making of artificial magnets. Which one among the three will have lasting magnetic effect?

St6: Electromagnet.

Tr: Where do we use Electromagnets?

St3: Telephones, bells, microphones, dynamo, etc.

Tr: Do you know the method of storing the magnets?

St2: ------

Tr: We must store them in magnetic keepers. Magnetism may be lost if magnets are kept in a disarray. Magnets must be kept in a specific manner to ensure retention of magnetism for a long time. Teacher demonstrates the process of storage of magnets in magnetic keepers as follows:

First keep two bar magnets with a wooden piece in between them so that their opposite poles point the same direction. Then join the opposite poles at each end with soft iron pieces. These are called magnetic keepers. (Students observe and try to keep the magnet in the magnetic keepers.)

Stage of Evaluation

Tr: O.K. Suppose you are given a bar and asked to find out whether it is a magnet or not?
St2: We would check, whether

(a) it rests in N-S direction.
(b) It attracts iron pieces.
(c) Its poles attract each other.

Tr: What do you call the specific test?

St11: Repulsion test.

Tr: You have seen such a wonderful substance and its properties. Are there any circumstances where a magnet loses its properties or power?

St1: When it has fallen from height forcefully.
St2: When it is heated.
St3: When it is hammered.
St4: When it is not stored properly.

Tr: Why does it lose its power?

St9: as the above processes destroy the alignment of domains inside. (Predicting)
What is demagnetisation?

Tr: Yes, very good. This process of loss of magnetic power of a magnet is called as De-magnetization.

Tr: How can you overcome the above problem?

St23: By storing them properly in magnetic keepers.

Tr: O.K. fine. We have learnt so much about the magnets and their properties. Now list out the uses of magnets.

St1: In toys, refrigerator doors.
St2: In loudspeakers.
St3: Telephones, motors.
St8: in magnetic compass to find out the directions. (appreciates)
Home Assignment/Activities

- Draw a concept map showing the different methods of magnetization.
- Why do we call earth a magnet?
Lesson plan - 2

HOW LEAVES ARE DESIGNED?

Concepts/ teaching points

❖ Parts of a leaf

❖ Xerophytes: The plants that live in dry areas are called as xerophytes.

❖ Mesophytes: The terrestrial plants which live in moderate conditions are called Mesophytes.

❖ Hydrophytes: The plants that live in water are called Hydrophytes.

❖ Venation is the arrangement of veins and veinlets on a leaf blade.

❖ When veinlets are irregularly distributed forming a net work, it is called reticulate venation.

❖ When the veins run parallel to each other on a leaf blade, it is called parallel venation.

❖ Phyllotaxy: The arrangement of leaves on a stem is called phyllotaxy

❖ Opposite Phyllotaxy : When the leaves are arranged opposite to each other.

❖ Alternate Phyllotaxy : When the leaves are arranged alternate to each other.

❖ Whorled Phyllotaxy : When the leaves are arranged in a whorl.

❖ Simple leaf: It consists of a single blade which may be entire or incised to any depth but not down to the midrib or petiole.

❖ Compound leaf: When the incision of the leaf blade goes down to the midrib or to the petiole so that the leaf is broken into number of segments called leaflets which are free from one another.
Instructional objectives

Students at the end of the unit are expected to

- explain the importance of plants and especially leaves.
- understand the reason behind the variety of leaves found in the surroundings.
- list various functions of leaves other than photosynthesis.
- describe the structure and parts of the leaf.
- distinguish between parallel and reticulate venation.
- explain the function of stomata in leaves.
- explain how the structure of leaf help in adapting itself to its surroundings.
- define phyllotaxy.
- differentiate alternate from opposite phyllotaxy.
- explain how xerophytes, hydrophytes and mesophytes adapts to the surroundings.
- explain the different ways of defence mechanisms among the plants.
- site examples of the leaves functioning as food reservoirs etc.
- differentiate simple leaf from a compound leaf.

Concepts to be attained

Parts of a leaf and types of leaves

Strategy used

Field trip to a garden and a green house.
Process skills developed
Observing, predicting, hypothesizing, inferring, generalizing

Attitudes to be developed
Appreciation of the variety of leaves found, curiosity, willingness to suspend judgment, cooperation, and reverence for life.

Situation Provided
The students were intimated about the field trip on the previous day. The objective behind the field trip was also explained before the field trip. The instructions were given to the pupils regarding what they were supposed to carry, look for, and collect during the trip and they were asked to collect different types of leaves. The students were given utmost freedom to explore things.

Stage of exploration
The students observed the leaves around them, discussed with each other about the color, size and texture of leaves collected. After collection of the leaves they were asked to stick them on herbarium sheets. As soon as they returned, the teacher along with the students extended and deepened the experiences of the students.

Tr: O.k. All of you have seen so many varieties of plants yesterday. Can you tell me which part of the plant prepares food?

St2: Leaf.

Tr: Yes. In today's class, let us have a discussion on the leaves, their structure and functions today. The class participated in the discussion. All of them expressed their observations.

St1: The leaves are of different sizes, colors, textures, and shapes.

St5: Yes, even I too found a variety of leaves. Some are green; some are brown, some are white in color.

St9: Some are small; some are very big in size; some have very rough surface whereas some are soft.

A - 74
Stages of Explanation & Expansion

Tr: Very good. All of you all had collected variety of beautiful leaves.

(Teacher explains various parts of a leaf using a concept map)

(Then the teacher asks the students to identify the parts of a leaf)

Students show the parts and name them.

St5: Madam. Some leaves have so many branches. What do you call them?
(Misconception)

St12: It is not branch. It is also a type of leaf.

Tr: Just now we have seen in the concept map that one of the main part of leaf where number of veins are seen i.e Lamina or Leaf blade.

If the leaf consists of a single blade, which may be entire or incised to any depth but not down to the midrib or petiole, then it is called as a simple leaf. Where as if there incision of the leaf blade goes down to the midrib or to the petiole so that the leaf is broken into number of segments called leaflets, which are free from one another, then it is called a compound leaf. For example: Banana leaf is an example for simple leaf where as tamarind leaf is a compound leaf.
(Teacher gives a worksheet where in the students are asked to identify simple and compound among the given leaves)

Students identifies the simple and the compound leaves from the given.

Tr: Very good.

St4: Teacher, In these leaves the veins are parallel to each other. (Observing)

St8: Yes teacher. In this leaf also. (student shows a leaf to the teacher)

St9: In all the other leaves, veins are in network.

Tr: The arrangement of veins in a leaf is called as venation. There are two types of venation. They are parallel and reticulate.

St1: When the vein lets are found like a network, it is called reticulate venation.

St9: When the veins run parallel to each other then it is called as parallel venation.

Teacher defines parallel and reticulate venation properly.

St20: Madam, (shows a stem) these leaves are arranged like the petals of a flower, where as in this they are arranged alternately. (observing)

Tr: Good. It is true. The arrangement of leaves on a stem is called phyllotaxy. The leaves are arranged on the stems differently in different plants. The leaves are arranged in three ways - alternate, opposite and whorled. (Students repeat with the teacher)

(Teacher shows three different stems to explain the phyllotaxy)

Stage of Evaluation

- Draw a labeled diagram of a leaf showing all the parts.
- Complete the work sheet given on phyllotaxy of leaf. (Appendix No. 8)
Concepts to be learnt

Types of plants and functions of leaves.

Strategy employed

Discussion.

Stage of exploration

Tr: In the last class we learnt leaves and their structure. Today we will learn about their functions. Will you tell me the various functions carried out by the leaf?

St: They prepare food for the plant.

Tr: Good. What else.

St: Even the leaves store food and water in many plants. We use the stored food in leave in the form of vegetables in our daily life.

St7: Yes. Spinach, lettuce, mint are leafy vegetables which store food in the leaves.

St8: The leaves of bryophyllum give rise to new plants directly.

Tr: In some cases the leaves are modified into tendrils like in the case of gloriosa lily, that help in climbing up thereby raising its flowers to view of pollinators.

Tr: The leaves even store air in them (in hydrophytes).

St: Yes madam. In Water hyacinth plant, leaves float on the surface, they are filled with air.

Tr: Do you know the reason?

St: To float on water.
Tr: Very good. Do you know any other functions of leaves?

St10: Yesterday I had seen a pitcher plant in discovery channel. It catches the insects.

St9: Pitcher plant. The leaf looks like a cup; one more leaf covers as soon as any insect approaches near the cup.

St10: It was an amazing scene.

St9: Do you know what are those plants called as?

St2: Insectivorous plants, as they capture insects in their trap.

St4: It is really interesting, what happens to the insect after getting trapped by the pitcher?

St9: Maybe it eats the insect.

St5: I don't think so.

Tr: The pitcher plant has certain digestive enzymes, which helps in absorption of food material.

Stage of explanation and expansion

Tr: We have seen variety of leaves around us performing various functions. Could you tell me why do we have so many varieties of leaves around us?

(Students discussed among them selves.)

St9: Because we have varieties of habitats.

St: In order to adapt and cope up with the surrounding environment.

Tr: What are the coping mechanisms in case of plants?
St8: Few areas have very high temperatures e.g. Desert regions. In these places some plants have thick spiny leaves e.g. Cactus in order to avoid evaporation of water from the leaves.

St3: They are not leaves; they are thorns.

Tr: In these plants the leaves are modified into thorns.

Tr: Why do they have thorns?

St: May be to protect them from grazing animals.

Tr: O.k. Thorns avoid transpiration. The process of evaporation of water from leaves called as Transpiration.

Students repeat the definition of transpiration with the teacher.

St3: In coniferous forests the trees are cone shaped in order to avoid water logging on leaves.

Tr: How?

St4: We play on inclined planes, in the same way the water flows down when it is sloped well.

St2: I had seen some leaves of aquatic plants that are thin, ribbon shaped, some are bulbous in nature.

St4: What may be the reason behind the shape of the leaves?

St8: May be to allow the water to pass through them.

St10: Yes. As they cannot stop the water current, the leaves are thin, tiny and they allow water pass from them.
St9: To avoid spoilage of leaves.

Tr: Very good. You have listed out so many functions of leaves.

Teacher repeats the points and writes down on the black board.

Stage of Evaluation

Draw a concept showing the various types of plants, namely herbs, shrubs, trees, creepers, climbers, twines and lianes. Gather information about their characteristics and write one example each.

Concepts/teaching point to be learnt

Adaptations in plants.

Strategy used

Lecture cum discussion

Stage of exploration & Explanation

Teacher using the ideas of the students explained that in order to adjust and sustain the plants adapt them selves to the environmental conditions. Those adaptations include leaves structure, shape, thickness etc. The leaves are designed in a plant based on its requirements. The plants living in water, in order to prevent water logging their body is structured in different ways such as thin, slender, ribbon shaped, with wavy stem, tiny leaves, leaves with less number of stomata and so on.
(Teacher shows some aquatic plants to the class and the students were asked to observe the characteristics)

LOTUS LEAF

HYDRILLA

WATER HYACINTH
(The students observe, draw and list down the characteristics in their notebooks.)

Tr: Shows the lotus plant and asks the students to describe it.

St: It has saucer shaped leaves that are attached at their centers and are held above the surface of the water surface facing the sun. Roots are always in water.

St5: Madam, water is not absorbed by the leaves. What is the reason for this madam. (observes)

Tr: The upper surface of the lotus leaf is provided with a waxy coat that prevents the water from stagnating on the surface.

Tr: Even in the case of water hyacinth, the plants with brilliant purple blue flowers are found to be of free floating style. Except roots all the parts of the plant are above the surface of water. In this case the base of the leaf has been provided with sponge cells that trap a lot of air, which helps the plant in floating.

St: Even some plants living in water have finger like, lacy or ribbon shaped leaves.

Tr: Yes in the case of Hydrilla, the leaves are ribbon like in shape. Do you know how does the shape of the leaf help the plant?

St: May be they allow the water to pass through them without damaging the leaves. (hypothesise)

**Stage of expansion**

Tr: Very good. The hydrophytes have to face the problems of stagnation, water current etc. The pores or stomata are closed in the hydrophytes in order to avoid entry of water in to the leaves. Whereas in the case of land plants (Terrestrial plants) the stomata are present on both the surfaces. Even in the case of land plants of tropical region where the rainfall is heavy face the problem of water stagnation. To avoid this, the leaves of the plants have drip-trip mechanism, allowing the water to drain down from the tip for example in Mango leaf.
In some of the terrestrial plants like banana, palms, and coconut the leaves are found to be large in size. What is the use of the large size of the leaves?

The large size of the leaves increases the photosynthetic rate.

Yes. The large leaves increase the photosynthetic rate. But they have different problems to face like strong winds, especially in banana leaves. Though the photosynthetic rate is high it is not adapted to deal with strong winds. Hence the leaves are torn to shreds by the winds if grown openly.

What about palm and coconut trees?

Palms are monocot and are shallow rooted. They have no branches and so the leaf stalks or rachises take on that function. If palms had large entire leaves like that of banana on their leaf stalks, this will offer a lot of resistance to the wind causing the tall palms to be uprooted.

I think all of you have seen palms. How are the leaves arranged in the palm trees?

The leaves are dissected.

How do the structure of leaf help the tree in overcoming the problems?

Leaves allows the strong winds to pass through and avoids winds to uproot the plants.

Where as in the case of rain forests, the plants face the problem of heavy rain, humidity and less sunlight. The plants have both large leaves and dissected leaves. The large leaves help in trapping more sunlight and the dissected leaves minimize water loss. So as in the case of tamarind and babul leaves.

Madam that means the compound leaves help in minimizing water loss among the plants/trees.

Yes. In extreme conditions of water shortage as in desert areas, the leaves...
are modified into thorns and spines, the stem is very thick, storing water and performing the function of leaves. Can you name few examples of xerophytes?

St: Cactus, Opuntia.

Tr: In this case the leaves are modified into long slender spines to prevent water loss and protection for grazing animals.

St: Water is stored in the stems of cactus.

Tr: Yes. In some of the plants like Australian Acacia the leaf petiole looks and behaves like a leaf; the stipules of babul leaves are modified into long and dangerous spines; the sugar cane leaves are coarse and spiny. All these modifications help the plants in protecting themselves from grazing animals and in reducing transpiration.

Tr: There are few plants that produce a chemical substance.

St6: In Calotropis, the plant especially leaves produces some chemical substance, white milky latex, which can burn the skin.

St9: Nicotine in tobacco is used to kill insects.

Tr: So the plants also use chemical defensive mechanisms for protecting themselves from many agents.

Tr: The cold parts of the world have a serious problem of freezing. The plants in these areas have needle like leaves to avoid freezing problem. The leaves are designed in various ways in order to adapt themselves to their surroundings.

**Stage of evaluation**

Teacher gives a worksheet and asked the students to write down the characteristics of the leaves found in xerophytes, aquatic and mesophytic plants. The students were also asked to identify the leaves and write the function of leaf in each case.
Lesson plan - 2

METALS AND THEIR PROPERTIES

Concepts and teaching points

Physical properties of Metals & non-metals

- Malleability: The property of metals being hammered and beaten into thinner sheets.

- Ductility: The property of metals that allows them to be drawn into wires is called ductility.

- Conductors of heat and electricity: The materials which allow the heat and electricity to pass through them are called as conductors of heat and electricity.

- Sonorous nature: The property of metals making a ringing sound when struck.

- Metallic luster: The shiny surface of the metal which makes them attractive for use in jewellery and decorations.

- Tensile strength: The metals can be stretched to some degree without fracturing. This is a measure of their tensile strength.

Chemical properties of Metals

- Reaction with oxygen: Metals react with oxygen and form the respective basic oxides.

- Reaction with water: Reaction of metals with water forms corresponding hydroxides.

- Reaction with acids: Metals react with acids and forms respective salts and liberate hydrogen gas.
Replacement reaction: More reactive metals replace less reactive metals from their compounds.

Activity series: It is the arrangement of metals in an order of their reactivity with air, oxygen and acids.

Corrosion: The wasting away of metals layer by layer is called corrosion.

Instructional Objectives

The students at the end of the unit will be able to

- define a metal
- classify the given materials into metals and nonmetals
- cite examples for metals
- list the physical properties of metals
- define the terms metallic luster, malleability, ductility, sonorous, conductivity etc.
- reason out why gold is used in jewellery
- appreciate the use of different metals in various fields
- experiment the conductivity of metals
- prove that copper and aluminium are good conductors of electricity
- reason out the usage of copper bottomed vessels.
- examine the reaction of metals with oxygen, water, acids and other metals.
- list the conditions necessary for a metal to get corroded.
- explain the process of corrosion
- list the methods of avoiding corrosion of metals.

**Process skills expected**

Observing, identifying, classifying, experimenting, hypothesizing, inferring, interpreting, inferring, reasoning and generalization

**Attitudes to be emphasized**

Understands and appreciates the uses of metals, curiosity, open-mindedness and cooperation, objectivity, perseverance, willingness to suspend judgement etc.

**Concept and Related Concepts**

Physical properties of metals

**Activities:** Lab session, Questioning, discussion

**Stage of Exploration**

Teacher asks questions related to origin of metals and their usage by the early man to elicit the term Metals. Teacher's instructions to the students:

Here are some substances given to you. Observe them carefully and try to classify them according to their properties. Note down your observations in your notebook. The whole activity goes on in the laboratory, where in the students get answers through performing activities and discussing with the peer group and teacher.

**Stage of Explanation and expansion**

Tr: Do you know the names of these substances?
St15: We know few of them like copper, gold, aluminium, silver etc.

Students classified them into two groups and named them as metals and non-metals.

Tr: On what basis did you keep few substances in metals category and others in non-metals?

St11: They are hard solids.

Tr: Do you mean to say that all metals are solids?

St2: Yes madam.

Tr: It is not true with the Mercury, which is also a metal. It is an exceptional case.

Tr: What about carbon, oxygen, sulphur, silicon, bromine, chlorine?

St23: They occur as solids, liquids and gases at room temperature.

St12: Carbon, iodine are solids.

Tr: Good. Bromine is a liquid and chlorine is a gas.

Tr: What about their weights?

St6: No madam.

(Teacher asks the students collect the information regarding the weights of the metals and non-metals from the library.)

Tr: (Showing two metallic wires of same volume)

Tr: Are they same in weight?

St5: No, They differ in their densities.
Tr. Very good.

Tr: What are the other properties of the substances, which you called as metals?

St6: All of them have shining surface.

Tr: What do you call that property?

St8: Metallic luster.

Tr: Where do we make use of this property of metals?

St7: We make varieties of ornaments with gold because it has a shiny surface.

Tr: Where else do we use this property of metals?

St23: The backside of the mirrors is coated with silver.

Tr: Do you know why a thin coating of silver backs mirrors?

St7: Because it has shiny surface.

Tr: As silver is a good reflector.

St14: Silver is coated on the back of the mirror. When we see our face in it, it is reflected back. (Hypothesizing)

Tr: Yes. Good. Then what about the non-metals?

St11: They have a very dull luster.

Tr: Yes. You are correct. They generally do not reflect light well.

Tr: Which forms do the metals take?

St9: (observing the materials provided) wires and sheets.
Tr: Where do we use wires and sheets?

St10: Wires are used for fencing and supplying electricity i.e. domestic wiring.

Tr: Which metal is used for wiring of houses?

St23: Copper wires.

Tr: What do you call this property of drawing wires from the metal?

St: ----

Tr: Ductility.

Tr: Do you know the metals that are beaten into sheets?

St14: Aluminium, iron.

Tr: Do you know where do we use aluminium sheets?

St7: In making air craft bodies.

Tr: Why aluminium is used in making air craft bodies why not other metals?

St: ----

Tr: Because of its abundance, light weight etc.

Tr: Have you ever seen how iron metal is drawn into sheets?

St12: By hammering.

Tr: Very good.

St23: Madam, I have seen a blacksmith working in his foundry. He was beating iron metals into sheets when it is hot and was making various implements.
Tr: Where do you make use of these hammered metals?

St9: They are used for making utensils and ornaments.

Tr: What do you call this property of metals?

St16: Malleability.

Tr: Very good. So we use metals for making utensils.

St5: Madam what about the non-metals? Can we beat them into sheets?

Tr: No. Nonmetals are not malleable and ductile. Solid nonmetals are brittle.

St14: When hammered they break into smaller pieces.

Tr: Do you know which metals are used for making cooking utensils?

St12: Aluminium, copper, steel.

Tr: Do you know why we are using these metals only for making utensils?

St8: They get heated fastly.

Tr: Gives an iron rod and asks a student to hold it on the flame for one minute.

St6: It is becoming hot.

Tr: Can you tell me why the other end of the rod has been heated up?

St2: Because heat has been conducted by the iron rod (reasoning).

Tr: What do you call this property as?

St1: Metals are good conductors of heat.

Teacher sets up a simple electric circuit wherein the bulb glows. Teacher provides various substances to test their conductivity.
Students try out and find that metals conduct electricity, whereas plastic, rubber and wood do not.

Tr: Just now you have seen the bulb glowing, when you are completing the circuit using metals. What do you infer from this?

St3: Metals conduct electricity.

Tr: That is the reason why we use copper and aluminium for making electric wires.

Tr: Do you know any other physical properties of metals?

St12: Madam when I was doing experiment with the metals, I heard ringing sound when it fell down.

Tr: What do you call this property of metals as?

St14: All metals are sonorous in nature.

St9: They are very strong and have tensile strength.

Tr: Very good.

St: Most of the non-metals are poor conductors of electricity. Isn't it Madam?

St9: Madam, then what about graphite?

Tr: Very good. Graphite is a good conductor of heat and electricity. But whereas other nonmetals are poor conductors of heat and electricity.

The students are given work sheet and were asked to give the physical property of listed metals.

Stage of Evaluation

1. Why do we use copper and aluminium for making utensils?
2. Which is the metal that exists in liquid state?

3. Why do we use gold in making jewellery?

**Concepts and related concepts**

Chemical properties of metals: Reaction with oxygen

**Strategy employed**

Lab session

The whole teaching learning process is going on in the laboratory where the students are discussing with their peer group and as well as with the teacher. The discussion is presented here under.

Tr: Today let us study the chemical reactions of metals with different elements and compounds.

**Stage of Exploration**

Teacher cuts a small piece of sodium and places it on a watch glass and introduces the metal to the students.

Tr: Observe the interior of the metal, which has a shining surface.

(Student observes the metal)

After some time the metal turns dull and finally becomes powder.

**Stage of Explanation and Expansion**

Tr: What has happened to the piece of sodium metal?

St4: It has become powder.

Tr: Do you know the reason behind this?
St2: May be we kept in open air.

Tr: What do you mean by open air? Did it undergo any reaction?

St2: May be with oxygen in air (hypothesising)

Tr: Very good. You are correct. It reacts with oxygen. She writes the chemical equation for representing the reaction on the black board.

Tr: Let us see what happens to sodium when it is kept in kerosene?

(students observe the reaction)

St5: Madam, Nothing has happened to it. May be it does not react with kerosene. (hypothesizing)

Tr: Yes. That is why sodium is preserved in kerosene, as it does not react with it.

Tr: In the similar way we will see how magnesium reacts with oxygen. Teacher asks the students to take a piece of magnesium wire with tongs and ask them to burn in a flame. (Experimenting)

Tr: What happened to the magnesium ribbon?

St9: Madam it had turned into ashes.

St8: Magnesium burns brilliantly in air and forms magnesium oxide.

Teacher writes the chemical equation on the black board and asks the students to note down.

\[ \text{2Mg} + \text{O}_2 \rightarrow \text{2 MgO (basic oxide)} \]

Magnesium oxide

\[ \text{MgO} + \text{H}_2\text{O} \rightarrow \text{Mg (OH)}_2 \]

Magnesium hydroxide

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St10: I think the ribbons, which we burn on Diwali festival, have magnesium.

Tr: Yes. Very good. Let us see how copper reacts with oxygen.

Tr: Do you have copper bottom vessels at home?

St2: Yes madam.

Tr: Have you ever seen what happens to the vessel when you heat it for little longer time?

St3: It will turn black.

Tr: Because it has reacted with oxygen to form ash. What do you call that ash as?

St20: No, Madam.

Tr: We call that as oxide of that particular metal. Any metal when it reacts with oxygen, it forms an oxide, which we call it as metallic oxide. It is partially soluble in water. The metallic hydroxide changes red litmus blue showing its basic character. This is the general equation for the reaction of metals with oxygen.

St21: Copper reacts with oxygen and forms copper oxide.

Tr: Now try with few nonmetals and let me know their reactions.

Students try to see the reaction of sulphur with oxygen and found that it burns with a blue flame and a pungent smell. The gaseous substance formed is soluble in water. The oxides formed from nonmetals are acidic oxides and turn blue litmus to red.

\[ \text{S} + \text{O}_2 \rightarrow \text{SO}_2 \text{ (acidic oxide)} \]

Sulphur + Oxygen = Sulphur dioxide

\[ \text{SO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_3 \]

Sulphur dioxide + Water = Sulphurous acid
Stage of Evaluation
Teacher gives few substances and asks the student to find out whether they are metals or nonmetals.

(Students perform the reaction with oxygen then testing the nature of oxide formed. If the oxide changes red litmus blue, they named them as a metal and vice versa as a non-metal.)

Concepts to be learnt
Reaction with water

Activities
Lab session

Stage of Exploration and expansion

Tr: Now let us see what happens when metals react with water. Teacher gently drops a piece of sodium in a trough containing water. (Observing)

Tr: What did you observe?

St6: Madam, sodium is floating like a boat on the surface of water.

St11: Madam, a hissing sound is heard just now.

Tr: Rightly noticed. It is because of the liberation of hydrogen gas.

The teacher with the ideas of students writes the equation on the black board.

\[ 2\text{Na} + \text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2 \]

Sodium Water Sodium hydroxide Hydrogen

Tr: Now let us see what happens if metals like potassium and calcium is dropped in trough containing cold water.
Students perform the experiment under the guidance of the teacher.

St14: Now also gas is liberated.

Tr: Try with magnesium.

St19: There is no hissing sound, even though hydrogen gas is liberated.

**Stage of Expansion**

Tr: Now the same experiment you repeat with hot water.

Students experiment the reaction of the metals with hot water.

St7: I heard hissing sound now.

Tr: Why didn't the same metals react with cold water?

St8: May be they are less reactive in cold water. (Predicting)

Tr: Very good. It is true. Now classify the metals that react with cold water and which react with hot water.

Students classify and notes down in their notebooks.

Tr: What do you infer from this?

St1: Metals react with water and form metallic hydroxides and liberating hydrogen gas. (Inferring)

Tr: Do you mean to say that all metals react with water?

St20: Yes madam.

Tr: Did any thing happen to your gold jewellery when you have bath?

St4: Nothing.
Tr: Why?

St2: Because they do not react with water. (Predicting)

St13: They are less reactive metals. (Predicting)

**Stage of Evaluation**

Tr: Now try to give me the general chemical equation of the reaction of metals with water.

Students write the chemical equation in their notebooks.

Tr: Will you give me an example of another metal that doesn't react with water?

St3: Copper and Aluminium (hypothesizing)

Tr: How do you say that?

St4: Madam, we see copper and aluminium vessels when kept in water, nothing happens to them.

Tr: Very good. They do not react with water.

**Concepts to be learnt**

Reaction with Hydrochloric acid

**Stage of Exploration**

Till now we have seen how metals react with oxygen and water. Let us see what happens to metals when they react with dilute hydrochloric acids. Teacher gives instructions to the students about the handling of the equipment and the precautionary measures. Teacher demonstrates the reaction of one metal with hydrochloric acid and asks the students to perform the same with other metals. Students try out with various metals.
Tr: What did you observe?

St1: Some reaction has taken place.

St28: Metals are reacting with dilute hydrochloric acid

Tr: Do you know what products are formed in the reaction?

St20: No, Madam.

Tr: Metals react with dilute hydrochloric acid forming respective chlorides and hydrogen is liberated.

**Stage of Explanation and Expansion**

Tr: Pointing one student, what is your observation?

St5: Madam, I had pieces of Aluminium with me. After adding 10 ml of Hydrochloric acid solution, the reaction is very slow initially, later the reaction proceeded rigorously.

Tr: Do you know the reason behind it?

St25: I don't know mam.

Tr: It is because of the presence of the protective layer of aluminium oxide on the metal. Once this layer gets dissolved the reaction is rigorous.

St4: Then hydrogen gas is obtained.

Tr: How do you know the name of the gas?

St9: When we bring a glowing matchstick near to the mouth of the test tube.. It burnt with pop sound indicating that evolved gas as hydrogen.
Tr: Very good. What happened to copper?

St9: Madam, it is not reacting with dilute HCl.

Tr: Try to heat it and see whether there is any change

St2: Still there is no reaction mam.

St1: Copper is least reactive with acids.

Tr: What do you infer from this?

St5: Metals react with acids to produce salts and hydrogen.

Stage of Evaluation

- Teacher gives the reactants and asks the students to complete the equation by identifying the products.

\[ \text{Mg} + 2 \text{HCl} \rightarrow \underline{\text{_________}} + \underline{\text{_________}} \]

\[ 2\text{Al} + 6 \text{HCl} \rightarrow \underline{\text{_________}} + \underline{\text{_________}} \]

- Which metallic containers would be suitable to store chutney, pickles and curd?

- Which metallic containers would you avoid to store the pickles, chutney and citrus fruits?

- Which metal leads to a violent reaction when reacted with dilute acid?

- Why are gold and platinum called as noble metals?

Concepts to be learnt

*Metals replace other metals or replacement reaction*
St6: On both magnesium and zinc strips, a brown coating is seen.

Tr: Do you know the name of the metal?

St1: Maybe copper.

Tr: Very good. Then what happened to the copper sulphate solution?

St3: It turned colorless.

Tr: What do you infer from this?

St15: Iron, zinc and magnesium are more reactive than copper.

**Stage of Evaluation**

Teacher gives instruction to students - "Now keep a copper strip in a solution of iron sulphate and tell me the result"

Tr: What do you observe?

St5: Copper strip did not get any coating.

St6: Iron sulphate solution also did not change.

St4: Over all we can say that less reactive metal cannot replace more reactive metals.

Tr: You have tried out various metals and their reactions; Can you name them in their increasing order of reactivity?

St21: Copper, iron, zinc, aluminium, magnesium.

Tr: Good. Teacher gives the activity series or reactivity series of metals

Gold, silver, Copper, lead, iron, zinc, aluminium, magnesium, sodium, potassium
Concepts to be learnt

Corrosion

Stage of Exploration

Teacher shows few rusted materials to the students and ask them whey they have brown colour coating on them? What do you call it?

St8: It is called rust. Iron nail reacts with moist air and forms rust. (iron oxide) (Hypothesizing)

Tr: Do you mean to say both oxygen and water required for any material to rust?

St3: Yes madam. Even copper wares lose shine and they acquire a green coating as get older.

St18: Silver ornaments turn black.

Tr: Very good. Metals corrode faster when they are exposed to moist air. This process of wasting away of metals layer by layer is called as corrosion.

Stage of Explanation and Exploration

Tr: How can we prevent corrosion?

St19: By painting

St11: By applying oil, kerosene

Tr: O.k. by applying lubricants.

St2: Alloying. Some metals when alloyed with other metals become more resistant to corrosion.

Tr: What is an alloy?
St14: It is a homogenous mixture of a metal with another metal or non-metals.

Tr: Name an alloy, which commonly made use of by every one.

St2: Steel is an alloy of iron.

Tr: Do you know how steel is protected from corrosion?

St: ----

Tr: By coating them with a layer of tin or chromium metal which are resistant to corrosion. This is done by electroplating.

Tr: There is one method of protecting especially aluminium vessels from being corroded like electroplating?

St: - - - -

Tr: Aluminium being more reactive that iron begins to corrode as soon as it comes in contact with moist air. But the reaction stops quickly ad it combines with moist air to form a coating of aluminium oxide as we found earlier. This is fairly uniform, therefore seals the metal underneath from further corrosion. This oxide layer is more uniform by electrolysing dilute sulphuric acid in a cell in which the aluminium objects to be treated as an anode. The oxygen evolved at anode, reacts with aluminium to form a uniform layer of aluminium oxide. This process is called anodizing.

Tr: Do you tell the names of two metals, which are highly resistant to corrosion and strong?

St3: Gold and titanium.
Stage of Evaluation

Teacher gives instruction saying that these are the three test tubes with a nail in each. In test tube A small amount of calcium hydroxide is taken, In test tube B completely boiled water is taken from which dissolved oxygen has been completely driven out by boiling. And the third test tube C small amount of water is poured. They were left like that for 3 or 4 days. These are the results. What do you observe?

St11: Nails of test tube A and B are free from rust.

St12: Nail in test tube C is rusted.

Tr: Do you know the reason behind it?

St14: In first test tube and second test tubes the water and oxygen are not available to the nail.

St23: Where as in the third test tube, being normal water i.e. full of oxygen, it is rusted.

Tr: What are the essential factors for corrosion?

St: Both oxygen and water. (Inferring)

Tr: Find all the methods of preventing corrosion apart from what we have discussed in the class.
Appendix VIII

Worksheet 1

Conductors or Insulators

Carry out the experiment with the above set up using the following materials: a fork, a comb, a pipe, chalk piece, a stone, a nail, copper wire, paper, pencil lead, aluminium strip, eraser.

Using this survey sheet record which materials are conductors and which are insulators.

Record your results by writing down the name of the object and the kind of materials it is made from in the correct column.

<table>
<thead>
<tr>
<th>Conductors</th>
<th>Insulators</th>
</tr>
</thead>
<tbody>
<tr>
<td>The bulb lights up.</td>
<td>The bulb does not light up</td>
</tr>
</tbody>
</table>

Do all the conductors have something in common?
Worksheet 2
Energy survey

You will need this survey sheet for noting down the name of the objects used at home and kind of energy it uses.

Your name: Sowmya
The date: 16/1/2002

Electric Kettle

Make a list of all the things that use energy.

<table>
<thead>
<tr>
<th>Name of object</th>
<th>Kind of energy it uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV</td>
<td>electric</td>
</tr>
<tr>
<td>Refrigerator</td>
<td>electric</td>
</tr>
<tr>
<td>Candle</td>
<td>light and heat</td>
</tr>
<tr>
<td>Solar heater</td>
<td>Solar energy</td>
</tr>
<tr>
<td>Bulb &amp; Table lights</td>
<td>light and heat</td>
</tr>
<tr>
<td>Fan</td>
<td>electric</td>
</tr>
<tr>
<td>Music System</td>
<td>electric</td>
</tr>
</tbody>
</table>

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WORKSHEET 3
Design a circuit

You will need this sheet of paper for drawing a circuit diagram using the following materials.

Use the space below to draw your circuit diagram.

Remember to include all these things in your design:

Two rooms
A switch in each room
A bulb in each room
One battery

Your name:
The date:
Worksheet 4

Types of Leaves

You will need this worksheet for identifying the types of leaves.

Given above are the different types of leaves. Draw the picture of each leaf in the correct column and under each diagram write the name of the leaf.

<table>
<thead>
<tr>
<th>Simple leaf</th>
<th>Compound leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How did you identify the simple and compound leaves from the given? Explain with an example.
Worksheet 5

Phyllotaxy is the arrangement of leaves on the stem.

You will need this worksheet for sticking stems having the following types of arrangement of leaves on them.

- Collect at least one stem each with above phyllotaxy and stick them in their appropriate boxes

<table>
<thead>
<tr>
<th>Alternate Phyllotaxy</th>
<th>Whorl Phyllotaxy</th>
<th>Opposite Phyllotaxy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Here are the names of different types of plants based on their habitat.

<table>
<thead>
<tr>
<th>Xerophytes</th>
<th>Mesophytes</th>
<th>Hydrophytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agave, asparagus, hydrilla, vallisneria, mango</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Euphorbia, trapa, banyan, lotus, peach, yucca</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Using various sources (Reference books, parents, etc.) classify the above plants into the following three categories.

- On what basis you have classified the above plants into three categories?
Worksheet 7

1. Below is given a map showing the depletion of resources. Looking into the map, write the inter relationship between the factors and how they affect the resources.

- Over population leads to increase in demand of
  - Food
  - Shelter
  - Clothing

- Overgrazing leads to
  - Extinction of Flora & fauna
  - Soil erosion

- Hunting of animals

- Intensive agriculture leads to
  - Urbanisation

- Industrialisation in turn to
  - Pollution

- Deforestation reduces
  - Fertility of soil

- Soil erosion

- Over population leads to increase in demand of

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Over population leads to increase in demand of food, shelter and clothing.

To increase the production of food, latest farming techniques, intensive agriculture and more land has to be brought under cultivation. More animals are killed (hunted) for food and their skin, ivory, etc...

Crops are destroyed by overgrazing due to increase in cattle. If lot of crops are destroyed it causes destruction to plants and animals. This in turn leads in extinction of forests and animals.

To increase shelter more farm lands are destroyed and villages have turned into cities. The overgrowing needs of man have lead to industrialisation. Thus industrialisation has lead to deforestation. The industries are also polluting. The deforestation also leads to soil erosion that in turn leads to reduction of fertility of soil, floods, improper rain. This finally leads to famine and drought.
For increase in clothing production more demand is there for cotton, rayon and fibres. All these are because of over population. We should control population & pollution. Isn’t it?

2. List down the different levels of national & international organisation which help in protection of the wild life including national parks & sanctuaries. Some organisations which help in protection of wildlife are:

- SPCA - Society for prevention of cruelty to animals.
- PFA - People for animals.
- Union for Conservation of nature and natural resources.
- UNCED - UN Conference on Environment Development.
- United Nations Environment Programme.

- Ashwini N. S
  VIII A
  D. M. S
Worksheet 8

NATURAL RESOURCES

Can be

RENEWABLE SOURCES

Are

Regenerated through

NATURAL resource

Exisable

Inexisable

Soil, forests, plants, animals, groundwater, metal, oil

NON RENEWABLE SOURCES

Not replaced after their utilization

Sundlight, water, wind, forests, plants, soil, groundwater

Can be recycled

Metal

Cannot be recycled

Coal, oil
# Worksheet 9

<table>
<thead>
<tr>
<th>S.L. No.</th>
<th>Name of the substance</th>
<th>Chemical formula</th>
<th>Colour</th>
<th>Physical state</th>
<th>Melting point</th>
<th>Reactivity</th>
<th>Property</th>
<th>Density (g/cm³)</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Iron</td>
<td>Fe</td>
<td>Silver</td>
<td>Light metal, does not corrode easily</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>7.874</td>
<td>Used in constructing ships, bridges and household materials.</td>
</tr>
<tr>
<td>2</td>
<td>Zinc</td>
<td>Zn</td>
<td>Silver</td>
<td>Hard</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>7.133</td>
</tr>
<tr>
<td>3</td>
<td>Copper</td>
<td>Cu</td>
<td>Goldish brown</td>
<td>Hard</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>8.96</td>
</tr>
<tr>
<td>4</td>
<td>Aluminium</td>
<td>Al</td>
<td>Silver</td>
<td>Light metal, does not corrode easily</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>2.70</td>
<td>Used in making vessels.</td>
</tr>
<tr>
<td>5</td>
<td>Magnesium</td>
<td>Mg</td>
<td>Silvershine, light grey</td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>1.738</td>
</tr>
<tr>
<td>6</td>
<td>Sodium</td>
<td>Na</td>
<td>White</td>
<td>Soft, highly reactive</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>0.971</td>
<td>Used in salt, baking soda, glass blowing soda.</td>
</tr>
<tr>
<td>7</td>
<td>Lead</td>
<td>Pb</td>
<td>Blush white</td>
<td>Heavy, low melting point</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>11.35</td>
<td>Used in Soldering, Medicine (Anti-venom).</td>
</tr>
<tr>
<td>8</td>
<td>Gold</td>
<td>Au</td>
<td>Gold</td>
<td>Soft, easily shaped</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>19.32</td>
<td>Used in jewellery, etc.</td>
</tr>
<tr>
<td>9</td>
<td>Silver</td>
<td>Ag</td>
<td>Silver</td>
<td>Conducts electricity, high melting point</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>2.145</td>
<td>Used in laboratories, etc.</td>
</tr>
<tr>
<td>10</td>
<td>Platinum</td>
<td>Pt</td>
<td>Silvery white</td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>19.32</td>
</tr>
</tbody>
</table>