Everyday Science

Teacher's Guide 4

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Introduction

Children want to know things. Early guidance and varied experiences do much to stimulate the development of their natural intelligence.

A teacher can play a very important role in arousing the interest of students by allowing them to discuss facts and ideas. The teacher can then help students draw conclusions from these facts and ideas as to why and how things happen.

The teacher can stimulate the thinking process of students by asking questions and encouraging them to ask their own.

Experiments allow students to test the facts that have been learnt by them for themselves, thereby clarifying the reasoning behind the activities that are done in class.

This course has been developed to provide information about the world around us, on which students can base their opinion, verify information, come to conclusions, and use the knowledge they have gained in their everyday lives. It will help gain and maintain the curiosity and enthusiasm of students who have just started studying science. Concepts developed at this stage will be of use later in their studies at an advanced level. It will help them develop a better outlook on life.

About the Pupil's Book:

This science series, now completely revised, has been written especially for primary level students. It provides information suitable for each student's level of understanding and has a direct appeal to students who need engaging and easy to read material. Baring in mind the interests, abilities, curiosities, and needs of student, it provides stimulating learning experiences that offer enjoyable educational motivation, thus serving as a foundation base for future learning.

The keyword in science is curiosity. The material in this series is designed to create in a child the same urge that motivates a scientist; the desire to know the answer to a question. A wide range of topics were carefully selected that will interest and inspire students.

Teachers will come to see that this series deals with those broad areas about which, most students frequently express curiosity; that it provides answers to many of the questions they ask, and offers new and exciting information in many fields.

The language is simple and easy to read, catering for the students range of abilities in each grade. Together, the text and illustrations motivate children todiscuss, question, and explore.

The contents have been selected and presented in such a way as to capture and hold the interest of the students. The objective is to simplify complex ideas and present them in an interesting way. Every effort has been made to keep the language simple.

When it is necessary to use a specialized word, it has been used. When it is not self explanatory within the context, it has been defined. Clear and well-labelled illustrations have been included, which help identify and clarify the topics that are dealt with.

Good pictures and diagrams arouse and develop interest. These make lasting impressions. They help make the text clear. They also appeal to the child's imagination, while satisfying his their curiosity and often provoking a favorable reaction.

Simple practicals interesting and stimulating presentation of factual materials— offer every chance of successful learning experiences. Knowledge of problem-solving techniques, that if acquired can be applied in everyday life.

It is intended, through this series, to introduce children to many of the interesting and enjoyable things in science they can learn about and do for themselves. The series also intends to develop in them a quest for knowledge and an understanding of how science is shaping the world in which they live.

The role of the teacher:

It is up to the teacher to devise ways and means of reaching out to the students, so that they have a thorough knowledge of the subject without losing interest.

The teacher must use his/her own discretion in teaching a topic in a way that he/she feels appropriate depending on the intelligence level as well as the academic standard of the class.

To the teacher:

With your assurance and guidance the child can sharpen his/her skills. Encourage the student to share his/her experiences. Try to relate pictures to real things. Do not rush the reading. Allow students time to respond to questions and to discuss pictures or particular passages. It will enhance learning opportunities and will enable the child to interpret and explain things in his/her own way.

Introduction

Method of teaching:

The following method can be employed in order to make the lesson interesting as well as informative.

The basic steps in teaching any science subject are:

(i) locating the problem
(ii) finding a solution through observation and experimentation
(iii) evaluating the results
(iv) making a hypothesis and trying to explain it

Preparation by the teacher:
Be well-prepared before coming to the class.

(i) Read the text.
(ii) Prepare a chart if necessary.
(iii) Practise diagrams which have to be drawn on the blackboard.
(iv) Collect all material relevant to the topic.
(v) Prepare short questions.
(vi) Prepare homework, tests, and assignments.
(vii) Prepare a practical demonstration.

The following may also be arranged from time to time.

(i) Field trips
(ii) Visits to the laboratory
(iii) A show of slides or films
(iv) Projects

This common strategy is easy as well as effective:

(i) Before starting a lesson, make a quick assessment of the students previous knowledge by asking questions pertaining to the topic. Relate them to everyday observations of their surroundings or from things that they have seen or read about in books, magazines, or newspapers.
(ii) Explain the lesson.
(iii) Write difficult words and scientific terms on the blackboard.
(iv) Ask students to repeat them.
(v) Help students read the text.
(vi) Show materials, models, or charts.
(vii) Make diagrams on the blackboard.
(viii) Perform an experiment if necessary.

(ix) Ask students to draw diagrams in their science manuals.
(x) Students should tackle objective questions independently.
(xi) Ask questions from the exercises.
(xii) Answers to questions are to be written for homework.
(xiii) The lesson should be concluded with a review of the ideas and concepts that have been developed or with the work that has been accomplished or discussed.

Conclusion:

The teacher can continue the learning process not only by encouraging and advising the students, but also by critically evaluating their work.

It is not necessary that the lesson begins with a reading of the textbook. The lesson can begin with an interesting incident or a piece of information that gain interest of the students and they will want to know more about the topic.

The topic should then be explained thoroughly and to check whether the students are following or not, short questions should be asked every now and then.

Sketches and diagrams on the blackboard are an important aspect to the teaching of science, but too much time should not be spent on them as the students lose interest. An alternative to drawing on the blackboard is a ready-made chart or one made by the teacher can be displayed in the class. The use of visual material keeps students interested as well as helps them make mental pictures which are learnt quickly and can be recalled instantly. Pupils should be encouraged to draw with the help of the teacher. Diagrams that are not in the text should either be copied from the blackboard or chart, or photocopied and distributed in the class.

Simple experiments can be performed in class. If possible, children may be taken to the laboratory occasionally and shown speciments of plants and animals, chemicals and solutions, and science apparatus, etc.

Practical work arouses interest in science. Class activities can be organized in such a way that the whole class participates either in groups or individually, depending on the type of work to be done or the amount of material available.

It is hoped that the above guidelines will enable teachers to teach science more effctively, and develop in their students an interest in the subject which can be maintained throughout their academic years , and possibly in their lives as a whole.

These guidelines can only supplement and support the professional judgement of the teacher but in no way can they serve as a substitute for it.

Growth and Movement in Living Things

Objectives:

To know:

- living things are different from non-living things
- living things eat, breathe, excrete, move, grow, and are sensitive
- animals move in various ways
- animals have special body parts to help them to move
- muscles make the body move
- the skeleton helps the body move
- the different kinds of skeletons in animals
- plants move
- unicellular plants move by flagella
- the eye-spot helps tiny plants to move towards the light
- plant stems grow towards the light
- plant roots grow downwards
- plant movements can be seen in flowers
- animals grow
- the body of an animal grows till it reaches adult size
- some animals undergo physical changes from their time of birth to their adult stage
- some animals can grow back their damaged or cut parts
- plants keep on growing all their lives
- plants grow from the tips of the roots and stems
- the structure of a bud
- other parts of a plant can grow into new plants

Teaching strategy:

Show the students a collection of living and non-living things.
Ask them to pick out the living and non-living things.

Ask: Why do we call a cockroach a living thing?
Why is a stone a non-living thing?

Explain the difference between living and non-living things in terms of feeding, breathing, excretion, movement, and growth.

Ask: Why we eat food?
Explain the uses of food in the body.

Ask: Why do living things breathe? Which gas do we breathe in? Why is oxygen gas necessary for all living things?
Explain the process of the oxidation of food for releasing energy.

Ask: What happens to the extra water that we drink?
Explain the process of excretion and why it is necessary.

Ask: Can a stone move by itself?
Explain that living things can move, which is characteristic that is not shared with non-living things.

Ask: Do plants move?
Explain that all living things are sensitive. Plants need sunlight to make food, so the stem grows towards it. Roots need to suck water for the plant, so they move downwards.

Ask: How does an animal move?
Explain the movements in animals.

Ask: How do fish swim? How do insects move? How do birds move? How does a rabbit move? How does a snake move?
Show the students charts of various animals and explain to them the various ways in which, these animals move .

Ask: How do you bend your arm or knee?
Encourage them to feel their biceps while bending and flexing their arm. Then show them the locations of joints and explain that muscles are attached to bones.
Explain that muscles can contract and stretch and that they help with moving the body parts.

Ask: Does a cockroach have bones?
Does a caterpillar or earthworm have bones?
Explain the hard outer covering of insects as the exoskeleton.
Explain that muscles are attached to the exoskeleton.

Show the students an earthworm.
Ask: Does it have a skeleton? How does it move?
Explain the movement of an earthworm and other soft-bodied animals.
Explain hydrostatic skeleton in a caterpillar.

Ask: Can we see a plant moving? Can it jump, walk , or crawl?
Explain that plant movements are very slow. Show the students a diagram of a euglena or chlamydomonas.
Explain that it is a unicellular simple plant. Point out the eye-spot and flagellum.
Explain how it moves towards light.

Ask: Where does a sun flower face? What happens to the leaves of a touch-me-not, when you touch them?
Explain sensitivity and movement in plants.

Ask: Where does a chick come from? Does a fish lay eggs or have babies? What is a caterpillar?
Explain that all animals grow big. They may change their shape and form to resemble their parents.

Ask: Which part of your body grows in length?
Explain that the whole body of an animal grows.

Ask: Does a puppy grow till it becomes as big as a horse? Does a goldfish grow as big as a whale?
Explain that animals' babies grow as big as their parents and then stop growing.
Explain the stages of a frog's life.
Explain the stages of the life cycle of a butterfly and a cockroach.

Ask: What happens if we cut our finger or bruise a knee? Will our finger grow back again if it was cut of completely?
Explain regeneration of body parts in some animals.

Ask: What will happen if you cut o the tip of a stem?
Explain that growth in plants takes place through buds.
Take a twig and pull of the leaves. Show the students the position of buds on the stem. Make a diagram of a bud on the board. Explain how a bud grows into a branch or flower.

Ask: Do you know how potato or ginger is grown?
Show the students a potato tuber, a piece of ginger, and an onion bulb. Explain the presence of buds and that they can grow into new plants. Draw pictures of runners and cuttings and explain how new plants can grow from other parts of the plant.

Answers to Exercises in Unit 1

1. a) Living things eat food, breathe, get rid of waste materials, grow, and move.
   b) Animals can move from place to place by using their legs, ns, or wings.
   c) Muscles help the body move.

d) The hard outer cover of an animal's skeleton is called an exoskeleton.
e) The stem of a plant grows towards the light. The roots of plants grow downwards to find soil and water. Their growth is slow. They cannot change their place .
f) The whole body of an animal grows. Animals eat food to grow.
g) The tips of the stems, roots, and leaves of plants grow.
h) A bud is made up of a number of tiny folded-up leaves.
i) Tubers, bulbs, cuttings , and runners all can grow into new plants.

2. a) food b) animals c) oxygen
d) parts e) joint f) eyespot
g) flowers h) tuber i) bulb
j) cuttings

3.a) (i) muscle (ii) bone (iii) joint
b) (i) flagellum
c) (i) tuber (ii) eye

5. a) roots b) roots c) stem

Additional exercise:

Choose the best answer:

a) Large water animals like the whale have _____ to swim.
flippers wings fins [flippers]

b) The hard outer covering of the body of an insect is called_____.
skin shell exoskeleton [exoskeleton]

c) Some tiny organisms swim in water using a_____.
hair flagellum fins [flagellum]
d) The buds of plants have tiny folded up_____.
leaves stem roots [leaves]
e) An onion bulb has thick fleshy leaves which store a lot of _____.
water food salts [food]
f) A starfish can grow back _____ which has been cut off.
an arm a leg a tail [an arm]
g) A gardener can grow new plants from small pieces of stem called_____.
twigs runners cuttings [cuttings]
h) A _____ is a baby frog.
tadpole chick worm [tadpole]
i) A caterpillar is the _____ of a butterfly.
egg larva pupa [larva]
j) We can get some important chemicals and _____ from plants.
medicines wool meat [medicines]

A Balanced Diet

Objectives:

To know :
the importance of food
the components of food and their functions
rules for keeping healthy

Teaching strategy:

Ask: What is food? Why do we eat food? Which types of food give us energy? Why do we eat oily and fatty foods in winter?
Explain that foods called, carbohydrates and fats, give us energy.

Ask: Why does a person become fat?
Explain that fats can be stored in the body. Show pictures of carbohydrates and fats.
Write the names of food substances containing carbohydrates and fats.

Ask: Why do we eat meat?
Explain that proteins help the body to grow and repair itself. Show pictures of protein enriched foods. Write the names of foods containing proteins.
Ask: Why do we eat fruits and vegetables?
Explain that for a healthy body we need vitamins and minerals, which we get from eating fresh fruits and vegetables.

Ask: Do we eat grass?
Explain that our bodies cannot digest a substance in plants. This substance is called fibre.
We eat fibre rich foods to keep our intestines in good health.

Ask: Why do we drink water?
Explain that all substances are carried by the blood in a solution form to all parts of the body. When our body needs water, we feel thirsty. Our body loses water by sweating and urination.

Unit 2 A Balanced Diet

Ask: Why must we eat a balanced diet? Why should we eat fresh fruits and vegetables? Why should you eat meals at regular times? Why shouldn't you remain hungry for very long?
Why should you exercise? Why must you rest? Why must you keep yourself clean?
Discuss the rules of keeping healthy. Explain the meaning of a balanced diet.
Write a list of the rules to be observed to keep the body strong and healthy.

Answers to Exercises in Unit 2

1. a) Food provides the body with energy. New cells are made from food. Food is needed for the growth and repair of damaged parts. We need food to stay healthy.
   b) The important food substances are, Carbohydrates, fats, proteins, vitamins, minerals and fibres.
   c) Eating the right kind of food in the right amount is called a balanced diet
2. a) energy b) Carbohydrates c) Proteins
   d) Vitamins e) Fibre f) Water
   g) balanced diet h) vegetables i) Resting
3. a) meat, to grow b) milk, give energy to the body
   c) potato, give energy to the body d) fruits, keep the body healthy
   e) vegetables, keep the intestines healthy.

Additional Exercise:

Choose the best answer:

a) Most green plants make their own food from materials that are taken from _____.
air and soil air and Sun air and water [air and soil]

b) A potato is an underground _____.
root stem bulb [stem]

c) Seeds may store starch and _____.
oil water sugar [oil]

d) Proteins, fats , and carbohydrates are called _____.
primary food substances secondary food substances
welfare foods [primary food substances]

e) Welfare foods are_____.
water and vitamins water and minerals
vitamins and minerals [vitamins and minerals]

f) _____ are used for the growth of the body.
Proteins Fats Carbohydrates [Proteins]

h) A substance that helps carry substances from one part of the body to another is _____.
air food water [water]

i) A mineral which helps in making red blood cells is _____.
calcium iron sodium [iron]

j) Fibre in our diet helps with _____.
respiration excretion digestion [digestion]

Living Things and their Environments

Objectives:

To know :

- all living things are interrelated
- living things are related to their environment
- the food for all living things comes from plants
- the energy of the Sun passes from plants to animals
- what animals eat
- what a food chain is
- the food cycle
- what a food web is
- what an adaptation is
- animals and plants are adapted in many ways
- adaptations make an animal or plant survive in a particular environment

Teaching strategy:

Ask: Where do we live? Where do animals live?
Where do we get our food? Where do animals get their food? Where do plants get their food?
Explain the interdependence of all living things and how both, animals and humans depend on plants.

Ask: What does a cow eat? What other animals eat plants?
Explain herbivores with examples.

Ask: What does a lion eat? What other animals eat meats?
Explain carnivores with examples.

Ask: Do we eat plants or animals?
Explain omnivores with examples.

Ask: How do plants get their food?
Explain photosynthesis. Explain how plants store energy in the sugars that they make.

Ask: What does a hen eat?
Explain that a hen eats the grains made by plants. Then we eat the chicken and in this way we all are connected in a food chain. Explain some simple food chains by giving examples.

Ask: What happens to organisms when they die?
Explain the presence of decomposers in the soil and the recycling of minerals by plants.

Ask: What does a snake eat? What does a hawk eat?
Explain food web and how one kind of food is eaten by many different animals by giving examples.

Ask: Where does a camel live? How can it live in the desert for so many days without food and water?
Explain the meaning of adaptation, with examples. Explain why animals are adapted.

Ask: Why does a lion have sharp teeth? Why does a porcupine have quills?
Explain that adaptations enable an animal to survive in a particular environment.
Explain the various adaptations of animals, birds , and plants for the type of environment that they live in.

Answers to Exercises in Unit 3

1. a) All the food in the world comes from green plants. They can make food.
   b) The energy of the Sun passes from plants to animals.
   c) Food energy passes from plants to animals in a long chain called a food chain.
   d) The dead plants and animals are broken down by bacteria in the soil.
   e) The special body parts an animal develops to fit into its surroundings is called an adaptation.
   f) Animals that live in very cold places have thick fur on their bodies and they have a thick layer of fat under their skins.

2. a) non-living b) Sun
   c) herbivores d) carnivores
   e) Omnivores f) decomposers
   g) adapted h) environment
   i) needle-like j) thick, fleshy

3. a) sharp claws and teeth b) hard shell
   c) horns d) hoofs

e) sharp claws and beak f) spines
g) lives in herds h) poison sting
i) long sticky tongue j) needle-like mouth
4. a) i) Refer to page 36 of Pupil's Book.
ii) Students may refer to the food web on page 36 of Pupil's Book to develop their own models
b) i) rabbit, grasshopper
ii) fox, snake, hawk, frog
iii) bird

Additional Exercise:

Choose the best answer:

a) All those things that are around an organism and which its way of life is called its _____.
locality area environment [environment]

b) Three-fourths o f the Earth's surface is covered with_____.
air water land [water]

c) One-fifth of the air is a gas called_____.
oxygen nitrogen hydrogen [oxygen]

d) The _____ provides energy for all living things.
Earth Sun Moon [Sun]

e) The gas that plants use for making their food is _____.
oxygen nitrogen carbon dioxide [carbon dioxide]

f) The soil contains many _____ which help plants and animals to grow healthy.
vitamins minerals salts [minerals]

g) _____ have special teeth that help them to chew leaves and grass.
Herbivores Carnivores Omnivores [Herbivores]

Mixtures and Solutions

Objectives:

To know:
what a mixture is
a mixture is not a pure substance
the different kinds of mixtures
what a solution is
the parts of a solution
what soluble and insoluble substances are
what a suspension is
what an emulsion is
what an alloy is
the methods of separating mixtures
what filtration and evaporation is
how to separate the components of black ink

Teaching strategy:

Take a beaker of water and add a teaspoon of salt to it and stir. Show it to the students. Put some sand in the water and stir. Show it to the students.

Ask: What has happened to the salt? What has happened to the sand?
Mix a teaspoon of salt and sand in a cup. Sh ow it to the students.
Mix some iron filings with some sand.

Ask: Can we separate the salt from the sand? Can we separate the iron filings from the sand?
Explain the formation of a solution. Explain that water is called the solvent and salt is the solute.

Ask: Can you separate the salt from the solution?
Explain that salt and sugar are soluble in water and they dissolve more in hot water.

Ask: Is sand soluble in water?
Explain that sand is insoluble in water.

Take some water in a test tube and put some powdered chalk in it and shake it.
Ask: Has the solution become clear?
Explain the formation of a suspension.

Take a test tube of water and add a few drops of cooking oil to it. Shake it.
Ask: Has the solution become clear? Why has it become milky?
Explain the formation of an emulsion. Place the test tube in a rack for a few minutes. Show the students the layer of oil on top of the water.

Show the students some coins. Explain that the coins are made of mixtures of metals called alloys. Explain that some things are made of copper and brass. Copper and brass are alloys and so is steel.

Set up an experiment to demonstrate filtration of a mixture of sand and water.
Set up an experiment to demonstrate the evaporation of water from a solution of salt and water. Demonstrate how iron is attracted to a magnet by seperating some iron filings from sand with a magnet.
Show the students how the components of black ink can be separated by adding drops of water to an ink spot on filter-paper.

Answers to Exercises in Unit 4

1. a) A mixture is not a pure substance, it contains more than one substance.
   b) A solution is a liquid mixture in which the solute completely dissolves in the solvent.
   c) It is a clear solution because the sugar has completely dissolved in water.
   d) In a suspension, the particles of the solute do not dissolve in the solvent, but remain suspended as in chalk and water.
   e) An emulsion is a milky mixture of oil and water. A mixture in which the substances do not mix properly is called an emulsion.
   f) A mixture of metals is called an alloy. For example, brass is an alloy of copper and zinc.
   g) Send can be seperated from water by filtering the mixture.
   h) A mixture of salt a find water can be separated by heating the solution.
   i) A mixture of sand and iron filings can be separated by stirring it with a magnet.

2. a) gases b) carbon dioxide
c) dissolves d) solute
e) solvent f) dissolve
g) insoluble h) alloys
4. a) air b) colas
c) sherbet d) brass

5. a) Evaporating b) Filtering

Additional Exercise:

Choose the best answer:

a) The state of matter depends on the amount of _____ between the particles.
space solids water [space]

b) When a substance is _____ its particles begin to move freely and a change of state occurs.
cooled heated evaporated [heated]

c) The melting point of ice is _____ degrees centigrade.
0 10 20 [0]

d) When water is cooled its particles _____ energy and move closer to each other, and it freezes to form ice.
gain lose do not lose [lose]

e) The temperature at which a liquid boils is called its _____.
freezing point boiling point melting point [boiling point]

f) The change of state from a liquid to a gas is called_____.
evaporation melting freezing [evaporation]

g) The change of state from vapour to a liquid state is called _____.
evaporation melting condensation [condensation]

h) When sugar dissolves in water a _____ is formed.
emulsion solution suspension [solution]

i) A mixture of sand and iron filings can be separated by stirring the mixture with a _____.
spoon wooden ruler magnet [magnet]

Water

Objectives:

To know :
the importance of water
the uses of water
the states of water
what the water cycle is
what water pollution is
what causes water pollution is
the results of having polluted water
the population and water
how to keep water clean

Teaching strategy:

Show the students ice cubes, liquid water, and steam.
Ask: What form of water is ice?
What happens when ice melts?
What happens to water when we boil it?
Explain the three states of water.
Draw the water cycle on the board.
Ask: What happens to rainwater? Explain the formation of rivers and seas.
Ask: What causes water pollution
Explain the effects of polluted water on the animals and the humans
Ask: How do we use water?
Explain the uses of water in our daily lives.

Unit 5 Water

Answers to activities in unit 5

1. a) Animals drink water. Plants need water to live and grow.
   We use water for drinking, washing bathing and cooking.
   b) Solid, liquid, gaseous
   c) The water drops in the cloud freeze and fall as snow.

2. a) pollution b) Rivers c) factories d) germs e) oxygen

3. a) Sun b) condensation c) cloud
   d) rain e) evaporation f) mountain g) sea

Additional activity

Choose the best answer:

a) The sun warms the water of seas and changes it into_____.

snow water vapour rain [water vapour]

b) Solid water is_____.

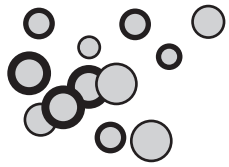
water water vapour ice [ice]

c) The water drops in the cloud freeze and fall as_____.

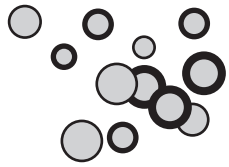
snow rain water vapour [snow]

d) Water in gaseous form is_____.

ice water water vapour [water vapour]



UNIT 6



Air

Objectives:

To know :
the Earth is surrounded by a layer of air
the composition of air
the importance of each component of air
what breathing is
what burning is
the similarities and diffrences between breathing and burning
what ventilation is
the importance of proper ventilation
what air pollution is
the harmful effects of air pollution
how we can reduce air pollution

Teaching strategy:

Tell the students to wave their hands up and down.
Ask: What do you feel?

Teach the students to make a paper fan.
Tell them to wave it in front of their faces.
Ask: What do you feel?
Explain that we are surrounded by air.

Ask: What gas do we breathe in? What gas do we breathe out?
Explain the various components of air and the importance of each.

Ask: Why is oxygen important? How do things burn?
Light a candle and cover it with a glass.
Ask: What happened to the candle? Why?
Explain that oxygen supports burning.

Explain that oxygen is used by living things to breathe and stay alive. Tell a student to blow on a cold window pane.
Ask: What do you see?
Explain that the tiny droplets of water are made from the water vapour in your breath.

Light a candle and cover it with a gas jar.
Ask: Why did the candle go out? What do you see inside the jar?
Explain that burning things need oxygen. The water droplets inside the jar show that burning produces water vapour.

Ask: Why do we keep doors and windows open in summer? Why do we open the windows when too many people are in a room?
Explain that warm air rises because it is light, while cold air is heavy. When the air inside a room becomes warm, it begins to rise. There must be ventilators near the ceiling, which will allow the warm air to go out. Cool air will come in to take its place from the doors and windows. This process is called ventilation. That is why we have exhaust fans in kitchens, bathrooms, offices, and halls.

Ask: Why do people go to hill stations and the countryside? Why must people who live in a city have a bath everyday? Why does furniture in our houses and schools become dusty?
Discuss air pollution and where pollutants come from. Discuss the harmful effects of air pollution. Explain the formation of acid rain and its harmful effects.

Ask: How can we reduce air pollution?
Is city air more polluted than the countryside air? Why?
Explain that growing population and industry are causing more pollution.
Help students make posters and write slogans to encourage people to reduce air pollution.

Answers to Exercises in Unit 6

1. a) Air is a mixture of gases.
   b) The gases found in air are: nitrogen, oxygen, carbon dioxide, water vapour, dust, and other gases.
   c) Plants use carbon dioxide to make their food.
   d) Oxygen helps living things breathe. It also helps things burn.
   e) They need oxygen to produce energy.
   f) The coming in of fresh air and the escaping of stale warm air is called ventilation.
   g) Air pollution can cause diseases like cancer.
   h) Poisonous gases and chemicals in air mix with rainwater to produce acid rain.

Unit 6 Air

2. a) Gases b) Nitrates c) water vapour d)oxygen
e) less f) more g)oxygen

Additional Exercise:

Choose the best answer:

a) The gas which is used for making chemical compounds called nitrates is _____.

oxygen nitrogen hydrogen [nitrogen]

b) The gas used by plants for making their food is _____.

oxygen nitrogen carbon dioxide [carbon dioxide]

c) Oxygen in the air helps living things to _____.

breathe eat excrete [breathe]

d) When a candle burns in air it produces carbon dioxide and_____.

water vapour oil coal [water vapour]

e) Cool air has _____ pressure .

low high no [high]

f) Burning coal and oil produces harmful gases such as_____.

ammonia sulphur dioxide oxygen [sulphur dioxide]

g) Water vapour in the air rises and changes back into tiny droplets of water which form _____.

clouds rain snow [clouds]

h) Poisonous chemicals and germs in fresh water cause _____ pollution.

air water land [water]

i) Fish and other river life cannot live without_____.

oxygen carbon dioxide sulphur dioxide [oxygen]

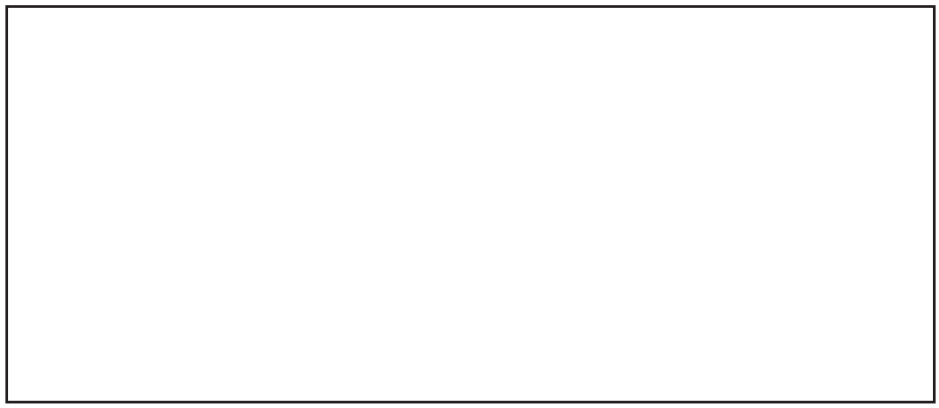
j) Poisonous gases and chemicals mix with rain water to produce_____.

sewage smoke acid rain [acid rain]

Assessment

Units 1-6

1. Answer the following questions:
   a) Why do the leaves of a plant move to face the light?
   b) What is a food web? Draw a food web below:



c) What kind of food should you eat to stay healthy?
d) Name the three states of water.

2. Fill in the blanks:
a) The fuel for the human body is _____. (food)
b) Fish have _____ to swim in the water. (fins)
c) Most _____ plants make their own food. (green)
d) Proteins, fats, and carbohydrates are called _____. (primary foods)
e) _____ of the Earth's surface is covered with water . (Three-fourths)
f) The change of water vapour (or gas) into liquid is called _____.
(condensation)
g) _____ helps living things to breathe and stay alive. (Oxygen)
h) The three states of water are _____, _____
and _____. (ice, water, water vapour)

3. Fill in the table with Yes or No:

	Breathing	Burning
a) Needs oxygen		
b) Produces heat		
c) Produces water vapour		
d) Produces light		
e) Produces carbon dioxide		

4. Name two methods of separating the parts of a mixture:

a) _____ b) _____

Assessment

Answers

1. a)The leaves turn to face the light because the plants need light to make their food.
   b) Consumers often eat more than one kind of food, so several food chains are connected to make a food web.
   c) To remain healthy we should eat the right kind of food from all the food groups in the right amounts. (some students may list various foods)
   d) Water can be found in three states solids, liquids, and gas.

3.

	Breathing	Burning
a)	Yes	Yes
b)	Yes	Yes
c)	Yes	Yes
d)	No	Yes
e)	Yes	Yes

4. a) Evaporating b) Filtering

Magnets and Magnetism

Objectives:

To know :
what a magnet is
what a natural magnet is
what artificial magnets are made of
the shapes of magnets
what magnetic force is
that magnetic force can act through non-magnetic materials
the force of a magnet is strongest at the poles
opposite poles attract each other
like poles repel each other
what a magnetic eld is
how a magnet is made
how a magnet can be demagnetized
the function and construction of a compass
the Earth seems to have a huge magnet inside it
the uses of magnets

Teaching strategy:

Show the students different kinds of magnets.
Ask: Do you know what magnets are made of ?
Explain natural and artificial magnets.
Write the word Alnico on the board. Explain that Alnico is an abbreviation of aluminium, nickel, and cobalt, the three metals which alnico magnets are made of.
Explain that alnico magnets are the most powerful magnets.

Unit 7 Magnets and Magnetism

Pick up steel pins and paper clips with a magnet.
Ask: Why does a magnet pick up the steel pins? Can it pick up a toothpick?
Explain that magnets have a magnetic force. A magnet can attract some metals such as iron, steel, nickel, and cobalt.

Ask: Can a magnet attract pins through a piece of paper?
Perform the experiment mentioned in the lesson and explain that magnetic force can act through non-magnetic materials.

Hold up a bar magnet. Stick pins along it.
Ask: Which part of the magnet holds the most pins?
Perform the experiment in the lesson. Explain that the poles are the strongest part of a magnet.

Hang a bar magnet by a string. Show the students that the magnet will stop in the North South position of the Earth.
Perform the experiment in the lesson to show that the opposite poles attract and similar poles repel each other.

Place a bar magnet on a sheet of paper. Sprinkle iron filings on the paper.
Explain the magnetic eld of a magnet, and the magnetic lines of force.
Also explain that the force of a magnet is strongest at the poles.

Demonstrate the making of a magnet by stroking. Explain that magnets made of hard steel will remain magnets for a long time.
Magnets made of soft iron lose their magnetism after sometime. Make an electromagnet with a battery and explain that an electromagnet will remain a magnet as long as the current flows through it.
Ask: Can a magnet lose its magnetism?
Explain the methods by which a magnet can be demagnetized.
Show the students some keepers placed between the poles of a horseshoe and U- shaped magnets. Explain why they are used.

Show the students a compass.
Ask: What is a compass used for?
Explain that a compass helps to find directions. It always points North due to the magnetic eld.

Ask: What can a magnet be used for?
Explain the uses of magnets.

Answers to Exercises in Unit 7

1. a) A magnet is a material that can attract metals such as iron, steel, cobalt, and nickel.
   b) A natural magnet looks like a dark coloured rock. It is called a lodestone or magnetite.
   c) Artificial magnets are made of hard steel
   d) Electromagnets consist of a coil of wire wound round a rod of iron.
   e) The force which holds objects to a magnet
   f) North pole and South pole

2.a) U-Shaped b) horse shoes
   c) rectangular d) Cylindrical
   e) electromagnet

3. a) Aluminium b) Nickel c) Cobalt

4. a) false b) true c) false
   d) false e) false f) true

Unit 7 Magnets and magnetism

Additional Exercise:

Choose the best answer:

a) An object that can attract iron or steel is called a_____.
metal magnet machine [magnet]

b) Articial magnets are made of hard_____.
wood stone steel [steel]

c) When an electric current is passed though the coil of an electro magnet the iron rod inside the coil becomes a_____.
current magnet wire [magnet]

d) The force, which holds objects to a magnet, is called _____.
electrical force pressure magnetic force [magnetic force]

e) Wood , rubber , and paper are _____ materials.
magnetic non-magnetic neutral [non-magnetic]

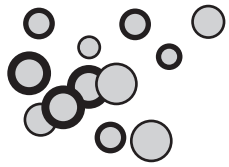
f) The force of a magnet is strongest _____.
at the poles in the centre around the magnet [at the poles]

g) _____ poles of a magnet attract each other.
Similar Opposite No [Opposite]

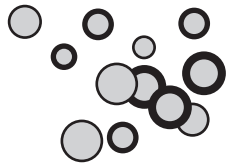
h) Keepers stop a magnet from losing its _____.
magnetism atoms molecules [magnetism]

i) Magnets that are used in electric bells are called _____.
bell magnets sound magnets electromagnets [electromagnets]

j) A small instrument which helps us to find directions is called_____.
a watch a thermometer a compass [compass]



UNIT 8



Static electricity

Objectives:

To know :
the structure of an atom
what are ions
what static electricity is
what is electro-static induction
how we can test the presence of a charge
what lightning is
what an electric circuit is
the importance of a switch
what are conductors and insulators

Teaching strategy:

Ask: What is matter made up of?
Draw the structure of an atom. Explain the structure of an atom. Draw two atoms and explain how ions are formed. The atom that gives away an electron becomes a positively charged ion, and the atom that receives an electron becomes a negatively charged ion.

Tell a student to brush his/her hair vigorously with a plastic comb and bring it near bits of paper.
Ask: Why are the papers sticking to the comb?
Explain the production of static electricity and the induction of charges by rubbing.

Rub a rubber balloon with a woollen cloth and hold it against the wall.
Ask: Why does the balloon stick to the wall?
Explain that rubbing produces static electricity.

Take the students to the laboratory and show them a gold leaf electroscope.
Demonstrate why the leaves repel each other when a charged body is brought close to the metal ball of the electroscope.

Ask: Where do you see lightning? What is lightning?
Explain how rubbing of clouds produces lightning.

Ask: Why does lightning strike high buildings and trees?
Explain that charged clouds induce opposite charges on the buildings and trees. When the charge becomes high, the electrons jump from the clouds to the buildings and trees, and lightning strikes.
Explain the use of lightning conductors to prevent damage by lightning.
Make an electric circuit with a cell, a bulb , and wires.

Ask: Why does the bulb light up?
Explain the pathway of charged particles in an electric circuit.

Ask: Will the bulb still glow if the cell is removed, or if the wire is detached?
Explain open and closed circuits and the need for the source of electricity to push the charge.

Ask: If a wooden strip is added to the circuit, will the bulb still glow? Why?
Explain that materials that do not allow electrons to ow through them are called insulators. Metals are materials that allow electrons to ow through. They are called conductors.

Do the activities.
Summarize the lesson.

Answers to Exercises in Unit 8

1. a) Everything on the Earth is made up of atoms.
   b) Protons, neutrons, and electrons.
   c) The two kinds of electric charges are positive charge and negative charge.
   d) It is produced by rubbing two materials.

Unit 8 Static electricity

2. a) protons b) positive
   c) negative d) loses
   e) gains f) static
   g) repel h) attract
   i) lightning j) Rubbing

3. a) repel b) attract
   c) attract d) repel

Additional Exercise:

Choose the best answer:

a) Protons have a _____ charge.
   negative positive neutral [positive]

b) Electrons have a _____ charge .
   negative positive neutral [negative]

c) Electricity that is not moving is called_____.
   current electricity static electricity magnetic electricity
   [static electricity]

d) A _____ object can be charged by a process called electrostatic induction.
   positive negative neutral [neutral]

e) A n instrument called a _____ can be used to test a body for the presence of a charge.
   gold leaf electroscope microscope telescope
   [gold leaf electroscope]

f) The jumping of electrons between clouds, or from the clouds to the Earth is called _____.

lighting lightning electrifying [lightning]

g) High buildings can be protected from damage due to lightning by fixing _____ on them.

lightning conductors heat conductors sound conductors [lightning conductors]

h) A cell of a battery is a source of energy, which pushes the _____ in a circuit.

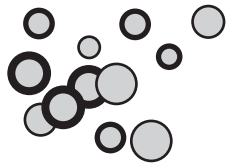
charge heat light [charge]

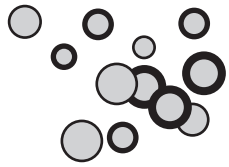
i) An electric current can be turned on and off by a _____.

fuse switch bulb [switch]

j) The pathway by which an electric current moves along the wire is called _____.

a current a wave a circuit [a circuit]





Heat

Objectives:

To know:
all things are made up of molecules which are groups of atoms
the movement of molecules produces heat
our senses are not reliable
in order to find out the temperature of an object we use a thermometer
the construction of a thermometer
the Celsius Scale
the Fahrenheit Scale
the freezing point and boiling point of water on both scales
the normal body temperature of human beings

Teaching strategy:

Tell the students to rub their hands together.
Ask: Do your hands feel warm?
Explain that all things are made up of molecules. When the molecules move fast they produce heat. Rubbing hands makes the molecules move fast, so they produce heat.
Perform the hot and cold water experiment mentioned in the Pupil's Book.

Ask: Why did the hands feel different in the lukewarm water?
Explain that our senses are not reliable. They are only relative.

Ask: How does a doctor know that you are sick? What does the thermometer tell him?
Explain that we cannot find out the temperature of a body just by touching it.
Show the students a clinical thermometer and a laboratory thermometer. Show them the scales marked on them. Dip them in warm and cold water and show them the movement of the liquid inside, on the scale.
Take the temperature of a few students with a clinical thermometer. Show them the

normal body temperature on the scale.
Show the students how to make a bottle thermometer. Explain how it works.

Answers to Exercises in Unit 9

1. a) When molecules move fast, they produce heat.
   b) A thermometer is an instrument used to find out exactly how hot something is.
   c) The markings on a thermometer are called the temperature scale.
   d) My normal body temperature is 98.6°F or 37 °C.
   e) The boiling point of water is 100°C.
2. a) atoms b) heat
   c) thermometer d) rises
   e) falls f) 0°C
   g) 212 °F h) higher
   i) heat j) mercury

Additional Exercise:

Choose the best answer:

a) When we rub our hands they_____.
   become hot become cold stay the same [become hot]

b) Groups of atoms are called_____.
   heat molecules mercury [molecules]

c) Rubbing makes molecules move_____.
   faster slower at the same speed [faster]

d) The movement of molecules produces _____.
   cold water heat ice [heat]

e) We use an instrument called a _____ to find out the temperature of something.
   thermometer tube bulb [thermometer]

f) The markings on the glass tube of a thermometer is called _____.
   temperature scale mercury freezing point [temperature scale]

g) The bulb of a thermometer contains_____.
cold water warm water mercury [mercury]

h) The level of the mercury on the scale shows the temperature in _____.
degrees alphabets pictures [degrees]

i) The normal human body temperature is _____ F.
98.6 ° 95.4 ° 100 ° [98.6 °]

j) The boiling point of water is _____ C.
110 ° 95° 100° [100°]

Light

Objectives:

To know :
we can see things because of light
light is a form of energy
light travels very fast
light can travel through spaces
light travels in straight lines
what refection of light is
the characteristics of an image formed in a mirror
what luminous and non-luminous bodies are

Teaching strategy:

Ask: Can we see things in the dark? Can we see things in light?
What would the world be without light?
Explain the importance of light for plants and animals.

Ask: What work can light do? How does a solar calculator work?
Explain that light is a form of energy which helps us work.

Ask: Do you see lightning first or do you hear the clap of thunder during a thunderstorm?
Explain that the speed of light is faster than the speed of sound.

Ask: What are stars? Why do stars give out light? How do we see stars when they are so far away?
Explain that light can travel through spaces.

Make a hollow tube of newspaper. Light a candle and place it on the desk. Ask a student to look at the flame through the tube. Bend the tube. Ask the student if he

can see the flame.
Explain that light cannot go round corners. It travels in straight lines.

Take a piece of cardboard. Make a pinhole in its centre. Shine a torch through the hole.
Ask: What can you see?
Make a slit in the cardboard and shine the torch through.
Ask: What can you see now?
Explain the difference between a ray and a beam.
Show the students a toy laser light. Explain that a laser beam is a narrow beam of light of one colour. It is used by doctors to seal cuts. Shine a torch on a mirror.
Explain there flection of light.

Ask: How does light help you to see things?
Explain that objects reflect light so we can see them.

Ask: How do our rooms get light in the daytime?
Explain the phenomenon of scattering of light with diagrams on the board.
Hold a mirror in front of the class. Ask a student to stand in front of it.

Ask: What can you see?
Tell him to raise his right hand.

Write the letter L on a piece of paper and hold it in front of the mirror.
Ask: How does the letter L appear in the mirror?
Explain the characteristics of the image formed in a plane mirror.

Ask: From where do we get light?
Show the students pictures of the Sun, a candle, a bulb, and a re. Explain that luminous bodies give out light of their own.

Ask: What is moonlight? Does the Moon have its own light? Does a chair or table give out light?
Explain that non-luminous bodies only reflect the light that falls on them.

Answers to Exercises in Unit 10

1. a) We can see objects when they reflect the light that falls on them.
   b) There would be no colours, plants, or animals on Earth.
   c) The speed of light is 300,000 kilometres in one second.
   d) We know that light can travel through space because we are able to see the light from the Sun and the stars.
   e) i) The straight path of light is called a ray.
      i i) Many rays make a beam of light.

f) A very narrow beam of light of one colour is called a laser beam.
g) The bouncing back of light from a smooth surface is called reflection of light.
h) The reflection of an object in a mirror is called an image.

2. a) sound b) laser c) scattered d) image

Additional Exercise:

Choose the best answer:

a) The Sun gives heat and _____ to the Earth.
sound electricity light [light]

b) The speed of light is__ _____.
200 ,000 km/s 300 ,000 km/s 400 ,000 km/s [300, 000 km/s]

c) The speed of light _____ the speed of sound.
is faster than is slower than is the same as [is faster than]

d) Light can only travel in _____.
straight lines curves lines circular lines [straight lines]

e) A beam of light is made up of many_____.
lines dots rays [rays]

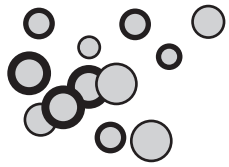
f) A very narrow beam of light of _____ colour (s) is called a laser beam.
many few one [one]

g) The bouncing back of light from a smooth surface is called _____.
dispersion refraction reflection [reflection]

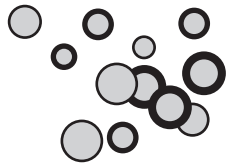
h) The reflection of an object is called an _____.
shadow image photograph [image]

i) When rays of light fall on a _____ surface they are scattered in all directions.
smooth shiny rough [rough]

j) Objects that give off their own light are called_____.
luminous non luminous opaque [luminous]



UNIT 11



Movement of the Earth

Objectives:

To know :
the Earth spins on its axis
the Earth spins on its axis once in 24 hours
the Sun seems to move from east to west due to the spinning of the Earth from west to east
how day and night are caused
how the change of seasons occurs
what constellations are
the Big Bear is a constellation that is used to locate the North Star in the northern hemisphere

Teaching strategy:

Show the students a globe. Spin it on its axis. Explain the rotation of the Earth.
Ask: From where does the Sunrise? W here does the Sunset?
Explain that the Sun does not move. The spinning of the Earth on its axis makes the Sun appear to move from east to west. Shine a torch on the globe from one side.
Show that the part that is facing the Sun has daytime.
Rotate the globe on its axis. Explain that as the Earth spins, the part that faces the Sun has day and the part that is away from the Sun has night.

Ask: What are the seasons? Why do seasons change? Why is it hot in summer? Why is it cold in winter? Is it hot or cold in spring? Is it hot or cold in autumn?

Show the globe to the class. It is tilted on its axis. Shine a torch on the globe.
Ask: Which part gets more heat and light from the Sun?
Explain that the Earth takes 365 days to go round the Sun.
The part that is tilted towards the Sun has summer. The part tilted away from the Sun has winter.

Unit 11 Movement of the Earth

Explain the change of seasons with the help of a chart. When the Earth gets equal amounts of light, it is either spring or autumn.

Ask: What is a compass? How did people find directions in olden days? How did sailors find their way at the sea? How did travellers in the desert find their way? Explain that there are formations of groups of stars in the sky which always stay together. They are called constellations. They have fixed positions in the sky. Show the students charts of some constellations.
Draw the Big Bear on the board. Explain that the pointer stars point to the North Star or Pole Star.
Tell them to find the Big Bear and Pole Star at night.

Answers to Exercises in Unit 11

1. a) It goes around its axis through the North and South Poles.
   b) This is because the Earth is spinning on its axis.
   c) The part of the Earth which faces the Sun has daytime.
   d) The part of the Earth which does not face the Sun.
   e) The part of Earth which is tilted towards the Sun gets more light so it is warmer.
   f) The part of Earth which is tilted away from the Sun gets less light so it is colder.
   g) It gets equal amounts of light.

2. a) axis b) axis c) axis d) 365 e) 24

3. a) spring b) summer c) autumn d) winter

Additional Exercise:

Choose the best answer:

a) The shape of the Earth is_____.
round flat geoid [geoid]

b) The blanket of air around the Earth is called_____.
atmosphere biosphere hemisphere [atmosphere]

c) The imaginary line that passes through the North and South poles of the Earth is called_____.
axis equator chord [axis]

d) The movement of the Earth on its axis is called_____.
evolution revolution rotation [rotation]

e) The number of days that the Earth takes to make one revolution is _____.
165 365 265 [365]

f) The change of seasons on the Earth is caused by the _____ of the Earth around the Sun.
rotation revolution evolution [revolution]

g) Groups of stars that seem to make shapes in the sky are called _____.
stations constellations rotation [constellations]

h) When the Moon is on the side of the Earth nearest to the Sun we can see _____.
a new moon an old moon a full moon [a new moon]

i) The Moon is _____ km away from the Earth.
184,000 284 ,000 384 ,000 [384, 000]

j) The rotation of the Earth takes _____.
12 hours 24 hours 36 hours [24 hours]

Assessment

Units 7-11

1. Answer the following questions:

a) What are artificial magnets made of ?

b) What is static electricity?

c) How is heat produced?

d) Name some simple machines that help to make our work easier

e) What are luminous bodies? Draw two luminous bodies .

f) How long does it take the Earth to spin on its axis? What is this movement called?

2. Fill in the blanks:

a) An object that can attract iron is called a_____ . (magnet)

b) An _____ is a pathway along which charge particles can flow.
(electric circuit)

c) Groups of atoms are called_____ . (molecules)

d) We use a _____ to find out exactly how hot something is.
(thermometer)

e) Light is a form of _____. (energy)

f) The moon does not give light. It is a _____ body.
(non-luminous)

g) The movement of the Earth around the Sun is called a _____.
(revolution)

3. Write true or false:
   a) Magnets can attract papers. (false)
   b) The Earth spins on its axis once in two days. (false)
   c) In a Celsius scale, the freezing point of water is 0°C. (true)
   d) Force cannot change the speed of an object. (false)
4. Which of the following are luminous bodies? Tick the correct answer.
   Sun
   fire
   desk
   candle

Answers

1. a) Artificial magnets are made of hard steel.
   b) Electricity which is not moving is called static electricity.
   c) When molecules move fast they produce heat.
   d) Some examples of simple machines are scissors, knife, wheel-barrow, bottle opener, and nut-cracker.
   e) Some objects give off light; they are called luminous bodies e.g. Sun, electric lamps, bulbs, res, etc.
   f) It takes the Earth 24 hours to spin on its axis. This movement of the Earth is called rotation.
4. Sun, fire and candle.

Test answers

1. Plants need light to make their food. The food of a plant is made in the leaves. The stem of a plant grows towards the light and the leaves turn to face the light.
2. (a) fins
   (b) wings
   (c) wings
   (d) legs
   (e) flippers
3. To stay healthy, you must eat healthy meals, exercise regularly and wash up to keep yourself clean.
4. Scientists can help increase the production of food by finding ways to improve the quality of plants and animals.
6. They rest during the day and look for food at night. They can also store water in their bodies for a long time.
7. Add water to the mixture. The salt will dissolve and the sand will not. Once the salt has dissolved separate the sand from the water by filtering. Next you need to separate the sand from the water by heating the water until it evaporates.
8. a) alloy
   b) Brass
9. Water vapour rises in the air. It cools and changes back into tiny droplets of water which forms clouds.
11. a) low
    b)high
    c)ventilation
12. a) Y Y b)Y Y c) N Y d) N Y e) Y Y
13. Magnets are used in many electrical machines and motors. They are used in loud speakers and cassette recorders. Electromagnets are used to lift scrap iron and steel from scrap yards. They also are used in electric bells an in the doors refrigerator and freezers.

Test answer

14. a) False
    b) True
    c) False
    d) True
15. When a body gains electrons it is negatively charged.
16. Electricity that isn’t moving is called static electricity.
17. The freezing point of water is 325F.
20. A) beam
    B) food
    C) lines
    D) reflection
    E) luminous
    F) Sun
21. Constellations are the shapes that groups of stars make.

Sample lesson plan

Unit 10 Heat

Topic	Time	knowledge		Plan activity time	Resource material
Heat and its measurement		objectives	skills		
Heat and temperature Temperature scales	40 min	To define heat and temperature To know the temperature scales	To know the difference between heat and temperature To describe celsius and fahrenheite scales of temperature	Previous knowledge:5 min. Discussion: 20 min. Activity: 10 min. Q/Ans: 5 min.	Hot and cold water, ice, thermometers, charts of temperature scales
Measurement of temperature and safety measures in using thermometers	40 min	To measure and record body temperature To measure temperature of hot and cold things using a labaratory thermometer	To know the human body temperature To know the temperature of ice and bolling water To know how to handle thermometer	Previous knowledge:5 min. Discussion: 20 min. Activity: 10 min. Q/Ans: 5 min.	Chinical and laboratory thermometers Cold and hot water, ice, chart of safety rales when using thermometer
Assessment tasks		Homework		Teacher's evaluation of the lesson	
Q.1 and 2		Take your temperature Make a water thermometer		The student can distinguish between heat and temperature. They know the temperature scales, and can handle, thermometers.	

Notes