NEP Compliant inside

NEW SCIENCE AHEAD

6

New ScienceAhead

has been developed in accordance with

- the CBSE's educational initiatives for effective teaching and learning
- the guidelines laid down in the National Curriculum Framework
- tried and tested methodology in the teaching of science
- the needs of the teacher and the student

Students' Book

- complete syllabus coverage
- experiments and activities
- carefully graded text
- appealing images and layout

Teachers' Resource Pack

- For each lesson:
  - **lesson plan**
  - **question bank** with answers
  - **worksheet** with answers
  - **answers for exercises** in the students' book
  - **activities for assessment**
- **Tests*** and **examination papers** with answers

** for classes 3–8*

In the Students' Book

Concept Development

Learning Objectives

- encourage students to evaluate their progress and take responsibility for their learning

Lesson Text

- carefully graded
- enables understanding
- visually appealing

In-lesson Activities

- help students develop a scientific temperament

NEW!

Case Studies

- in-depth coverage of important topics

Assess Yourself

- summarises the lesson
- enables easy revision

Quick Access

Bloom's Taxonomy*

a write-up summarising Bloom's taxonomy of educational objectives, with a handy table of question cues and learning outcomes

** in the preliminary pages*

Reference

Science Tidbit

- nuggets of interesting information

NEW!

Be Inspired! Scientists and Values

- information on people who have expanded the world of science or made the world a better place

OUR HERITAGE

NEW!

- an exploration of India's rich heritage in science

Internet Links

- enable students to use IT to explore topics in greater depth

NEW!

Glossary

- definitions of technical terms

Smart Book for Teachers

NEW!

informative, interactive and exciting, with:

- animations
- picture galleries
- videos
- interactive tasks
- presentations
- teachers' resources

including

- extra questions
- worksheets
- concept maps
- question-paper generator

Students' App

NEW!

questions that help students review lessons

for classes 3–8

Web Support

a portal dedicated to the series with free access for teachers

In the Students' Book

Skill Development

Looking Back

- within-lesson questions
- immediate feedback for the teacher

Exercises

- multiple choice questions (MCQs)
- true or false
- fill in the blanks
- diagram-based questions
- short- and long-answer questions

…and more

Activities for Assessment

- science experiments
- written assignments
- simple projects
- presentations (IT)
- model making
- field trips

…and more

Higher-order Thinking Skills

- questions to improve students' analytical and problem-solving skills

Life Skills

- decision making
- problem solving
- critical thinking
- self management
- effective communication

…and more

NEW!

Fun Activities

- activities that make learning science joyful

Testing

Tests

NEW!

- short tests to assess students' understanding of concepts

for classes 3–8

National Science Olympiad Practice Papers

- for competitive examination practice

Examination Papers

- for examination practice

NCERT SYLLABUS

Questions	Key Concepts	Resources	Activities/Processes
1. Food			**(Periods–20)**
Sources of food What are the various sources of our food? What do other animals eat?	Plant parts and animal products as sources of food; herbivores, carnivores, omnivores.	Examples of food from different parts of plants and of food from animal sources.	Germination of seeds such as mung, chick pea etc.; preparing a chart on food habits of animals and food culture of different regions of India.
Components of food What is our food made up of? Why do we eat a variety of food?	Carbohydrates, fats, proteins, vitamins, minerals, fibres, their sources and significance for human health; balanced diet; diseases and disabilities due to food deficiencies.	Mid Day Meal; Charts, pictures/films of children suffering from food deficiencies and disabilities.	Studying the variety of food in different regions in India; preparing a menu of balanced diet in the context of the diversity of foods eaten in different parts of the country. Classifying foods according to food components; test for starch, sugars, proteins and fats.
Cleaning food How do we separate the grains after harvesting the wheat /rice crop?	Threshing, winnowing, hand picking, sedimentation, filtration.	Talking to some elders about practices after harvesting the crop; kit materials.	Discussion on threshing, winnowing, handpicking; experiments on sedimentation, filtration. Separating mixture of salt and sand.
2. Materials *Materials of daily use* What are our clothes made of? How did people manage when there were no clothes?	Different types of cloth materials – cotton, wool, silk and synthetics. Development of clothing materials.	Sharing of prior knowledge with parents and community. Archaeological and historical accounts.	Whole class discussion. Simple activities to distinguish among different types of cloth.
Are some of our clothes made of materials obtained from plants? In what kinds of places do these plants grow? Which parts of the plants are used for making clothes?	Plant fibre, especially cotton and jute; production of cotton, jute and other locally available plant fibres; types of soil required for the growth of different fibrous plants.	Sharing of prior knowledge with parents and community.	Whole class discussion. Field survey/ collecting information on locally available plant fibres (coconut, silk cotton, etc.)
Different kinds of materials What kinds of things do we see around us?	Grouping things on the basis of common properties.	Materials, kit items.	Collecting and grouping things on the basis of gross properties e.g. roughness, lustre, transparency, solubility, sinking/floating using prior knowledge, through experiments.
How things change/ react with one another In what ways do things change on being heated? Do they change back on being cooled? Why does a burning candle get shorter?	Some changes can be reversed and others cannot be reversed.	Prior knowledge, kit items	Experiments involving heating of air, wax, paper, metal, water to highlight effects like burning, expansion/compression, change of state. Discussion on other changes which cannot be reversed – growing up, opening of a bud, ripening of fruit, curdling of milk.

Questions	Key Concepts	Resources	Activities/Processes
How much salt can be dissolved in a cup of water?	Solubility, saturated solutions. Amount of substance dissolving varies with temperature. At the same temperature amounts of different substances that dissolve varies.	Salt, sugar and other common substances, kit items.	Experiments for testing the solubility of commonly available substances. Experiments on the effect of heating and cooling on solubility. Comparison of solubilities of different substances using nonstandard units (eg. spoon, paper cone).
3. The World of the Living			**(Periods–36)**
Things around us Are all things around us living? What is the difference between living and non-living? Are all living things similar? Do all living things move? Where do plants and animals live? Can we grow plants in the dark?	Living / non – living characteristics; habitat; biotic, abiotic (light, temperature, water, air, soil, fire)	Recollection of diversity of living organisms and the habitat where they live.	Listing of things around us, listing of characteristics after making observations say on size, colour, shape etc., categorisation; observations on habitat; observing germination of seeds, also observing under dark conditions; growth and development of domestic animals, hatching of birds' eggs etc., developing drawing skills.
The habitat of the living How does habitat affect plants and animals? How do fish live in water?	Habitat varies – aquatic, deserts, mountains etc. – plants and animals show adaptation; other plant part modifications like tendrils, thorns etc. Animals in deserts and water.	Potted plants or seeds, pots, etc; thermometer, any water plants, any xerophytic plants, Information on desert and aquatic plants and animals.	Listing the diverse set of living organisms around us; prepare herbarium specimens of different leaves, plants; studying modifications in plants and animals; observing how different environmental factors (water availability, temperature) affect living organisms;
Plants – form and function What is the structure and function of various parts of the plants - stem, leaf and roots? How do different flowers differ from one another? How does one study flowers?	Morphological structure and function of root, stem and leaves. Structure of the flower, differences.	Plants, flowers, blade, hand lens.	Studying plant parts – types of stems, roots, leaves, seeds; experiment to show conduction by stem, activity to show anchorage by roots, absorption by roots. Study of any flower, counting number of parts, names of parts, cutting sections of ovary to observe ovules.
Animals – form and function What is inside our bodies? How do animals move? Do all animals have bones in their bodies? How do fishes move? And birds fly? What about snakes, snails, earthworms?	Structure and functions of the animal body; Human skeletal system, some other animals e.g. fish, bird, cockroach, snail.	Observation of nature; model of skeleton, X-rays of arms or legs, chest, hips, jaws, vertebral column (could be given in the textbook).	Activities to study X-rays, find out the direction in which joints bend, feel the ribs, backbone etc. Observation/ discussion on movement and skeletal system in other animals.

Questions	Key Concepts	Resources	Activities/Processes
4. Moving Things, People and Ideas			**(Periods–12)**
Moving			
How did people travel from one place to another in earlier times? How did they know how far they had travelled? How do we know that something is moving? How do we know how far it has moved?	Need to measure distance (length). Measurement of length. Motion as change in position with time.	Everyday experience; equipment (scale etc.) to measure length. Stories for developing contexts for measuring distances.	Measuring lengths and distances. Observation of different types of moving objects on land, in air, water and space. Identification and discrimination of various types of motion. Demonstrating objects having more than one type of movement (screw motion, bicycle wheel, fan, top etc.). Observing the periodic motion in hands of a clock / watch, sun, moon, earth.
5. How Things Work			**(Periods–28)**
Electric current and circuits			
How does a torch work?	Electric current: Electric circuit (current flows only when a cell and other components are connected in an unbroken loop)	Torch: cell, bulb or led, wires, key.	Activity using a bulb, cell and key and connecting wire to show flow of current and identify closed and open circuits. Making a switch. Opening up a dry cell.
Do all materials allow current to flow through them?	Conductor, Insulator.	Mica, paper, rubber, plastic, wood, glass metal clip, water, pencil (graphite), etc.	Experiment to show that some objects (conductors) allow current to flow and others (insulators) do not.
Magnets			
What is a magnet?	Magnet.	Magnet, iron pieces.	Demonstrating how things are attracted by a magnet. Classification of objects into magnetic/ non-magnetic classes.
Where on a magnet do things stick?	Poles of a magnet.	Magnet, iron pieces, iron filings, paper.	Activity to locate poles of a magnet; activity with iron filings and paper.
How is a magnet used to find direction?	A freely suspended magnet always aligns in a particular direction. North and South poles.	Bar magnet, stand, thread, compass.	Activities with suspended bar magnet and with compass needle.
How do two magnets behave when brought close to each other?	Like poles repel and unlike poles attract each other.	Two bar magnets, thread, stand.	Activities to show that like poles repel and unlike poles attract.
6. Natural Phenomena			**(Periods–26)**
Rain, thunder and lightning			
Where does rain come from? How do clouds form?	Evaporation and condensation, water in different states. Water cycle.	Everyday experience; kit items.	Condensation on outside of a glass containing cold water; activity of boiling water and condensation of steam on a spoon. Simple model of water cycle. Discussion on three states of water.

Questions	Key Concepts	Resources	Activities/Processes
Light Which are the things we can see through?	Classification of various materials in terms of transparent, translucent and opaque.	Previous experience, candle/torch/lamp, white paper, cardboard box, black paper.	Discussion, observation; looking across different materials at a source of light.
When are shadows formed? Do you get a shadow at night – when there is no light in the room, no moonlight or other source of light? What colour is a shadow?	A shadow is formed only when there is a source of light and an opaque material obstructs a source. A shadow is black irrespective of the colour of the object.	Child's own experience, candle/torch/lamp, white paper, black paper, coloured objects.	Discussion; observing shadow formation of various objects of different shapes, and of same shape and different colours; playing and forming shadows with the hands in sunlight, in candle light, and in a well lit region during daytime; making a pinhole camera and observing static and moving objects.
On what kinds of surfaces can we see images?	Reflecting surfaces; images are different from shadows.	Experience, objects with polished surfaces, mirror etc.	Observing differences between the image and the shadow of the same object.
7. Natural Resources *Importance of water* What will happen to soil, people, domestic animals, rivers, ponds and plants and animals if it does not rain this year? What will happen to soil, people, domestic animals, plants and animals living in rivers and ponds, if it rains heavily?	Importance of water, dependence of the living on water. Droughts and floods.	Experience, Newspaper reports.	Estimation of water used by a family in one day, one month, one year. Difference between need and availability. Discussion. Activity: plant growth in normal, deficient and excess water conditions.
Importance of air Why do earthworms come out of the soil when it rains?	Some animals and plants live in water; some live on land and some live in upper layers of soil; but all need air to breath/to respire.	Experience.	Discussion.
Waste Do you throw away fruit and vegetable peels and cuttings? Can these be reused? If we dump them anywhere, will it harm the surroundings? What if we throw them in plastic bags?	Waste; recycling of waste products; things that rot and things that don't. Rotting is supported by animals/animal and plant products.	Observation and experience.	Survey of solid waste generation by households; estimation of waste accumulated (by a house/ village/colony etc.) in a day, in a year; discussion on 'what is waste'; Activity to show that materials rot in soil, this is affected by wrapping in plastics.

Contents

UNIT 5 HOW THINGS WORK

UNIT 6 NATURAL PHENOMENA

UNIT 7 NATURAL RESOURCES

10 Movement in Animals

Learning Objectives

By the end of the lesson, you will be able to:

- list the functions of the systems in the body
- explain how movement in humans is enabled by the skeletal and muscular systems
- describe how the earthworm, snail, cockroach, fish, snake and birds move

INTRODUCTION

You already know that cells are the building blocks of an organism and that organisms can be unicellular or multicellular. Unicellular organisms are single-celled organisms like the *Amoeba* or the *Paramecium*. All activities necessary for life are performed only by a single cell.

Multicellular organisms are made up of different types of cells. Each cell in a multicellular organism is specialised to carry out a particular task. For example, the red blood cells in humans are specialised to carry oxygen.

A group of similar cells that are specialised to perform a function is called a ***tissue***. For example, muscle tissue consists of cells which contract to move the parts of the body. *A group of different tissues working together to perform a specific function is called an* ***organ***. For example, the heart is an organ that pumps blood to all parts of the body. It consists of muscle and nervous tissue, bound together by connective tissue. *A group of organs that work together to perform a life function is called an* ***organ system***. The oesophagus, stomach, small intestine and large intestine are some organs of the digestive system. This system performs the major task of digesting food and absorbing nutrients that the body needs.

Functions of Body Systems

The human body is made up of many organ systems with each system performing a particular function. The major systems of the body and their functions are given in Table 10.1. All these systems work together to keep us alive.

In this lesson, let us focus on how humans and other animals move using different systems.

Table 10.1 Organ systems and their functions

Body system	Main organs	Functions
Nervous system	Brain, spinal cord, nerves	helps the body gather information about its surroundings, controls the body
Skeletal system	Bones	supports the body, protects organs like the brain, heart and lungs
Muscular system	Muscles	helps the body move by pulling on the bones
Circulatory system	Heart, blood vessels, blood	helps the body transport substances
Digestive system	Mouth, oesophagus, stomach, small intestine, large intestine	helps the body break down food into substances that can be used
Respiratory system	Nose, trachea, lungs	helps the body take in oxygen and send out carbon dioxide
Excretory system	Kidneys, ureters, bladder, urethra, skin	helps the body send waste materials and toxic materials out of the body
Reproductive system	Female: ovaries, uterus, vagina Male: testes, sperm ducts, urethra, penis	helps the body reproduce

MOVEMENT IN HUMANS

Humans walk, run or swim to move from one place to another. We use our arms and legs to move. The bones and the muscles work together to make this possible.

*The **skeleton** is the framework that is formed by the bones in the body.*

THE HUMAN SKELETON

Most animals move from place to place either in search of food or water, or to escape from their enemies. They also move to find suitable shelters or habitats, and for reproduction.

The skeleton gives shape to the body. The skeleton of a newborn baby has around 300 bones, but an adult human has only 206 bones. This is because, as the baby grows, some of the bones fuse or join together.

The skeleton has three main functions.

- **Support:** The skeleton supports the body and gives it shape.
- **Protection:** It protects the important organs such as the brain, the heart, the lungs and the spinal cord.

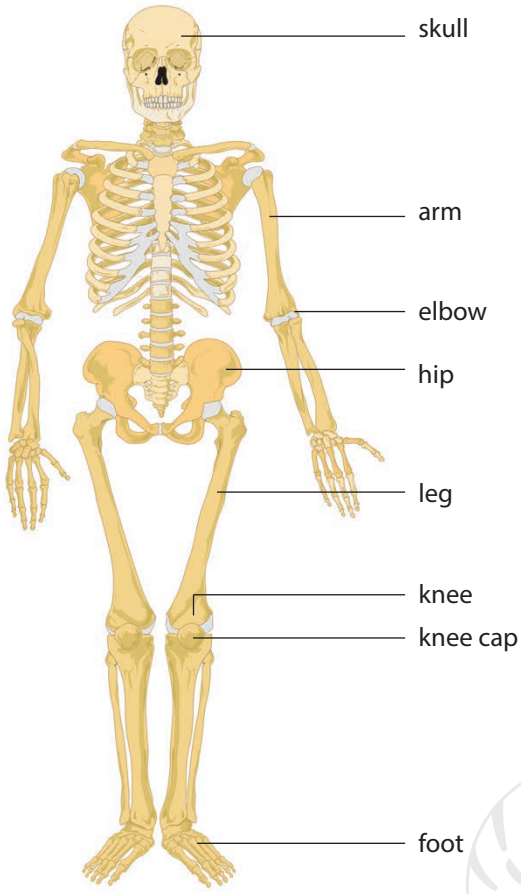


Fig. 10.1 The human skeleton

- **Movement:** It helps the body move with the help of muscles.

The bone is a living tissue, very hard on the outside and soft on the inside. Blood cells are produced in the **bone marrow**, a soft substance present inside the bone. At the ends of bones and at the joints, we find a kind of tissue called **cartilage**. It is softer and more flexible than a bone. Cartilage reduces the friction in the joints when the bones move over one another or rub against each other. Cartilage is found in the nose, ear, ends of ribs, joints and between the vertebrae.

Bones are made of living cells. When a bone is broken, new cells are formed that and close up the break and help the broken bone to heal.

PARTS OF THE HUMAN SKELETON

The human skeleton can be divided into the skull, backbone or vertebral column, ribs, the two pairs of girdles (shoulder and pelvic) and the limbs (arms and legs).

The Skull

The skull is the bony framework of the head. The upper part of the skull is the **cranium**, which is made up of eight flat bones joined together. The face is made of 14 bones. The lower jawbone is the only movable bone in the skull. All the other joints in the skull are immovable.

Function

- The cranium forms a cage around the brain and protects it.

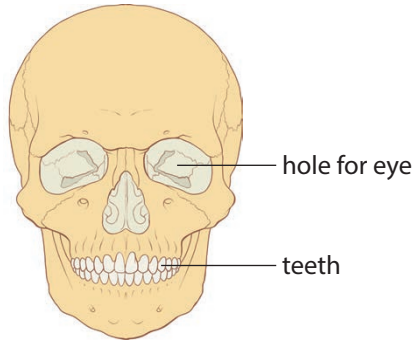


Fig. 10.2 Skull

The Vertebral Column

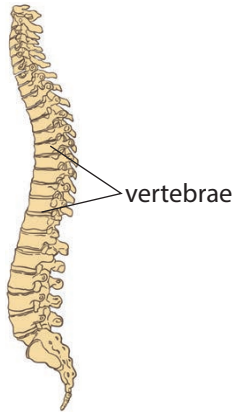


Fig. 10.3 Backbone

The backbone, also called the vertebral column or the **spine**, runs from the base of the skull to the lower back. The backbone is strong but flexible. It is made of 26 irregularly shaped bones called **vertebrae**. The backbone is S-shaped. Each vertebra has a hole in the middle through which the **spinal cord** passes. The spinal cord is very important as it carries information to the brain from the rest of the body, and vice versa. Cartilage is found between the vertebrae.

Functions

- The backbone holds the head and body upright.
- It protects the delicate spinal cord.
- The joints in the vertebrae help us to bend and twist our back.

The Ribs

The ribs are thin, flat, curved bones that form the **ribcage**. There are 12 pairs of ribs that curve around from the spine to the front of the body. The ribs are connected by cartilage to the flat breastbone (**sternum**), which is about 12–15 centimetres long. The ribcage is flexible, which is necessary during breathing.

- The first seven pairs of ribs are attached directly to the breastbone. These are known as **true ribs**.
- The eighth, ninth and tenth pairs of ribs are attached to the lowest true rib. These are known as **false ribs**.
- The last two pairs of ribs are not attached to the sternum or to the lowest true rib. These are only attached to the spine. They are called **floating ribs**.

Function

- The ribs form a protective cage around the heart and lungs.

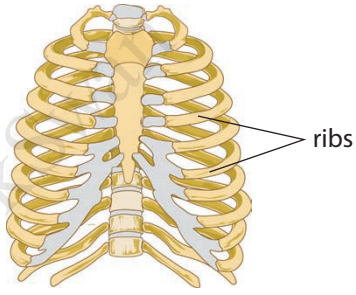


Fig. 10.4 Ribcage

The Girdles

The girdles connect the limbs to the backbone. The **pectoral girdle** is made up of the collar bones and the shoulder blades. The shoulder blade is a large, flat bone. The **pelvic girdle** is made up of the hip bone and the thigh bone.

Functions

- The pectoral girdle links the arms to the backbone. The collar bone supports the weight of the entire arm. The ends of the collar bone

and shoulder blade meet to form the shoulder socket, where the arm fits.

- The pelvic girdle links the legs with the vertebral column. The hip bone has a ball and socket joint, into which fits the head of the thigh bone (**femur**).

The Limbs

The arm is made up of three long bones—**humerus** in the upper arm, and **ulna** and **radius** in the lower arm.

Each leg is made up of four bones. The three long bones are the **femur** (thigh bone), and the **tibia** and **fibula**. The femur is the largest bone in our body. The fourth bone is the knee cap or the **patella**. The femurs are the longest and strongest bones in the body.

Each hand has eight bones in the wrist and 19 bones in the hand and fingers. Similarly, each foot has seven bones in the ankle and 19 bones in the foot and toes.

Joints

The region where two bones meet is called a joint. Bands of tough, elastic tissue called **ligaments** hold the bones together at the joints. Muscles are attached to bones by tough tissues called **tendons**. When muscles contract, they pull the bones and make them move.

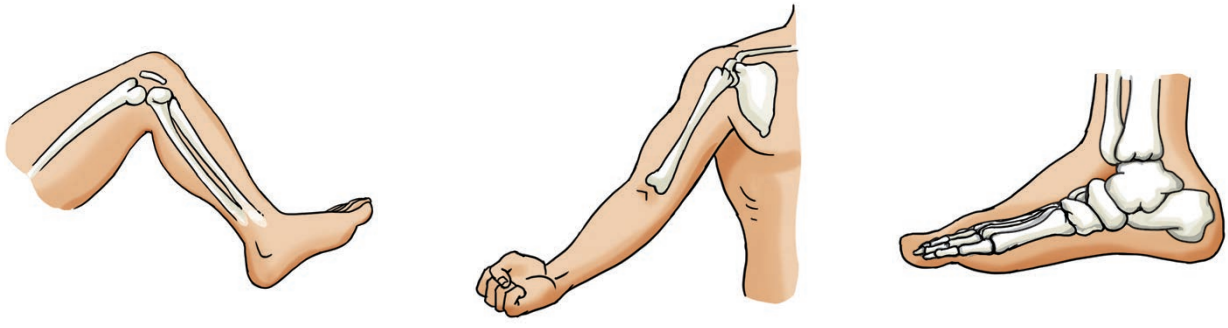
Movement is possible only at the joints. The joints in the skull (except the joint of the lower jaw) do not allow any movement. Other joints allow different types of movements. The main joints present in the body are given below.

Hinge joint

The upper and lower arms are connected at the elbow by a hinge joint. Similarly, the upper and lower legs are connected by a hinge joint at the knee. A hinge joint is very strong, but allows movement in one plane only—either up and down, or backward and forward.

Ball-and-socket joint

The ball-and-socket joint is present in the hip and the shoulder joints. The end of one of the bones is round like a



a. Hinge joint b. Ball-and-socket joint c. Gliding joint

Fig. 10.5 Examples of joints in the body

ball and fits into a hollow part (**socket**) in the other bone. This joint allows movement in all directions.

Pivot joint

The pivot joint is found between the first and second vertebrae. It allows the head to turn to the left and right, and also move up and down.

Gliding joint

Gliding joints are present in the wrists and ankles. The bones have flattened ends and can glide over each other. This joint allows side-to-side, as well as back-and-forth movement.

X-rays

X-rays can pass through the skin and muscles, but not bones. These rays make it possible to take special photographs of the bones in the body. Doctors take X-ray photographs when they have to look at the bones—for example, when someone has a fracture.

MUSCLES

The bones can move only when muscles pull on them. Muscles can only pull not push and so at least two muscles are needed to move a bone—one to pull the bone in one direction and the other to pull the bone in the other direction.

For example, the **biceps** and the **triceps** muscles move our lower arm up and down. When we want to raise our arm, the biceps in the front become shorter (contract) and pull up the arm. When we want to lower the arm, the biceps relax and the triceps at the back contract and pull the arm down.

Fig. 10.6 An X-ray image of hands

Looking Back

Understanding

Answer in one word.

1. How many bones are there in your backbone?
2. What type of joint is present in your knee?
3. What type of joint is present between your first and second vertebrae?
4. Name the muscle that helps you raise your arm.

MOVEMENT IN OTHER ANIMALS

Do all animals have a skeleton like we have? Does a worm or a snail have bones? Many animals do not have a skeleton.

Based on the presence or absence of the backbone or vertebral column, animals are broadly classified into two groups—vertebrates and invertebrates.

Vertebrates *are animals with a backbone. The animals that do not have a backbone are called* ***invertebrates***.

Some of the invertebrates have a hard covering or shell that gives the body support or protection. This protective covering that is outside the body is called the **exoskeleton**. Snails, crabs, lobsters and insects like the cockroach and grasshopper have exoskeletons. The skeleton that is inside the body of other animals like fish, birds and humans is called the **endoskeleton**.

Let us learn about the different kinds of skeletons that some animals have and how they move.

Earthworm

The earthworm has a body that is divided into segments and has no skeleton. It has an internal cavity that is filled with liquid. The muscles of the earthworm are arranged around this cavity. There are two sets of muscles that act perpendicular to each other. When

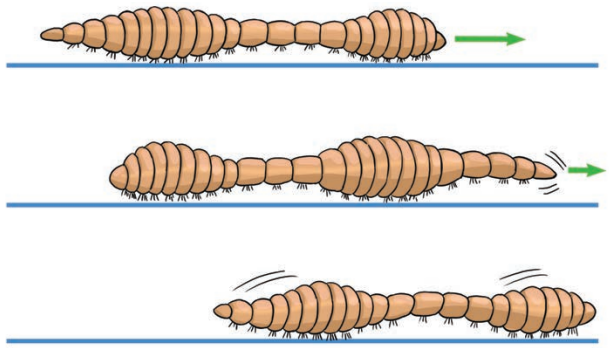


Fig. 10.7 Movement in earthworm

one set of muscles contracts, the other set relaxes.

The earthworm also has stiff hair-like projections called **setae** to grip the ground so that the body can move forward by regular contractions and expansions of the muscles.

Snail

The soft body of a snail is protected by a hard, coiled shell. This is its exoskeleton.

The snail moves by creeping on a flat 'foot' underneath the body. The band of muscles in the foot contract and expand to create a rippling movement that pushes the snail forward.

The foot also secretes slimy mucus to make a slippery track over which the snail moves.

Cockroach

A cockroach too has a exoskeleton. It has six jointed legs and two pairs of wings. The legs are used to walk and run, while only one pair of wings is used to fly. The

muscles of the leg help in walking and the chest muscles help in flight.

Fish

A fish has a bony endoskeleton. It moves by moving its body from side-to-side in a zigzag manner. This pushes the water and moves the fish's body forward. The muscles on either side of the fish's backbone expand and contract to make this movement possible.

Fish are streamlined in shape—rounded in front and narrow at the back. This shape facilitates easy movement through water because it reduces water resistance. Birds also have a streamlined shape.

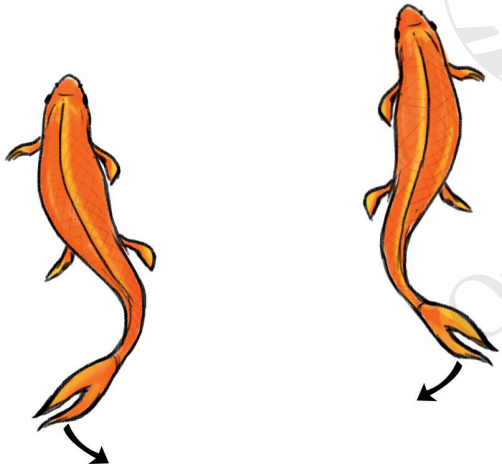


Fig. 10.6 Swimming fish

Snake

A snake has a long, flexible backbone. It contracts its muscles, thrusting its body from side to side, creating a series of curves. Each curve pushes against the ground to give a forward thrust to the

Fig. 10.7 Moving snake

body. Movement is helped by the scales, which catch on any uneven surface.

Birds

The wings of a bird are covered with feathers. The bird moves its wings up and down to move up and forward. Strong chest muscles pull their wings up and down. A bird also uses its two legs to walk or jump on a surface when it is not flying.

Fig. 10.8 Flying bird

A cheetah, the fastest land animal, can run at a speed of around 96 kilometres per hour. The peregrine falcon can reach speeds of around 320 kilometres per hour when diving to catch its prey.

Looking Back

Understanding

Fill in the blanks.

1. A/An _____ (earthworm/snail) does not have a skeleton.
2. A cockroach has an _____ (exoskeleton/endoskeleton).
3. A snake has a flexible _____ (body/backbone) which helps it move.
4. A fish has a _____ (streamlined/oval) shape.

Assess Yourself

Mark ✓ if you have understood the concept.

- Organisms can be unicellular or multicellular.
- Cells make up tissues; tissues make up organs; organs make up organ systems; organ systems make up the body.
- The main organ systems in the human body are the nervous, skeletal, muscular, circulatory, digestive, respiratory, excretory and reproductive systems.
- All the body systems work together to keep us alive.
- Animals move in search of food, water, shelter and to protect themselves from their enemies.
- The skeleton is the framework formed by the bones in the body.
- The main functions of the human skeleton are support, protection and movement.
- The bone is a living tissue. Blood cells are produced in the bone marrow.
- The cartilage decreases the friction between bones when they move over each other or rub against each other.
- The human skeleton consists of the skull, vertebral column, ribs, girdles and the limbs.
- The main types of joints in the body that allow movement are the hinge joint, the ball and socket joint, the pivot joint, and the gliding joint.
- Muscles pull at bones to make them move at the joints.
- Vertebrates are animals with a backbone. Invertebrates are animals that do not have a backbone.
- The covering or shell that protects and supports the bodies of invertebrates like the snail and cockroach is the exoskeleton. The skeleton that is inside the body of animals like fish and humans is the endoskeleton.

For self assessment

Exercises

Remembering/Understanding/Applying

Multiple choice questions

A. Choose the correct option.

1. A group of similar cells that carry out a function is called a _____.

   a) organ b) tissue
   c) system d) body

2. Which of the following are major functions of the human skeleton?

   (i) support (ii) protection
   (iii) movement (iv) circulation

   a) (i), (ii) and (iv)
   b) (ii), (iii) and (iv)
   c) (i), (iii) and (iv)
   d) (i), (ii) and (iii)

3. Which of these protects the brain?

   a) cartilage b) skull
   c) spine d) vertebrae

4. The pelvic girdle links the _____.

   a) legs with the backbone
   b) hands with the backbone
   c) head with the backbone
   d) shoulder with the backbone

5. The bones at the joints are held together by _____.

   a) cartilage b) tendons
   c) ligaments d) organs

6. Tendons are _____.

   a) tough tissues that attach bones together
   b) tough tissues that attach muscles to bones
   c) soft bony structures that attach bones together
   d) tissues that are found in bones

7. Where do you find a hinge joint in your body?

   (i) between the upper and lower arm
   (ii) between the head and the neck
   (iii) between the collar bone and the shoulder blade
   (iv) between the upper and lower leg

   a) (i) and (ii) b) (i) and (iii)
   c) (i) and (iv) d) (i), (iii) and (iv)

8. Which of the following is a hinge joint?

   a) knee joint b) shoulder joint
   c) wrist joint d) ankle joint

9. The snail is an example of an animal with _____.

   a) an exoskeleton b) an endoskeleton
   c) girdles d) a cranium

10. Which of the following have a streamlined shape?

    (i) fish (ii) snail
    (iii) earthworm (iv) bird

    a) (i) and (ii) b) (i) and (iii)
    c) (i) and (iv) d) (i), (iii) and (iv)

For peer assessment

Objective-type questions

B. Fill in the blanks.

1. A group of organs working together to perform a life function make a _____ _____.

2. The main function of the _____ system is to get rid of the waste from the body.

3. The heart is a part of the _____ system.
4. The spinal cord is a part of the _____ system.
5. An adult has _____ bones; a newborn child has about _____ bones.
6. The brain is protected by the bones of the _____.
7. The longest bone in the human body is the _____.
8. The organs in the upper part of the body are protected by the _____.
9. Wrists and ankles have _____ joints.
10. The _____ joint allows movement in one plane only.

C. Say whether the statements are true or false.

1. Blood cells are made in the heart.
2. Bone is harder than cartilage.
3. There is only one moveable bone in the skull.
4. The vertebrae protect the heart and lungs.
5. The humerus is the longest bone in the body.
6. The joint between the arm and the shoulder blade is a pivot joint.
7. When you raise your arm, the biceps pull and the triceps push the bones in the lower arm, to make the arm move.
8. The shell of a snail is actually its endoskeleton.
9. The scales of a snake help it to move.
10. The strong chest muscles of a bird help it to fly.

Short answer questions

D. Answer in brief.

1. Name the organ system that is involved in breathing in human beings.
2. Name the only moveable bone in the skull.
3. What are floating ribs? Why are they called that?
4. Name the two girdles in the human skeleton.
5. Name the bones in the human arm.
6. What type of joint is present in the knee?
7. What is the function of X-rays?
8. How many muscles are needed to move a bone in one direction?
9. What type of skeleton does an earthworm have?
10. What kind of skeleton does a snail have?
11. How does the shape of a fish's body help it to move in water?
12. Describe how a bird flies.

Long answer questions

E. Answer in detail.

1. Name three organ systems in the human body and their main functions.
2. Name the main organs and the functions of the nervous system.
3. What are the functions of the human skeleton?
4. Explain the structure of the following and their functions.
   (i) The rib cage (ii) The skull
   (iii) The vertebral column
5. Explain the structure of the ball-and-socket joint, giving two examples. What kind of movement does such a joint allow?
6. How do the following animals move?
   (i) Earthworm (ii) Snail
   (iii) Bird (iv) Snake

Higher-order Thinking Skills

1. The *Amoeba* does not have any organs and systems. How do you think it stays alive?
2. If you had no bones in your body, how would it affect your appearance and movement?
3. Why are the bones in the cranium fused?

Life Skills

Learn how to give first aid for a fracture.

- Do not move the patient if there is a possibility of a neck fracture or a back fracture.
- Do not let the patient move the broken arm or leg.
- Make a splint with two sticks or rulers and tie it firmly around the arm or leg. Use a sling if necessary.
- Place an icepack over the injury to reduce swelling.
- Call for an elder or a doctor as soon as possible.

Enrichment Activities

I. Experimental project

Applying

Aim: To find out the importance of calcium in the bones

Materials required: A bone, 3% solution of hydrochloric acid, salt, forceps, water

Method: Take a bone without any marrow in it. Ask your teacher for help to make a 3% solution of hydrochloric acid in which some salt has been dissolved. Place the bone inside this solution and leave it for some days. The acid 'eats' away the calcium in the bones.

After some days, take the bone out of the solution with forceps and wash off the acid from the bone. Dry the bone and try to bend it. Can you bend it? What did the acid do to the bone?

Why is calcium important to your skeleton? Find out how you get the calcium you need to keep your bones strong. Find out what will happen to you if you do not get enough calcium in your diet.

II. Model making

Applying

Making a working model of an arm

You need two flat sticks with rounded tips, rubber bands, knife and a marker pen. Set the two flat sticks on top of one another at a 90° angle to form an L shape. Use small rubber bands around the two touching ends of the sticks to form an X, to hold the sticks together in the L position. The rubber bands should be wrapped tightly enough so that the sticks do not slip out of position, and at the same time it should be loose enough to move backward and forward like a hinge.

Cut two notches in the vertical stick. Cut two more notches in the horizontal stick. Fix the rubber bands into the notches so that they run from the top of the vertical stick to the bottom notch, one rubber band on the left of the vertical stick, and one on the right.

Move the sticks back and forth, allowing the rubber band to demonstrate the hinge joint of the elbow.

III. Meet and assess

Applying

Organise a seminar on: **Bone grafting**

A bone graft is a surgery performed to place new bone into spaces between or around abnormal bones. Bone grafts may be taken from another part of the person's body, such as the hip or ribs, or may come from a donor. Artificial substances are also used. Find out more about bone grafting—types, procedures, risks and so on.

IV. Imagine and create

Creating

Imagine that you are a doctor who has been sent to study the life forms that humans have found on a distant planet. Write a report to your supervisors informing them about the results of your analysis.

Fun Activity

You have learnt how joints are necessary for movement. But have you thought about how it would be if we did not have any joints? You can find out the importance of joints by doing this fun activity.

Take two wooden or plastic rulers and ask your friend to tie them to either side of your elbow. Check to see what you can or cannot do.

Be Inspired!

Diva Sharma

Diva Sharma, a school student, loved working with animals in an animal shelter. When the animal shelter was in danger of being closed due to lack of funds, she started to raise money to help the shelter. She spoke to her friends and teachers in school and asked them to donate what they could to save the animal shelter. She also spoke to teachers and students from other schools and put up posters in many places. Diva's efforts paid off and she raised more than ₹1,00,000 in three days! This money helped in saving the animal shelter from closing.

Internet Links

http://webecoist.com/2009/01/28/strange-animal-movement-means-locomotion

OUR HERITAGE

Artificial legs have been referred to in the Rig Veda, a text which was composed many thousands of years ago. It is said that Queen Vishpala lost her leg in a battle and an iron artificial leg was given to her so that she could continue to fight.

17

Air Around Us

Learning Objectives

By the end of the lesson, you will be able to:

- describe the composition of air
- explain the importance of air on Earth
- analyse the causes of air pollution

AIR

Air cannot be seen but we can feel its presence. When we switch on a fan, the air present in the room starts moving and we can feel it. Moving air, that is wind, makes leaves and branches of trees sway, flags flutter on top of buildings and kites fly. A **wind vane** is an instrument used to show the direction of the wind.

During storms, the wind blows at a very high speed, causing damage to life and property. High speed winds during cyclones cause great damage to coastal areas.

Fig. 17.1 Movement of air

Understanding

Activity 17.1

Aim: To show that air can cause movement

Method: Hold a pinwheel (*firki*) in your hand, walk a few steps and then run. Note the movement of the pinwheel.

Observations and conclusions: You will observe that the pinwheel rotates slowly at first and then faster. This rotation is caused by the movement of air.

Understanding

Activity 17.2

Aim: To show that air is present everywhere and occupies space

Materials required: an empty glass and a trough of water

Method: Invert the glass. Holding it vertically, insert it in the trough of water. Does water enter the glass? Now, tilt the glass slightly in the water and observe what happens.

Observations and conclusions: In the first case, water does not enter the glass because the glass is full of air. So, there is no space for water. When the glass is tilted, the air inside the glass escapes in the form of bubbles and makes place for water. This activity shows that air is present even in an empty glass and that it occupies space.

A glass or bottle may appear empty but is it really so? Air is present everywhere, even in empty bottles.

THE ATMOSPHERE

A layer of air called the **atmosphere** surrounds the Earth. The atmosphere extends to hundreds of kilometres above the Earth's surface. However, it gets thinner as we go higher and higher above the surface of the Earth. This is the reason why it is difficult to breathe at high altitudes. That is why mountaineers carry oxygen cylinders while trekking at high altitudes.

COMPOSITION OF AIR

Air was thought to be a pure substance until the 18th century. However in 1774, the English scientist Joseph Priestley found that air contained oxygen, and thus showed that air is a mixture of gases.

The main constituents of air are given in Table 17.1.

Table 17.1 Constituents of air

Gas	Volume in air
Nitrogen	78%
Oxygen	21%
Carbon dioxide	0.04%
Argon	0.9%
Water vapour	variable
Other gases	traces

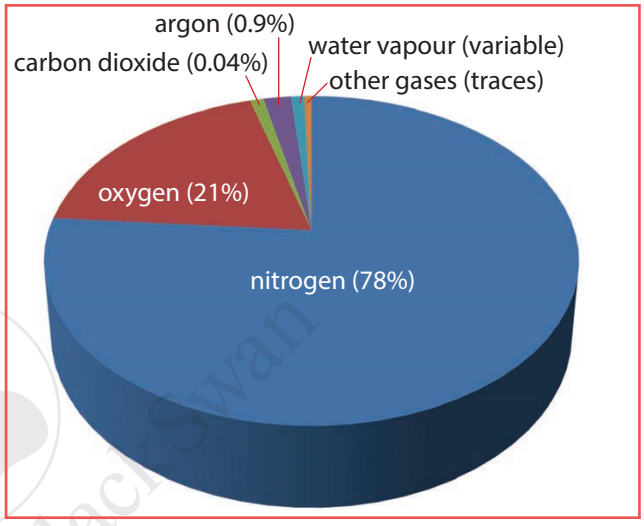


Fig. 17.2 Composition of air

The amounts of water vapour and carbon dioxide vary greatly. Areas near forest fires and factories will have more carbon dioxide and areas near water bodies will have more water vapour.

Looking Back

Understanding

Fill in the blanks.

1. Moving air is called _____.
2. The layer of air that surrounds the Earth is called the _____.
3. Mountaineers need _____ cylinders while trekking at high altitudes.
4. Air is a _____ of gases.
5. The largest component of air is _____, which is 78% by volume.

IMPORTANCE OF AIR FOR LIFE ON EARTH

Let us look at the components of air that are important for life on Earth.

Oxygen

Living things need oxygen for respiration. ***Respiration*** *is a process that results in the release of energy from food.* Respiration releases carbon dioxide as a waste product. Plants take in oxygen through the stomata present on the underside of their leaves and tender green parts of their stems. Aquatic animals breathe in the oxygen dissolved in water through gills.

Oxygen is also needed for **combustion** or burning. *Combustion* is *the process by which oxygen reacts with a fuel and releases heat energy*. It is needed to produce heat for cooking and other purposes. It is also required to run automobiles. Fuels such as wood, coal, kerosene and liquefied petroleum gas (LPG) are used to produce heat at home and in factories. Some fuels such as petrol, diesel and compressed natural gas (CNG) are used to run cars, trucks and buses. When a fuel burns, it uses up oxygen. In the process, carbon dioxide is released into the atmosphere.

Oxygen cycle

Burning of fuels and respiration by plants and animals are processes that use oxygen. But the amount of oxygen in air remains constant. How is this possible?

We have learnt about a process where green plants take in carbon dioxide and release oxygen. What is it? This is the process of photosynthesis.

Fig. 17.3 Plants give out oxygen during photosynthesis.

Understanding

Activity 17.3

Aim: To show that air is needed for combustion

Materials required: candle, matches, glass, glass jar

Method: Light a candle and place it on a table. Invert a glass over the lighted candle. What do you observe?
Invert a tall glass jar over a lighted candle. What do you observe now?

Observations and conclusions: The candle gets extinguished in both cases. But when the tall glass jar is inverted over the lighted candle, the candle burns for a longer time. This is because since the glass jar is taller, it has more air in it than the glass. Therefore, the candle burns for a longer time.

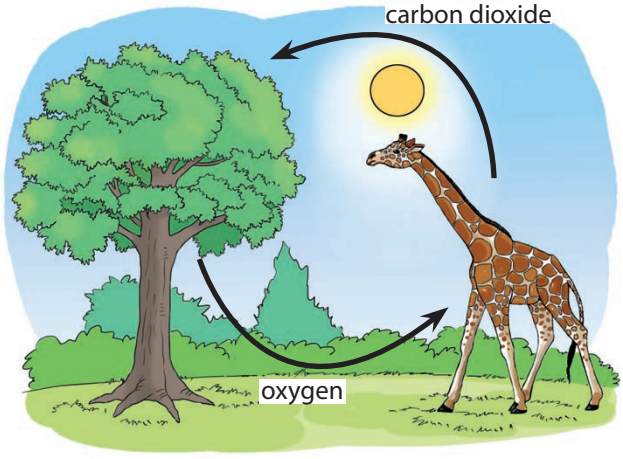


Fig. 17.4 The oxygen cycle

During the day, oxygen is released by plants during photosynthesis. Plants also take in oxygen for respiration and release carbon dioxide. But the oxygen released by photosynthesis is much more than the oxygen consumed during respiration. Hence, there is a net release of oxygen. *The cycle in nature, by which oxygen is utilised by plants and animals during respiration and generated by plants during photosynthesis, such that the level of oxygen in the air is constant, is called the* ***oxygen cycle****.* The oxygen cycle is delicately balanced. Deforestation, that is the excessive cutting of trees, can cause a serious fall in the amount of oxygen being released into the air. Similarly, excessive burning of fuels can use up or consume more oxygen from the air. Deforestation and excessive burning of fuels can therefore lead to reduction in the oxygen content in the air and cause the accumulation of carbon dioxide in the air. Hence, we must plant more trees and burn less fuel.

Nitrogen

Nitrogen is a major component of air. It does not support combustion. Plants cannot use nitrogen directly from the atmosphere. It has to be changed to a different form. Some bacteria in the soil and in the roots of certain plants like pea plants convert nitrogen into a form that can be used by plants. Lightning can also convert nitrogen into this form.

Animals get nitrogen in the form of proteins by eating plants or other plant-eating animals. When plants and animals die, nitrogen is released back into the atmosphere by decomposers. Nitrogen is also a major part of fertilisers. Nitrogen thus circulates between the atmosphere, soil and living organisms. This cycle is known as the **nitrogen cycle.**

Carbon Dioxide

Carbon dioxide is present in very small amounts in air. Yet, it plays an important role in the environment through the process of photosynthesis.

Carbon dioxide is used by plants to produce food by photosynthesis. Aquatic plants too use carbon dioxide dissolved in water for this purpose. Directly or indirectly, plants are the source of food for all animals.

Solid carbon dioxide changes directly into gas on heating. It does not form liquid carbon dioxide. That is why solid carbon dioxide is called dry ice.
Dry ice is extremely cold and is therefore used to freeze fruits, vegetables and so on. It is also used to preserve medical samples and medicines.

Water Vapour

Water is present in air in the form of water vapour. The amount of water vapour present in air is referred to as humidity. The humidity in air depends on the location.

As the temperature increases, more water changes into water vapour and mixes with the air. As a result, the humidity increases. In winters, humidity is low since water does not evaporate easily at lower temperatures. This is why our skin becomes dry during winters. The presence of water vapour in air is important for both plants and animals. Plant leaves can become dry and crumpled due to the lack of water vapour in air. Fruits and vegetables remain fresh only when there is an optimum level of moisture in the air. Animals can get dehydrated during hot and dry weather.

Excess water vapour can also cause discomfort. During the rainy season, because of excessive humidity, the heat becomes oppressive even if the temperature is not very high.

Understanding

Aim: To prove that air contains water vapour

Method: Fill a glass with cold water. What do you observe on the outer walls of the glass after some time?

Observations and conclusions: You will observe droplets of water on the outer walls of the glass. The water vapour in air condenses on contact with the cold walls of the glass.

Dust and Smoke

Air also contains dust and smoke. The amounts of these vary from place to place. Factories and motor vehicles release smoke, while it becomes dustier when the wind blows.

The dust and smoke in the air we breathe may cause harm to our respiratory system. When we breathe through our nose, the fine hair and mucus present in our nostrils prevent the dust and smoke from reaching our lungs.

Fig. 17.5 Smoke due to a forest fire

Understanding

Activity 17.5

Aim: To observe dust particles in air

Method: Select a room in your house with at least one window. Cover the windows with black chart paper to make the room dark. Make a small hole in the chart paper on one of the windows to allow sunlight to enter. Observe the beam of sunlight entering the room.

Can you see very tiny particles moving freely in the beam? These are the dust particles present in air.

Understanding

Activity 17.6

Aim: To show that air is dissolved in water

Method: Take some water in a beaker and heat it gently. You will see bubbles of air forming at the base of the beaker and then rising to the top. At this stage, these bubbles are of air dissolved in water.

As the water is heated further, bubbles of water vapour get formed as the water turns into water vapour.

Aim: To show that soil contains air

Method: Take a lump of dry soil in a beaker. Slowly add water to it and observe carefully. You will see bubbles of air coming out. This confirms that air is present in the soil.

OXYGEN IN WATER AND SOIL

All living organisms need oxygen for respiration. How do the animals that live in water get oxygen? Aquatic animals like fish use their gills to separate the air dissolved in water. Underwater plants utilise oxygen dissolved in the water.

Have you ever wondered why earthworms come out only when it rains? Earthworms live in the soil and breathe the air trapped between the soil particles. During the rain, the trapped air is replaced with water and so earthworms and other small animals that live in the soil come out to breathe.

The roots of plants also take in air from the soil through **pores**. Mangroves are plants that grow in waterlogged areas; their roots bend upwards and come out of the surface of the soil to take in air.

Fig. 17.6 Earthworm in soil

AIR POLLUTION

The contamination of air by undesirable substances or pollutants is called ***air pollution.*** Air pollution is mainly the result of the burning of fuels and various industrial activities.

The pollutants may be:

- tiny solid particles, such as ash, in smoke produced by burning of fuels in homes and factories
- dust particles, which are present everywhere in varying amounts
- harmful gases such as carbon monoxide, oxides of nitrogen and hydrogen sulphide, which are produced by automobiles and factories

Fig. 17.7 Pollution of the air

Fig. 17.8 Windmills for electricity generation

IMPORTANCE OF AIR

Besides its use in respiration and combustion, air has many other uses. Some of these are as follows.

- Windmills use the movement of air to generate electricity, draw water from tube wells and run flour mills.
- Wind helps in the movement of gliders, aeroplanes, parachutes, balloons, sailing yachts and so on.
- Wind helps insects, bats and birds to fly.
- Wind helps in the pollination of many plants.
- Wind is also useful in scattering the seeds of plants.

Fig.17.9 Sailing boat

- Air plays an important role in the water cycle as it carries water vapour in it.

Looking Back

Understanding

Say whether the statements are true or false.

1. Both nitrogen and oxygen support combustion.
2. Carbon dioxide is very important for both plants and animals.
3. Carbon monoxide is a pollutant.
4. Air is only useful for respiration and burning.
5. Windmills can be used only to generate electricity.
6. Air does not play a role in the water cycle.

Assess Yourself

Mark ✓ if you have understood the concept.

- Air cannot be seen but we can feel its presence all around.
- A layer of air called the atmosphere surrounds the Earth.
- Air is a mixture of gases and includes nitrogen, oxygen, carbon dioxide and water vapour.
- Nitrogen is the major component of air and does not support combustion. It circulates between the atmosphere, soil and living organisms.
- Oxygen is needed for respiration by living things.
- Carbon dioxide is used up during photosynthesis and oxygen is released.
- Water is present in air in the form of water vapour.
- Respiration is a process that results in the release of energy from food. Combustion is the process by which oxygen reacts with a fuel and releases heat energy.
- Photosynthesis is the process by which green plants make their food (starch) using carbon dioxide and water in the presence of sunlight; oxygen is also released during this process.
- The cycle in nature, by which oxygen is utilised by plants and animals during respiration and generated by plants during photosynthesis such that the level of oxygen in the air is constant, is called the oxygen cycle.
- The amount of water vapour present in air is referred to as humidity.
- Air pollution is the contamination of air by undesirable substances known as pollutants.

For self assessment

Exercises

Remembering/Understanding/Applying

Multiple choice questions

A. Choose the correct option.

1. The largest component of air is _____.

   a) nitrogen b) oxygen
   c) carbon dioxide d) water vapour

2. Carbon dioxide is important for the living world because _____.

   a) plants use it for photosynthesis
   b) animals use it for photosynthesis
   c) plants use it for respiration
   d) animals use it for respiration

3. During combustion, _____.

   (i) nitrogen is consumed
   (ii) oxygen is consumed
   (iii) carbon dioxide is formed
   (iv) oxygen is formed

   a) (i) and (ii) b) (i) and (iii)
   c) (ii) and (iv) d) (ii) and (iii)

4. Respiration is a form of _____.

   a) combustion b) photosynthesis
   c) rusting d) humidity

5. Oxygen is used in _____.

   a) respiration
   b) photosynthesis
   c) pollution
   d) respiration and combustion

6. The oxygen cycle is threatened by _____.

   a) planting trees
   b) deforestation
   c) photosynthesis
   d) respiration

7. The maximum amount of pollution in air can be found _____.

   a) over high mountain ranges
   b) on high seas, away from land
   c) in cities and industrial towns
   d) over large farmlands

8. Which statements are **not** true about air?

   (i) Air is a mixture of gases.
   (ii) Oxygen makes up 50% of air.
   (iii) Air contains water vapour.
   (iv) Air contains very little nitrogen.

   a) (i) and (ii) b) (i) and (iii)
   c) (ii) and (iv) d) (ii) and (iii)

9. Water is found in the air in the form of _____.

   a) dust b) ice
   c) water vapour d) carbon

10. Which one of the following harms the air?

    a) evaporation
    b) pollution
    c) condensation
    d) precipitation

For peer assessment

Objective-type questions

B. Fill in the blanks.

1. The layer of air surrounding the Earth is known as the _____.
2. The major component of air is _____.
3. Though the gas _____ is important for plants, they cannot use it directly from the air.

4. In our body, energy is released during _____, in which _____ gas is used and _____ gas is given out.
5. Contamination of air by undesirable substances is known as air _____.
6. Fishes have special organs called _____ to absorb air dissolved in water.

C. Say whether the statements are true or false.

1. Air contains a fixed percentage of water vapour.
2. Respiration is the main reason for the decrease in the amount of oxygen in the air.
3. Oxygen is added to the atmosphere by respiration.
4. Plants absorb the nitrogen which they need from the air.
5. Animals that live under the soil do not need oxygen for survival.
6. Dust and smoke present in air cause respiratory problems.
7. Windmills are used to generate electricity.

Short answer questions

D. Answer in brief.

1. What are the major constituents of air?
2. The percentage of carbon dioxide in air is very small. Why is this gas important?
3. What is the similarity between respiration and combustion?
4. How does the cutting down of trees affect the oxygen cycle?
5. How do fish get oxygen for respiration?
6. Name two major air pollutants.

Long answer questions

E. Answer in detail.

1. How can you show that an empty glass is not really empty but is filled with air?
2. Describe the oxygen cycle in nature.
3. Describe an experiment to show that air contains water vapour.
4. Why do earthworms come out of the soil only during the rainy season?
5. Write a short note on the importance of air.

Higher-order Thinking Skills

1. You know that oxygen supports combustion. Will the same substance burn faster if the amount of oxygen present in the air is higher?
2. Which place will be more humid throughout the year: Mumbai or Hyderabad? Why?

Life Skills

There are important things that you can do to help reduce air pollution.

- Buses and trains can carry a lot more people in one journey. So use them instead of cars to bring down the amount of pollution.
- Walk or cycle to school or any other place whenever you can, as these do not create pollution.
- Turn off lights when they are not needed. Less electricity used means less coal, oil and gas will have to be burnt in power stations, therefore causing less air pollution.

Enrichment Activities

I. Research project

Applying

Find out the answers to the following questions.

- What are the most common pollutant particles suspended in the air at home and outdoors?
- What are the respiratory problems and allergies that can occur on exposure to pollutants?
- Why do more allergies occur during the spring season?

II. Experimental project

Applying

Aim: To check the pollution in air at different locations

Materials required: white cards or chart paper, Vaseline, a magnifying glass

Method: Smear Vaseline on the white cards and stick them at a few locations in your house and outdoors. You can stick them outside a window, near the main door, in the playground, under a tree, on a wall near the ceiling, in your classroom and so on.

Leave the cards for a couple of days and then check with a magnifying glass to see which card has the most dust sticking to it. Record your observations. Write your conclusions based on the observations.

III. Think and discuss

Evaluating

Air contains a small amount of water vapour. Do you think this water vapour can be condensed to get drinking water? What would be the advantages and disadvantages if this were possible? Have a class discussion on the topic.

IV. Imagine and create

Creating

Write a four line poem on how important oxygen is for living organisms.

Be Inspired!

Three kids from Mumbai—Muskan Tuttan, Shardul Datar and Parth Shinde—have designed lamps and *diyas* powered with solar energy. These lamps and *diyas* can be used to light up homes and neighbourhoods during Diwali and other festivals. Since solar energy does not pollute the environment, these lights will help to decrease the air pollution during festivals.

Internet Links

http://coe.mse.ac.in/kidscorner.asp

http://www.pewclimate.org/global-warming-basics/kidspage.cfm

NEW SCIENCEAHEAD
CLASS 6

Orient BlackSwan

The National Education Policy (NEP) 2020 emphasises certain crucial parameters based on content and pedagogy. The New ScienceAhead series provides a rich range of exercises and activities for each of the parameters. Here is a quick reference guide to some of the examples in this book.

The New ScienceAhead series is mapped perfectly to the National Education Policy 2020.

21st Century Skills
A broad set of skills, knowledge, work habits and character traits that are important for success in the 21st century

Experiential/ Constructivist Approach
Learners construct their knowledge, based on what they already know, through experience or by doing and reflection

Integrated Approach
An approach to teaching and learning that works by connecting knowledge and skills across the curriculum, by bringing real life examples to the classroom

The NEP parameters	Features	Page nos.
The 4Cs		
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Critical Thinking	Higher Order Thinking Skills	9
Creativity	Enrichment Activities	117
Social and Emotional Learning	Life Skills	18
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Subject Integration	Science Tidbit (History)	7
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Art Integration	Fun Activity	89
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Health and Wellness	Text	20–29
	Life Skills	116
	Text	209–210

Sustainable Development Goals

A framework of 17 global goals designed to be a blueprint to achieve a better and more sustainable future for all

The NEP parameters	Features	Page nos.
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India Knowledge

A strong focus on ancient knowledge from India, traditional values, modern developments and future aspirations

Digital Integration

The use of digital tools to enhance and support the teaching–learning process

ICT/Digital resources

Orient BlackSwan Smart App - MCQ-based Quizzes for Practice and Revision

Teacher's Smart Book - Flipbook, Audio, Animations, Presentations, Picture Galleries, Interactive Activities, Embedded Questions, Worksheets with Answer Key, Games

Teacher Empowerment

Teachers' Resource Pack - Lesson Plans with Enrichment Activities, Question Bank with Answer Key, Worksheets with Answer Key, Periodic Tests with Answer, Sample Papers for Assessment with Answers, Students' Book Answer Key

Teachers' Portal - Lesson Plans, Question Bank with Answer Key, Worksheets, Sample Assessment, Answer Key (for Exercises and Assessment Papers in the Students' Book; Worksheets and Assessment Papers in the TRP), Periodic Tests with Answer Key

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