NEP Compliant inside

NEW SCIENCE AHEAD

5

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

- carefully graded text
- experiments and activities
- appealing images
- attractive 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

Mind Opener
- draws students into the lesson
- prepares them for new learning

Lesson Text
- carefully graded
- enables understanding
- visually appealing

In-lesson Activities
- help students develop a scientific temperament

You Now Know
- summarises the lesson
- enables easy revision

Reference

Did You Know?
- nuggets of interesting information

Be Inspired! Scientists and Values
- information on people who have expanded the world of science or made the world a better place

OUR HERITAGE

- an exploration of India's rich heritage in science

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

Glossary
- definitions of technical terms

Smart Book for Teachers

informative, interactive and exciting, with:

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

including

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

Students' App

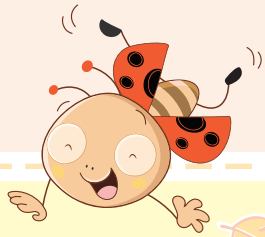
NEW!

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
- 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

Fun Activities

- activities that make learning science joyful

Testing

Tests

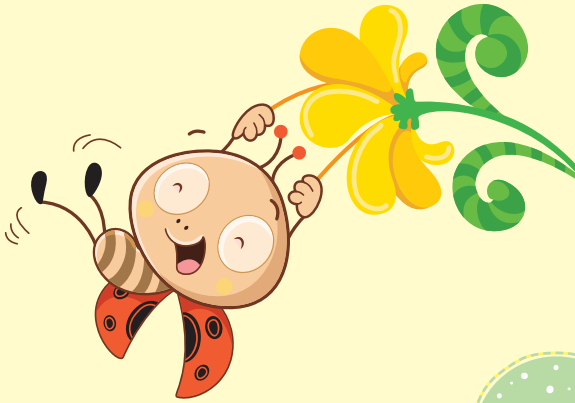
NEW!

- short tests to assess students' understanding of concepts

for classes 3–8

Examination Papers

- for examination practice



Contents

Contents

List of enrichment activities included in New ScienceAhead 5

- Written assignments: pages 50, 142
- Research work on the computer (IT): Internet links at the end of every chapter
- Group work: pages 30, 142
- Simple science experiments: pages 31, 33, 34, 40, 43, 47, 53, 55, 67, 107, 114, 115, 121
- Collecting natural specimens: pages 30, 40, 50
- Show and tell/Interviews: pages 40, 50, 58, 108, 128, 142
- Simple projects and presentations: pages 18, 24, 30, 40, 43, 49, 50, 58, 59, 67, 78, 91, 99, 108, 128, 135
- Model making/Designing: pages 10, 67, 142
- Field tour: pages 10, 24, 90, 99, 128
- Class response: Mind openers at the beginning of each lesson; 'Looking Back' questions; higher-order thinking skills questions
- Crafts: pages 18, 90, 91, 107, 128
- Games, puzzles and quizzes: pages 9, 23, 39, 59, 66, 106, 141

7 Bones and Muscles

Mind Opener

Raise your right hand. Feel it with your left hand. Can you feel the bones inside? Imagine that the bones were not there. What would happen to your raised hand? What shape do you think your body would have, if there were no bones inside?

Learning Objectives

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

- describe the functions of the skeletal system
- explain how joints allow us to move our body parts
- describe how muscles help the bones move
- identify the different types of muscles and explain their functions

Our body consists of several **organs**. Each organ has a job to do. For example, the lungs absorb oxygen and give out carbon dioxide. The heart pumps blood to different parts of the body. The stomach helps to digest food.

The organs in the body do not work alone. They work together with other organs. Several organs working together perform one major function for the body. For example, the stomach alone cannot digest food. Other organs such as the teeth, salivary glands, food pipe, small intestine, large intestine, liver, pancreas, and some others work together with the stomach to digest the food you eat and throw out the waste. These organs working together form an **organ system**. The organs which help to digest food together form the digestive system.

The main systems in your body and their functions are given in the table on the next page.

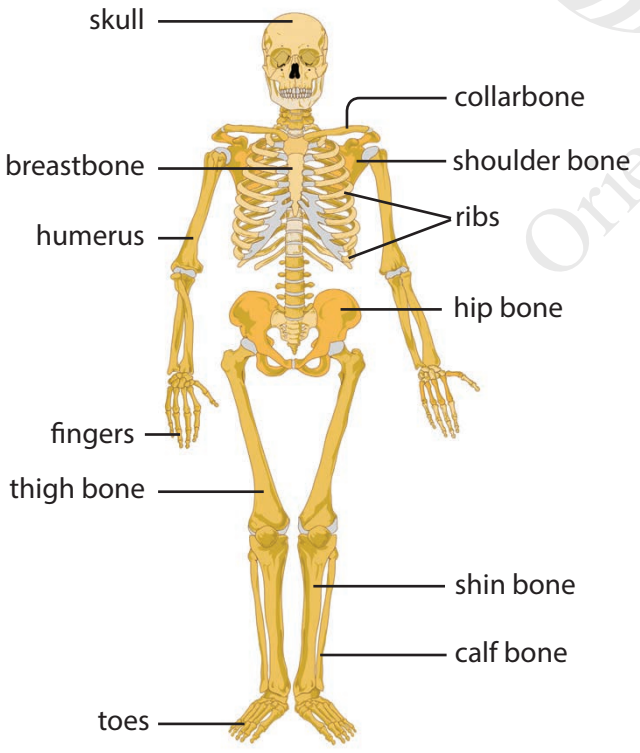
THE SKELETAL SYSTEM

All the bones in our body form a framework called the **skeleton**. Without the hard skeleton, our body would collapse. The skeleton gives the body its shape and strength. It also protects the brain, heart, lungs and other soft organs inside the body.

Bones are hard and are of different shapes and sizes. For example, the leg and arm bones are long. The chest bones are thin and rounded. The bones

The organ systems in humans

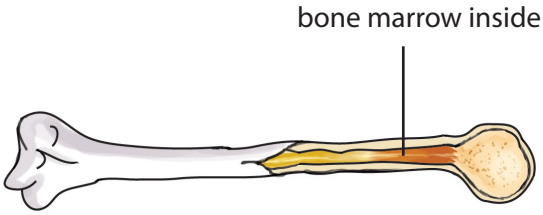
Organ system	Main organs	Functions
Nervous system	Brain, spinal cord, nerves	Helps the body gather information about the surroundings and controls the rest of the body
Skeletal system	Bones	Gives shape to the body; protects internal organs
Muscular system	Muscles	Helps the body move
Circulatory system	Heart, blood, blood vessels	Helps the body carry food and oxygen to all parts of the body; collects waste materials
Digestive system	Teeth, stomach, small and large intestines	Helps the body digest food
Respiratory system	Nose, lungs	Helps the body absorb oxygen and give out carbon dioxide
Excretory system	Kidneys, skin	Helps the body remove waste from the body
Reproductive system	Different in males and females	Helps the body reproduce



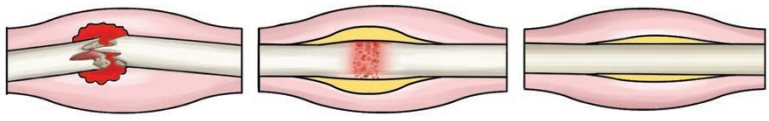
The human skeleton

in the head are flat and rounded. The bones in your little finger are short.

The skeleton of an adult is made up of 206 bones. At birth, you have more bones but these join together as you grow into an adult. As you grow bigger, new cells are added to your bones, and they also become longer and larger. Bones are hard and tough on the outside, but they are soft and spongy inside. The inside of a bone contains a jelly-like substance called the **bone marrow**, where the blood cells are produced in our body. Bones are living and can mend themselves if broken.



Inside a bone



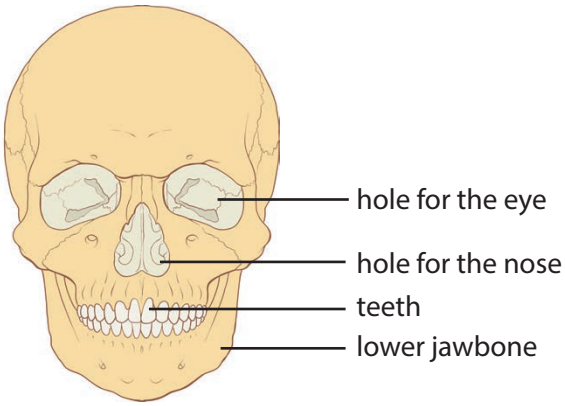
A bone repairing itself in a few weeks

Feel the bones in your arms and hands, legs and feet, head, chest, back and jaw. How many bones can you count? Some are small. Others are long. Some are curved. Guess the shape of each bone you can feel.

PARTS OF THE SKELETON

The Skull

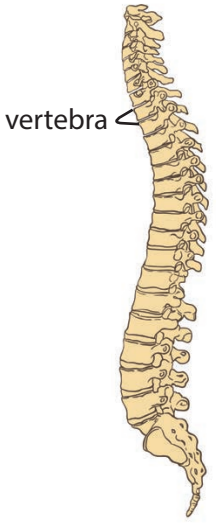
The bones of your head make up the **skull**. It protects the brain and contains holes for the eyes, nose, ears, mouth and backbone. The skull is made up of 22 different bones that are joined together. The upper part of the skull is made of 8 bones and the face is made of 14 bones. The lower jawbone is the only moving bone in the skull.



Skull

The Backbone

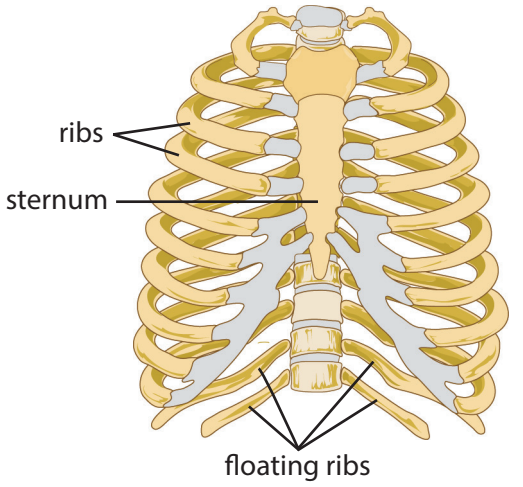
The backbone has 33 small bones called **vertebrae**, which are joined together to form the backbone. The backbone is also called the **spine** or the **vertebral column**. Each vertebra has a hole in it through which the delicate **spinal cord** passes. The vertebral column thus protects the spinal cord.



Backbone

The Ribs

The **ribs** are thin, flat, curved bones that form a cage around the heart and lungs to protect them. There are 12 pairs of ribs. They are attached to the backbone at the back. The first 10 pairs of ribs are attached to the **breastbone**



Ribcage

or the **sternum** in front. The other two pairs are not attached to the sternum and are thus called **floating ribs**.

The Limbs (Arms and Legs)

The bones of the lower limbs (legs) are attached to the **hipbone**. The upper half of the leg has a long bone called the **femur** or the thigh bone. It is the longest bone in the body. The lower half of the leg has the **shin bone** and the **calf bone**. The foot has a number of small bones. The upper limbs (arms) are attached to the shoulder blades. The upper arm has one long bone called the **humerus**.
The lower arm has two long bones. The wrist and hands have several small bones.

Answer the following questions.

1. What are the functions of the skeletal and muscular systems?
2. How many bones are found in the head?
3. What is the main function of the vertebral column?

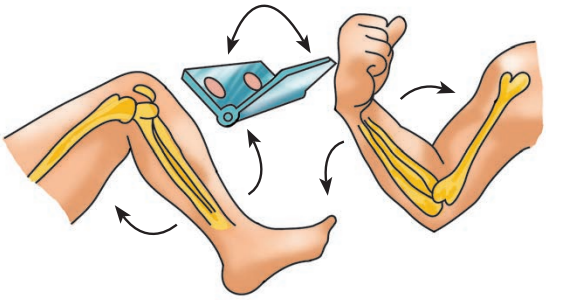
JOINTS

The most fascinating thing about the skeleton is that, even though it is strong and rigid, it can bend and move. This is possible because of the way the bones are joined. ***Joints*** *are the places where two bones are joined together.* The bones at the joints are held together by strong, stretchy bands called **ligaments**. Different joints allow different types of movement. Only the joints in the skull do not move.

The main kinds of movable joints present in the body are as follows.

Hinge Joint

A hinge joint is strong but allows only back-and-forth movement. The knees and elbows have hinge joints.



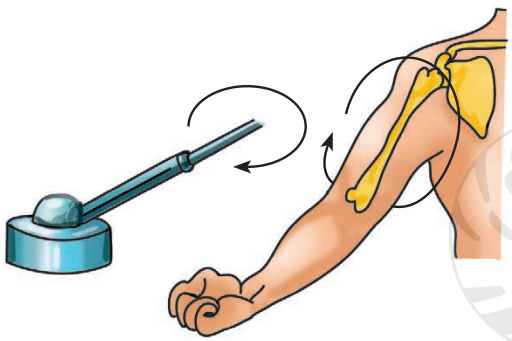
Hinge joint (knee and elbow)

Activity

Try to move your arms in all possible ways at the elbow, and then at the shoulder joint. What difference do you find in the types of movements possible?

Ball-and-socket Joint

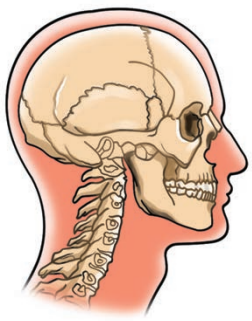
In this joint, the end of one of the bones is round like a ball. It fits into a hollow part (**socket**) in the other bone. This joint allows movement in all directions. It is present in the hip and the shoulder joints.



Ball-and-socket joint (shoulder)

Pivot Joint

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



Pivot joint

Gliding Joint

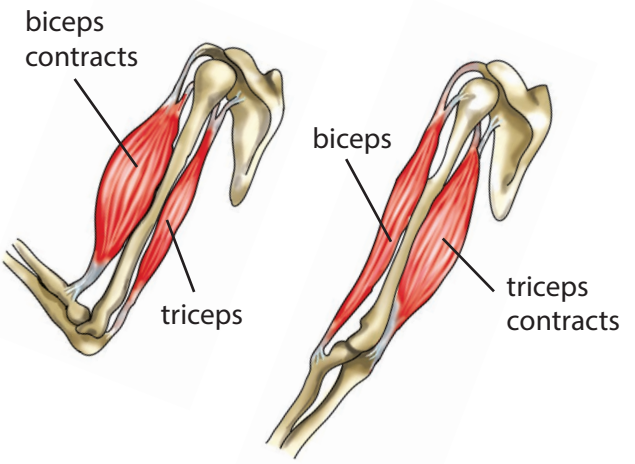
In this joint, the bones can slide over each other. It is present in the wrists and ankles. It allows side-to-side, as well as backward and forward movement.

Gliding joint (ankle)

THE MUSCULAR SYSTEM

The bones cannot move by themselves. The muscles attached to the bones pull the bones to make them move. There are more than 640 muscles in your body. Together they make up about 40% of your body weight.

Muscles are made of tough elastic tissues. They are attached to the bones by tough bands of tissues called **tendons**. Muscles can only pull at the bones. They cannot push. So, at least two muscles are needed to move a bone. For example, two muscles called **biceps** and **triceps** move our lower arm up and down. When we want



Muscle action in the human arm

to raise our arm the biceps in front becomes shorter (**contracts**) and pulls up the arm. To lower the arm, the triceps at the back contracts and pulls the arm down.

Kinds of Muscles

You can raise or lower your arm, kick with your leg, or write with your hands whenever you want to. The muscles which control these movements are in your control. They are called **voluntary muscles**. But, you cannot control the movement of your stomach. It is controlled by muscles that work on their own. They are called **involuntary muscles**. They are found in the stomach, intestines and walls of the blood vessels. Your heart is made up of a special kind of tough muscle called **cardiac muscle**. It is an involuntary muscle that works throughout your lifetime without getting tired.

Looking Back

Answer the following questions.

1. What holds the bones together at a joint?
2. Where do you find a pivot joint in the human body?
3. Can you make your heart stop?

You Now Know...

- An organ system is a group of organs that work together to perform a major function for the body. There are several such systems in your body.
- The bones in our body form a framework called the skeleton.
- Two bones meet at a joint and are held together by ligaments.
- Muscles are attached to the bones and help in the movement of the bones.
- Voluntary muscles are in our control, involuntary muscles are not.

Exercises

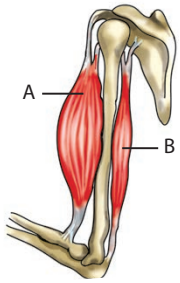
A. Multiple choice questions

1. What is the jelly-like substance inside your bone?
   a) blood b) bone marrow c) bone tissue d) blood cells
2. The vertebral column protects the _____.
   a) heart b) brain c) lungs d) spinal cord
3. Which is the longest bone in the body?
   a) humerus b) femur c) calf bone d) collarbone
4. A ligament is _____.
   a) a strong stretchy band which holds the bones together
   b) a strong band of tissue which connects the muscle to the bone
   c) the place where two bones are joined together
   d) a joint which does not allow any movement
5. Which of these is a ball-and-socket joint?
   a) ankle b) knee c) hip d) wrist

B. Mark ✓ for true and × for false statements.

1. All organs work alone to perform different functions for the body.
2. The backbone consists of one long bone.
3. All joints in the body allow movement.
4. The ball-and-socket joint allows movement in one direction only.
5. Muscles pull or push bones to make them move.

C. Study the given diagram of the arm and answer the following questions.



1. Which muscle contracts when you raise your arm?
2. Which muscle contracts when the arm is straightened?
3. What attaches the arm muscles to the bone?
4. Name the joint between the shoulder blade and bone of the upper arm.

D. Define the following.

1. Bone marrow 2. Spine 3. Femur 4. Ligament 5. Tendon

E. Answer the following questions.

1. What are the functions of the skeleton?
2. What are the functions of the ribs and the spine?
3. What is a joint? How are the bones held together at a joint?

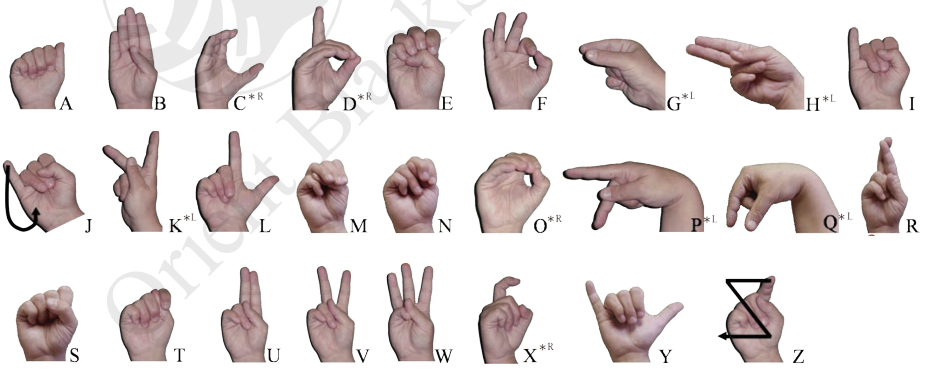
4. Name the different types of joints. Give one example of each.
5. Describe the structure of a ball-and-socket joint. What movements does such a joint allow?
6. Why are at least two muscles needed to move a bone in the body?
7. What are the differences between a voluntary and an involuntary muscle? Give an example of each.

Higher-order Thinking Skills

1. Suppose your vertebral column was a single bone. How would this have affected you?
2. If someone hits you in your stomach it hurts really badly. But a similar blow to your chest, above your heart, does not hurt so much. Why?
3. If there were no tendons attached to the bones, would you be able to move? Why?
4. What do you think would happen if the heart were made of voluntary muscles?

Life Skills

There are people who cannot speak and thus use hand movements and gestures to communicate. This is called sign language. Learn the signs for some common phrases like 'hello', 'good morning', 'how are you' and so on. Note that letters with asterisks are shown from the side (*L left or *R right), rather than as the viewer would see them.



Enrichment Activities

1. **Thumb tricks!**
   - Write your name by holding the pencil with your fingers, without using your thumb. Were you able to write? Was it difficult?
   - Touch your thumb to each of your fingers. Now touch your little finger to all the other fingers. Which was easier?
   - Look at your thumb and write about how it is different from your other fingers. (For example, the differences in movement, in shape and function).

2. **Tie a bone in a knot!**

Materials required: vinegar, glass bowl, chicken bones, tweezers, water

Method

1. Clean the bones well and place them in a bowl of vinegar.
2. Leave the bowl undisturbed for a week.
3. Take the bones out carefully with tweezers and wash them well with water.
4. Try to bend the bone. You will notice that the bone is flexible and you can knot it.

Find out from a book or from the Internet why the bones have become flexible.



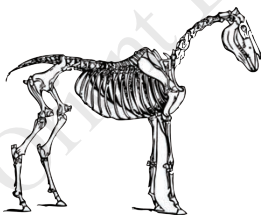

Fun Activity

Match the animal skeletons with their silhouettes.

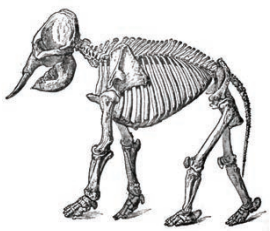
Can you name the animals?

1.

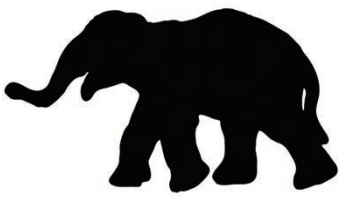
2.



3.



a.



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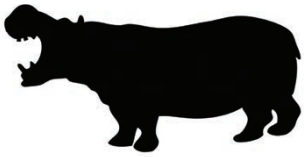
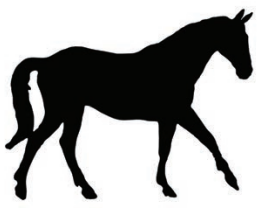


c.



Internet Links

http://www.kidshealth.org/en/kids/bones.html

https://www.dkfindout.com/uk/human-body/skeleton-and-bones/

13 Air and Water

Mind Opener

When mountaineers climb high mountains such as Mt Everest, they carry oxygen cylinders for breathing. Why?
When an aeroplane flies, its doors and windows are sealed. You are not allowed to open a window even slightly. What can be the reason?

Learning Objectives

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

- describe the layers of the atmosphere
- explain the properties of air
- demonstrate that water is a solvent
- describe the methods of removing soluble and insoluble impurities from water

THE ATMOSPHERE

You know that air is all around us. We cannot stay alive for more than a few minutes without air. We need oxygen to breathe. *The blanket of air that surrounds the Earth is called the* ***atmosphere***. It is several hundred kilometres thick.

The density of the atmosphere is not the same throughout. It is thick near the ground and becomes thinner as we go up, until it fades[1] to nothing in space. As the air becomes thinner as you go higher, breathing becomes more and more difficult. This is why mountaineers carry oxygen while climbing high mountains such as Mt Everest.

[1] fade to disappear slowly

LAYERS OF THE ATMOSPHERE

The atmosphere can be divided into several layers.

The Troposphere

The layer nearest to the Earth's surface is the **troposphere**. It extends up to about 15 km above the surface of the Earth. This is the only layer in which living things can breathe normally. This is where clouds form, bringing rain and snow. Most weather changes take place in this layer.

The Stratosphere

The layer that lies above the troposphere, the **stratosphere**, extends

The lower layers of the atmosphere

to about 50 km above the surface of the Earth. This is where jet planes usually fly.

The Mesosphere

The **mesosphere**, the layer that lies above the stratosphere, extends to about 85–90 km above the surface of the Earth. Meteors[2] burn up in this layer.

The Thermosphere

The **thermosphere** lies above the mesosphere. It extends to about 500–600 km above the Earth.

The Exosphere

The **exosphere** lies above the thermosphere and fades into space.

[2] meteor a small piece of matter that enters the Earth's atmosphere from space

THE IMPORTANCE OF THE ATMOSPHERE

The atmosphere contains oxygen, which all living things need to breathe.

It also contains carbon dioxide, which is used by plants to make food for the living world.

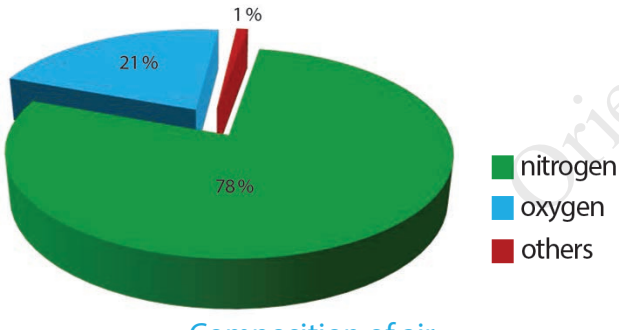
The atmosphere absorbs a large part of the heat in sunlight, and prevents the Earth from getting overheated. At night, it retains heat and prevents the Earth from getting freezing cold.

The stratosphere contains a layer of a gas called **ozone**. The Sun gives out rays known as **ultraviolet rays**, which are harmful to living things. These rays cause skin cancer and problems in the eyes. The ozone layer absorbs most of these harmful rays and thus protects all the living things on the Earth.

WHAT DOES AIR CONTAIN?

Air is a mixture of gases. About 78% of the air is **nitrogen**, 21% is oxygen and 1% is mainly **argon** and carbon dioxide. Air contains a small amount of carbon dioxide, about 0.03%. But it is very important for the living world as plants use it to make food.

Air also contains varying amounts of water vapour, dust and smoke. Water vapour in the air comes from the evaporation of water in oceans, rivers and lakes. When there is a lot of water vapour in the air, for example during the rainy season, we say that it is **humid**. *The amount of water vapour in air is called* ***humidity***. Hot, humid days are uncomfortable. You sweat a lot and your skin feels sticky.



Composition of air

PROPERTIES OF AIR

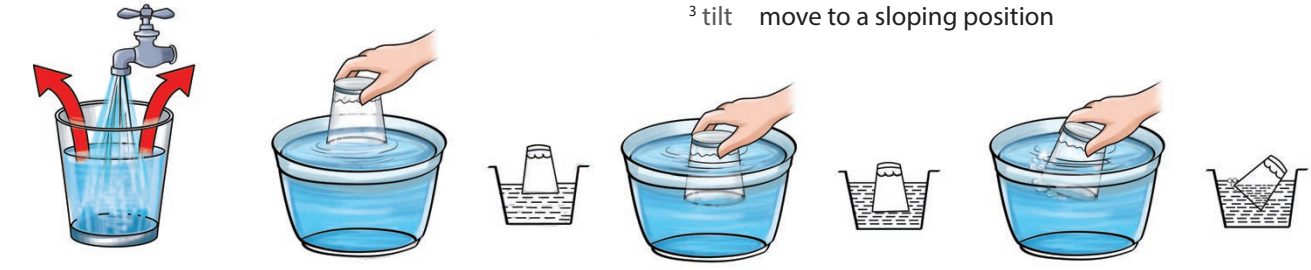
Air Occupies Space

Air is everywhere, but you cannot see it. You feel air when the wind blows or when the fan is on. An empty cup or a glass is not really empty. It is filled with air. Air occupies space.

Here is an easy way to show that air occupies space. Take an empty glass and pour water into it. Water easily fills the glass. What happens to the air that was in the glass? It escaped from the top as water fills the glass. Now let us see what happens if we do not allow the air to escape from the glass.

Take a bowl half filled with water. Stuff the bottom of an empty glass with cotton wool. Hold the glass upside down and push it slowly into the water, without tilting[3] it. Air now has no way to come out of the glass. Carefully take the glass out of water, without tilting it. Feel the cotton at the bottom. Is it dry or wet? What does this show? The cotton is still dry. Water could not enter the glass, as air could not escape.

[3] tilt move to a sloping position


Air escapes; water enters the glass. Air cannot escape. Water cannot enter the glass. Air escapes; water enters the glass.

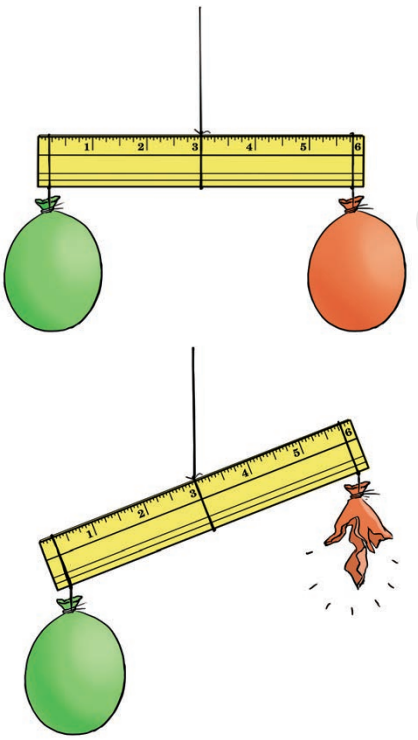
Air occupies space.

Again, push the glass into the water. Now slowly tilt the glass. You will see bubbles of air escaping. Water can now enter the glass. Feel the cotton after taking the glass out of water. Is it wet now?

Air Has Weight

You can try this simple experiment to prove that air has weight.

Tie a piece of string to the middle of a scale. Take two inflated balloons of the same size. Tie a balloon to each end of the scale. Make sure both ends of the scale are at the same level. Now prick one balloon carefully so that all the air escapes. The end of the scale with the balloon filled with air will come down. It contains air and is therefore heavier.



Air has weight

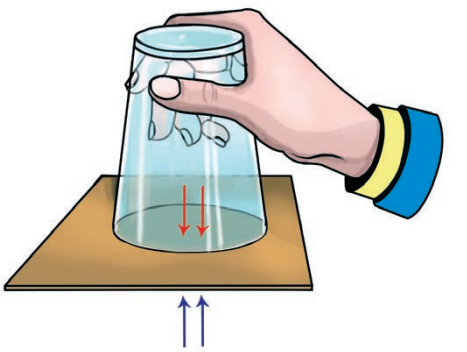
Air Exerts Pressure

Fill a glass with water up to the brim.[4] Carefully place a piece of stiff card over the mouth of the glass. Make sure that no air is trapped between the water and the card. Hold the card in place with your hand and turn the glass upside down. Remove your hand. You will find that the card will stay in place and the water will not flow out.

This is because air exerts pressure on the card from below to keep the card in place. Here, the pressure exerted by air upwards is more than the pressure exerted by water downwards. If there had been air trapped inside the glass, the card would have fallen off, because of the downward pressure exerted by the trapped air.

Air presses from all sides on everyone and everything. You can understand this by a simple experiment.

Take a plastic bottle with a tight fitting cap. Pour some hot water into the



Air exerts pressure.

[4] brim the upper edge of a cup or bowl

Air exerts pressure from all sides.

bottle and after about a minute, screw the cap back tightly. Keep the bottle in a bowl and pour cold water and ice on top of it. Now watch it collapse[5] from all sides!

Why does this happen? Water vapour from the hot water in the bottle drives out most of the air from the bottle. When the bottle is cooled, the water vapour **condenses**. There is almost no air inside the bottle now, and so the pressure exerted by it is very small. The pressure exerted on all sides of the bottle by the air outside is much more. This makes the bottle go out of shape.

Using air pressure

You use a straw to drink cold drink from a bottle or from a glass. How does this work? When you suck in the air in the straw, the air pressure inside the straw decreases. The air pressure on the surface of the drink is now more than the air pressure inside the straw. This forces the drink into the straw and your mouth.

[5] collapse fall down or lose shape suddenly

A medicine dropper and a doctor's syringe suck up liquid in the same way. Try to figure out yourself how the difference in air pressure is created in both of these.

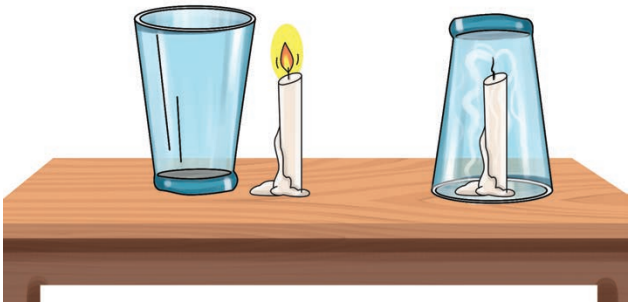
Using a straw

Syringe

When you pump air into the tyre of your bicycle, it gets harder due to increased air pressure. This allows you to ride your bicycle comfortably. Try to let some air out of your bicycle tyre and ride. What happens?

Air is Needed for Burning

Fix two small candles on a table. Ask an adult to light them. Cover one of the candles with a glass. Why does the flame go out after a few seconds? Why does the uncovered candle keep



Air is needed for burning.

burning? This activity shows that air is needed for burning.

ATMOSPHERIC POLLUTION

You know that air contains particles of dust and smoke. It may also contain some harmful gases. Dust, smoke and harmful gases make the air dirty

Air pollution from factories

or **polluted**. This **pollution** of the atmosphere is caused mainly by the release of smoke and poisonous gases from factories and vehicles. When fossil fuels such as coal or oil are burnt in a factory, or when petrol is burnt in vehicles, the poisonous gases given out pollute the air.

Looking Back

Answer the following questions.

1. Name the atmospheric layer in which most weather changes take place.
2. How can you tell that air has weight?
3. How does a straw bring the liquid up to your mouth?

WATER

Did you know that three-quarters of the Earth is covered by water? Water is found everywhere—in the oceans, lakes, rivers, under the ground, and even in the sky as water vapour. Every living thing on the Earth depends on water. Without water no living thing can survive, since water is very essential for the functioning of the body. Our blood is mostly water and it carries oxygen and food to all parts of our body.

Water Dissolves Many Things

Activity

Put a teaspoonful of salt in a glass of water. Stir the water with a spoon. The salt disappears! Now taste this water. Does it taste salty? Why? Where did the salt disappear?

The salt that you added to the glass of water did not disappear, it dissolved in the water. That is why the water became salty. The salt and water together formed a **salt solution**. The water here is called a **solvent**. Salt, the substance that dissolved in water is called a **solute**.

Water dissolves many substances. These substances are said to be **soluble** in water. The ones that do not dissolve in water are **insoluble** in water.

Salt dissolves in water.

Try dissolving different substances such as sand, sugar, flour, milk powder and pepper in water. Group them into soluble and insoluble substances.

IMPURITIES IN WATER

After water falls on the Earth in the form of rain, it flows over soil and rocks. On the way, it picks up different **minerals** and **salts** that are soluble. It also carries insoluble substances such as chalk, mud and stones. In addition, many soluble and insoluble impurities get introduced in water from wastes from homes and factories that are dumped into lakes and rivers. The water may also have disease-causing germs.

Water which has harmful impurities and disease-causing germs must be cleaned before drinking.

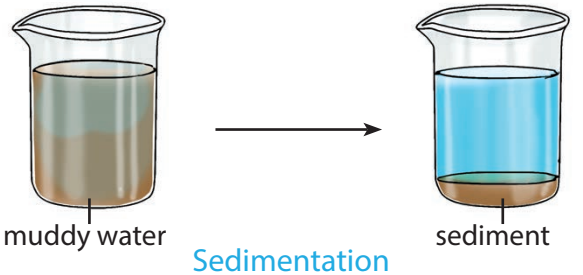
Removing Insoluble Impurities

Insoluble impurities in water can be removed by the following two methods.

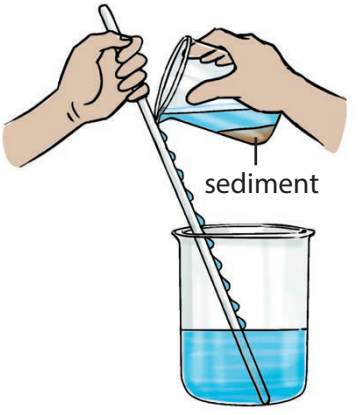
Sedimentation and decantation

Take a glass of water. Put some mud in it and stir. Does the water become muddy? Now, keep the glass undisturbed for ten minutes. You will find that the insoluble mud particles settle down at the bottom of the glass, leaving clear water on top. The mud that settles down is known as **sediment**. This method can remove heavier insoluble impurities from water. It is called **sedimentation**.

Now, carefully pour out the clear water into another glass. The sediment is left behind. This process is known as **decantation**.



Sedimentation



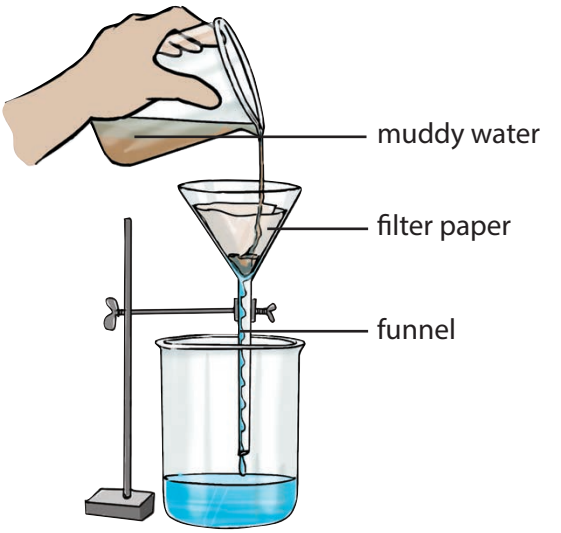
Decantation

Filtration

Take muddy water in a glass. Pour it into another glass through a piece of cotton cloth. Does the cloth hold back most of the mud, giving you cleaner water?

This is because the holes in the cloth are small, and the bigger mud particles cannot pass through them. A **filter paper** has very tiny holes in it. They are so small that you cannot even see through them. It can be used to filter out the mud to get water free from insoluble impurities. Let us see how.

Add some mud to water and stir. Take a filter paper. Fold the filter paper into half and then into a quarter. Open it out to make a cone. Take a **funnel** and place the filter paper cone inside the funnel. Place the funnel over the mouth of a glass. Now, pour the muddy water into the funnel. Clean water will collect in the glass and all the mud particles will be left behind on the filter paper.

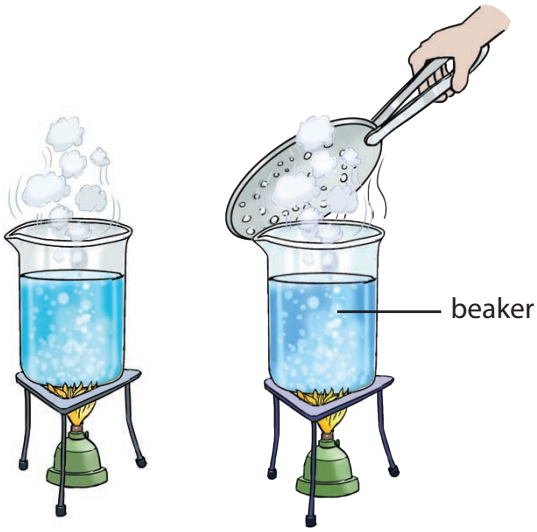


Filtration using filter paper

The water filter used in homes and offices has a filter 'candle' with very fine holes in it. It is used to filter out insoluble impurities.

Removing Soluble Impurities

Pour some salt water in a beaker and heat it. If you hold a cold steel plate on top of the dish, you will find that the steam condenses to form water droplets. These water droplets are of pure water, free from all soluble as well as insoluble impurities. You will notice that the salt is left behind in the dish after all the water has evaporated.



Evaporation Condensation

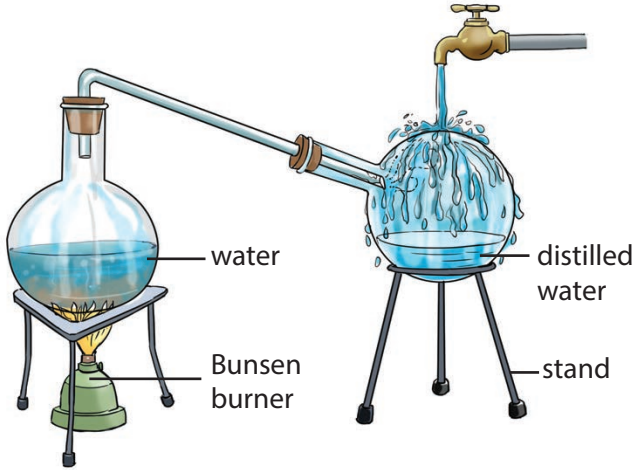
This method of **evaporation** followed by **condensation** is used to remove soluble impurities from water. It is called **distillation**.

Distillation

The distillation process consists of two steps.

Step 1: Water is evaporated in a distillation flask by heating.

Step 2: The water vapour is taken to another flask called the **condenser**, where it is cooled to form water. The condenser is kept cool by circulating cold water around it. Salt and water can be separated in this way. The water collected in this way is the purest form of water. It is known as **distilled water**. It is used in science laboratories and car batteries.



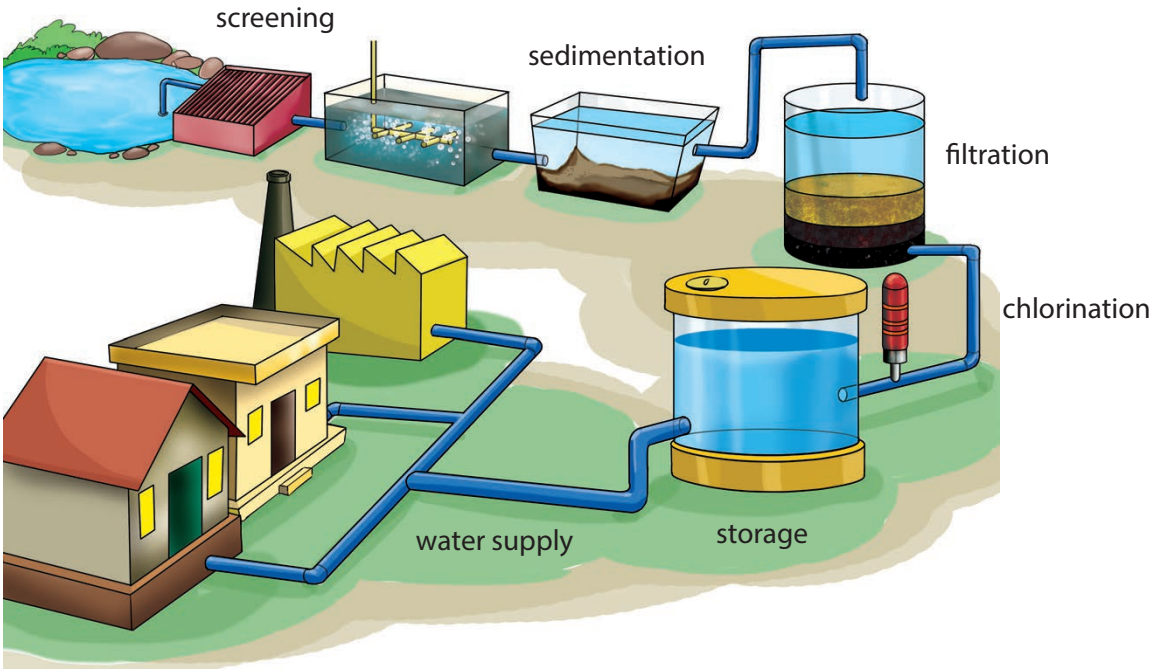
Distillation

Drinking Water

At home, water can be boiled for around 15 minutes to kill the germs and then filtered. A substance called **alum** is also used to purify water. Several types of **water purifiers** are available in the market for home use. Some use a special kind of light called **ultraviolet light** to kill germs. Others use special filters that can filter out bacteria.

The town water supply uses water from lakes and rivers. This water is purified in the **waterworks** to make it safe for drinking. The following processes are used.

Screening The water that is taken from lakes and rivers is first passed through screens that remove most of the large impurities like stones, leaves and so on. This process is called **screening**.

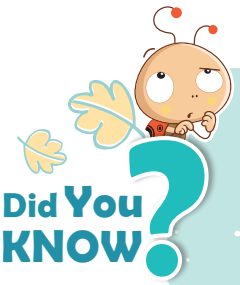


Water purification plant

Sedimentation Water is first allowed to stand in large sedimentation tanks, where all the large insoluble solid particles settle down at the bottom.

Filtration The water is then filtered through sand beds to filter out small insoluble particles. This removes most of the small insoluble particles.

Chlorination Next, chlorine is added in small amounts to kill germs.



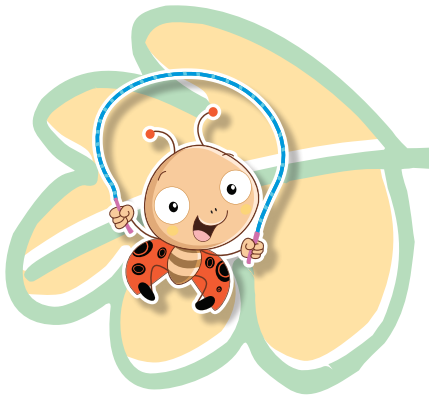
- About 80% of the sewage in India is let into rivers without being treated. This makes the water in rivers unfit for use.
- Water is the only substance on Earth that is naturally found in all three states: solid (ice), liquid (water) and gas (steam or vapour).

Answer the following questions.

1. How is water important for life?
2. Name the methods by which we can remove insoluble impurities from water.
3. Why does water need to be cleaned?

You Now Know...

- The blanket of air that surrounds the Earth is called the atmosphere.
- The atmosphere consists of five layers: the troposphere, stratosphere, mesosphere, thermosphere and exosphere.
- Air is a mixture containing 78% nitrogen, 21% oxygen and 1% other gases including argon and carbon dioxide. It also has dust, smoke and water vapour.
- Air occupies space and has weight.
- Air exerts pressure in all directions.
- Air is needed for burning.
- Water is very important to all living things.
- Harmful impurities in water have to be removed to make it fit for drinking.
- Sedimentation, decantation and filtration are used to remove insoluble impurities in water.
- Distillation is used to remove soluble impurities in water.
- In the waterworks, sedimentation and filtration are used to remove insoluble impurities. Chlorine is added to kill germs.



Exercises

A. Multiple choice questions

1. Which of the following does air contain besides nitrogen, oxygen and carbon dioxide?

   a) argon b) water vapour c) dust particles d) all of these

2. Which of these gases in the air is important for plants to make food?

   a) oxygen b) carbon dioxide c) hydrogen d) argon

3. What happens when you use a straw to suck water from a bottle?

   a) The air pressure inside the straw increases.

   b) The air pressure inside the bottle decreases.

   c) The air pressure inside the straw decreases.

   d) The air pressure on the surface of the water becomes less than the air pressure inside the straw.

4. What is the process of evaporation and then condensation of water to remove impurities called?

   a) filtration b) decantation c) distillation d) sedimentation

5. Which of these is **not** a method used in the waterworks?

   a) filtration b) distillation c) sedimentation d) chlorination

B. Mark ✓ for true and × for false statements.

1. The atmosphere is the same at both 50 km and 1 km above the Earth.
2. The percentage of carbon dioxide in the air is very low.
3. Air exerts pressure in the downward direction only.
4. Air helps in burning.
5. Water can dissolve all substances.
6. Distilled water is the purest form of water.

C. Circle the odd one out.

1.	stratosphere	atmosphere	solution	troposphere
2.	nitrogen	oxygen	solvent	argon
3.	decantation	circulation	filtration	distillation

D. Name the following.

1. The layer of gases that surrounds the Earth: _____
2. The layer of air in which weather changes take place: _____
3. The layer of air where jet airplanes fly: _____
4. The gas in the air that absorbs harmful rays from the Sun: _____
5. A special kind of light used to kill germs: _____

E. Answer the following questions.

1. Why do people who climb high mountains carry oxygen cylinders?
2. Identify the gas and give its percentage in air.
   (i) more than three-quarters of air is this gas.
   (ii) when you breathe, you take in this gas.
   (iii) the gas that plants need to make food.
3. How will you show that air is needed for burning?
4. Explain sedimentation and decantation.
5. A solid is dissolved in water. How will you get the solid back from water?
6. What is distillation?
7. How is water made fit for drinking in the city waterworks?

Higher-order Thinking Skills

1. All living things breathe in oxygen. But the percentage of oxygen in the air does not decrease. Why?
2. If there is no air, will you be able to cook your food?
3. Distillation gives the purest form of water. Why do you think distillation is not used to get drinking water?

Life Skills

Place a ✓ next to the actions which help in water conservation.

1. keeping the tap on while brushing your teeth
2. reusing water used to clean the floor to water lawns
3. taking long showers
4. washing a single shirt in a washing machine
5. repairing leaking taps and pipes

Enrichment Activities

Take some water that has been purified in the city waterworks. Carry out experiments for sedimentation, filtration, evaporation and condensation. Were any impurities left behind in each of these experiments? Note down the results in your notebook.

Internet Links

http://thewaterproject.org/resources/water_pollution_filtration_experiments

NEW SCIENCEAHEAD

CLASS 5

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

The NEP parameters	Features	Page nos.
The 4Cs		
Collaboration and Communication	Enrichment Activities	142
Critical Thinking	Higher Order Thinking Skills	10
Critical Thinking	Higher Order Thinking Skills	50
Critical Thinking	Higher Order Thinking Skills	99
Social and Emotional Learning	Life Skills	24
	Enrichment Activities	50
	Text	70–73
Multiple Intelligences	Life Skills	90
	Life Skills	128
	Enrichment Activities	142

Experiential/ Constructivist Approach

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

The NEP parameters	Features	Page nos.
Experiential/Constructivist Approach	Activity	34
	Enrichment Activities	99

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.
Subject Integration	Text (Geology)	11–14
	Exercise (Language)	66
	Enrichment Activities (Language)	142
Art Integration	Enrichment Activities	67
	Life Skills	128
Health and Wellness	Text	4–7
	Life Skills	49

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.
Values	Life Skills	39
	Life Skills	58
Life Skills	Life Skills	24
	Text	70–73
	Life Skills	107

The NEP parameters	Features	Page nos.
Sustainable Development Goals	Text	1–3
	Life Skills	18
	Life Skills	135

India Knowledge

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

The NEP parameters	Features	Page nos.
Know more about India	Our Heritage	40
	Our Heritage	108

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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