



NEW SCIENCE AHEAD



4

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

NEW!

- 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

questions that help students
review lessons
for classes 3–8

NEW!

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

Higher-order Thinking Skills

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

Exercises

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

Life Skills

- decision making
- problem solving
- critical thinking
- self management
- effective communication
- ...and more

Activities for Assessment

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

Fun Activities

- activities that make learning science joyful

Testing

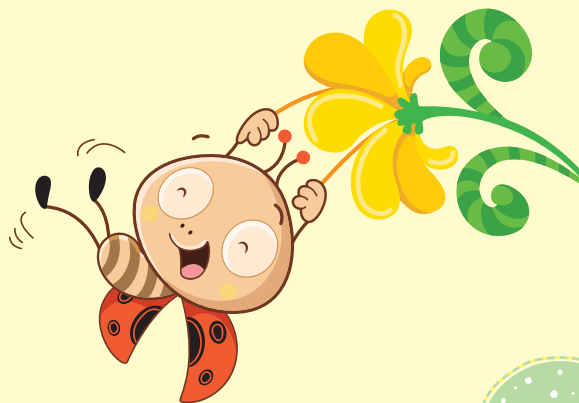
Tests

- short tests to assess students' understanding of concepts
for classes 3–8

Examination Papers

- for examination practice

NEW!



Contents



 1. Food	1	4. Matter	25
What are nutrients?		What is matter?	
Types of nutrients		The states of matter	
Carbohydrates for quick energy		Solids	
Proteins to grow		Liquids	
Fats for energy and warmth		Gases	
Vitamins and minerals for good health		Change of state	
Roughage		Solutions	
Water			
 A balanced diet		5. Our Clothes	33
Cooking food		Why do we wear clothes?	
Preserving food		What are clothes made from?	
Be Inspired! / Our Heritage		Clothes for work	
		Taking care of clothes	
		Be Inspired! / Our Heritage	
2. Digestion	10	6. How Plants Make Food	40
What is digestion?		Why are leaves green?	
The digestion process		How do plants make food?	
Digestion starts in the mouth		Plants and animals depend on each other	
Digestion in the stomach		Be Inspired!	
Digestion in the small intestine			
Undigested food		7. Adaptations in Plants	47
Good eating habits		What is adaptation?	
		Terrestrial plants	
3. Teeth and Microbes	16	Plants in deserts	
Kinds of teeth		Plants in the hills	
Incisors (cutting teeth)		Plants in the plains	
Canines (tearing teeth)		Plants in marshy places	
Premolars (crushing teeth)		Aquatic plants	
Molars (grinding teeth)		Floating plants	
Structure of a tooth		Fixed plants	
Damage to your teeth		Underwater plants	
Taking care of your teeth		Insectivorous plants	
Microbes		Fungi	
Bacteria			
Protozoa		8. Adaptations in Animals	57
Viruses		What is a habitat?	
Fungi		Adaptation to habitat	
Be Inspired! / Our Heritage			





Animals that live on land
 Animals that live in water
 Animals that live both on land
 and in water
 Animals that live on trees
 Animals that fly
 Adaptation for food
 Herbivores
 Carnivores
 Omnivores
 Parasites
 Adaptation for hunting
 and protection
 Be Inspired!

9. Reproduction in Animals

Why do animals reproduce?
 Animals that give birth to babies
 Animals that lay eggs
 Birds
 Frogs
 Insects
 Other egg-laying animals

10. Safety and First Aid

Safety at home
 In the kitchen
 In the bathroom
 Around the house
 Safety at school
 Safety at play
 Safety on the road
 First aid
 Small cuts
 Nosebleeds
 Minor burns
 Insect bites
 Fainting
 Be Inspired!

11. Force, Work and Energy

83

Force
 Kinds of forces
 The force of friction
 The force of gravity
 Work
 Simple machines
 Lever
 Pulley
 Wheel and axle
 Inclined plane
 Screw
 Wedge
 Energy
 Heat energy
 Light energy
 Electrical energy
 Sources of energy
 The Sun
 Moving air
 Moving water
 Fuels
 Be Inspired!

68



75

12. The Earth and the Solar System

93

The stars and the Sun
 The planets and the solar system
 Some facts about the planets
 The Earth
 How the Earth moves
 The Earth rotates on its axis
 The Earth revolves around the Sun
 Revolution of the Earth
 causes seasons
 Be Inspired! / Our Heritage

13. Air, Water and Weather

102

What is weather?
 How does the Sun affect weather?





What makes the wind blow?
 What causes sea breeze
 and land breeze?
 Evaporation and condensation
 The water cycle
 Hail
 Snow
 Dew and frost
 Fog
 The Earth's water
 How we get drinking water
 Our Heritage



14. Our Environment

111

What is the environment?

What does our environment
 give us?
 How do we damage our
 environment?
 Effects of air pollution
 Effects of water pollution
 Effects of land pollution
 Biodegradable and
 non-biodegradable waste
 How can you help?
 Be Inspired!



Periodic Tests 120

Examination Papers 122

Glossary 126



Orient Black Swan

List of enrichment activities included in New ScienceAhead 4

- Multiple choice questions: pages 2, 6–7, 13–14, 22, 30, 31, 37, 44, 54, 64–65, 72, 80, 89, 90, 99, 108, 116, 117
- Written assignments: page 66
- Research work on the computer (IT): Internet links at the end of every chapter
- Group work: page 56
- Simple science experiments: pages 20, 27, 28, 29, 32, 42, 46, 53, 86, 93, 104, 109, 110
- Collecting natural specimens: pages 39, 74
- Show and tell/Interviews: pages 24, 39, 82, 118
- Simple projects and presentations: pages 8, 15, 56, 69, 74
- Field tour: pages 56, 82, 110, 118
- Class response: Mind openers at the beginning of each lesson; 'Looking Back' questions
- Crafts and model making: pages 15, 92, 100–101
- Games, puzzles and quizzes: pages 7, 55, 60, 65



Our Clothes

Mind Opener

Humans are the only animals to wear clothes. Why do dogs or cats not wear clothes? What do you think is the most important reason we wear clothes?

Learning Objectives

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

- ☞ list the uses of clothes
- ☞ explain why we wear different clothes in different weather conditions
- ☞ identify the materials that clothes are made from
- ☞ explain that the clothes worn by people suit the job they do
- ☞ explain how we take care of clothes

WHY DO WE WEAR CLOTHES?

We wear clothes mainly to cover and protect our bodies. Before people learnt to make cloth, they used leaves, tree bark or the skins of animals to cover and protect their bodies. Slowly, they learnt to make cloth using cotton, wool, silk and other fabrics. They started wearing different types of clothes.

We wear clothes that are comfortable and suited to the weather conditions of the place we are in. In hot places or when the weather is hot, we wear clothes made of **cotton**. Light cotton clothes let air in. This helps

sweat to evaporate which helps the body cool down. Cotton clothes also absorb excess sweat. **Light-coloured clothes** are suited for hot weather as they do not absorb much heat.



Cotton clothes are good for summer.



Wool, fur or leather clothes keep us warm in winter.

In cold places or when the weather is cold, people wear clothes made of **wool, fur** or **leather**. Such clothes prevent body heat from escaping and thus keep the body warm.

Dark-coloured clothes are suited for cold weather as they absorb heat.

When it rains, we wear **raincoats** over our clothes. Raincoats are made



Raincoats keep us dry when it rains.

of material that does not absorb water. They prevent our clothes and bodies from getting wet.

Apart from the weather, clothes also protect us from **dust**, small **injuries** and **insect bites**. By wearing long-sleeved clothes, we can cover our arms and protect them from the bites of insects such as mosquitoes.

Looking Back



Your mother is knitting a woollen sweater for you. In what kind of weather will you wear it?

WHAT ARE CLOTHES MADE FROM?

Clothes are made from **fabrics**. Fabrics are made from **fibres**. Fibres can be natural or human-made.

Cotton is obtained from the cotton

plant. The fluffy **cotton bolls** growing on a cotton plant are picked and fibres are obtained from them. The cotton fibres are made into threads, which are then woven¹ to make clothes.

¹ woven from weave: to cross long threads over and under each other to make cloth



Animals also provide us with fibres for making clothes. **Silk** threads are made by the **silkworm**. The **wool** from sheep is woven for making winter clothes. Cotton, wool and silk are known as **natural fibres**.

Leather is made from animal skins. It is not made from fibres.

*Fibres that are not obtained from plants or animals are called **human-made** or **synthetic fibres**.* Nylon and polyester clothes are made from synthetic fibres. These fibres are made from things dug out from the Earth.

Clothes made from synthetic fibres are strong. They last longer than clothes made from natural fibres. They do not absorb much water and do not form **wrinkles**² easily. However, most clothes made from synthetic fibres do not absorb sweat and may be uncomfortable to wear in summer. Some of them can catch fire easily.



Cotton from cotton plants is used to make clothes.



Silk is made by silkworms.



Wool is obtained from sheep.

Looking Back



Fill in the blanks.

1. Cotton and wool are _____ fibres.
2. Nylon and polyester fibres are _____ fibres.
3. Clothes made from _____ fibres do not absorb water.

² wrinkle a line that is formed when cloth is folded



CLOTHES FOR WORK

People wear different types of clothes depending on their work. For example, doctors and nurses wear white coats. Their clothes should be very clean as they take care of sick people.

Soldiers wear special **uniforms** made of tough fibres. This is because they live and work in very rough conditions.

Factory workers who work with heavy machinery wear **overalls** for safety. Overalls are a single piece of clothing that cover a person from the neck to the feet. Overalls are made in such a way that they cannot get caught in machines.

You wear a uniform to school. This shows that you belong to that particular school. The teachers and security guards of the school can easily recognise you as a student and take care of you.



Policewomen in uniform



A worker in overalls



Students in uniform

TAKING CARE OF CLOTHES

If we look after our clothes well, they will last a long time. They will also look better.

Cotton, nylon and polyester clothes can be washed with a detergent. Cotton clothes look crushed after drying, so they are ironed.³

Silk and woollen clothes can be washed gently at home with a mild detergent. But it is better to have them cleaned without water. This process is called **dry-cleaning**.

We may not wear silk and woollen clothes frequently, and so we put them away. They should be stored properly, or they can be damaged by insects such as silverfish and moths. They are generally kept in boxes along with **mothballs** or dried neem leaves.

³ ironed (of clothes) made smooth using a clothes iron or press



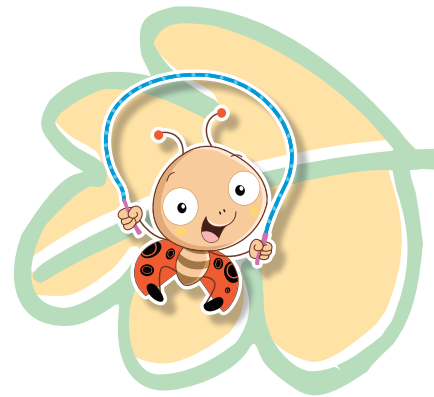
You Now Know...



- 🍃 Clothes protect us from the cold, heat, rain, dust, injury and insects.
- 🍃 People wear clothes that suit the weather conditions and the type of work they do.
- 🍃 Clothes are made from materials obtained from plants and animals, as well as from substances dug out from the Earth.
- 🍃 If we look after our clothes well, they will last for a long time.



Exercises



A. Multiple choice questions

1. Which of these is **not** a natural fibre?
a) cotton b) wool c) nylon d) silk
2. Cotton clothes are worn in summer because they _____.
a) absorb sweat b) prevent body heat from escaping
c) block air d) absorb heat
3. Which fibre do we get from sheep?
a) cotton b) wool c) silk d) polyester
4. What do factory workers wear to work?
a) uniforms b) overalls c) white coats d) jackets
5. The process of cleaning clothes without water is called _____.
a) ironing b) crushing c) drying d) dry-cleaning

B. Match the words in the two columns.

Column A

1. leather
2. nylon
3. doctor
4. soldier

Column B

- a. white coat
- b. tough uniform
- c. fibre not obtained from plants or animals
- d. animal skin



C. Look at these clothes and write down the kind of weather in which they are worn.



1. _____

2. _____

3. _____

D. Name the following.

1. A piece of clothing that prevents us from getting wet when it rains: _____
2. The insect that makes silk fibres: _____
3. Fibres that are not from plants or animals: _____
4. Single-piece clothes often worn by factory workers: _____
5. Clothes worn by school children of the same school: _____

E. Answer the following questions.

1. Why do people living in hot places wear cotton clothes?
2. What kinds of clothes do people living in cold places wear? Why?
3. How should silk and woollen clothes be stored?



Higher-order Thinking Skills

1. Can raincoats be made of cotton, silk or wool? Why, or why not?
2. The police also wear uniforms. Can you say how that helps?



Life Skills

Ask an adult at home which detergents or other materials are used in your home for washing clothes, starching them and so on. Find out how each item is used.



Enrichment Activities



1. Collect different types of cloth materials. Paste them in your scrapbook. Feel them and observe the differences between them. Look at them with a magnifying glass. Draw the patterns you see in the scrapbook.
2. Do a project on the clothes people wear in various parts of the world. Also mention the climate of those places. You can upload your project to a website and share it with your family and friends.

To make and share a website, go to <http://www.students.websiteforever.com>, the safest website builder for students, which does not require any technical expertise. This facility is provided by Orient BlackSwan and Akmin Technologies.



Be Inspired!



Anuj Sharma

Many children in India cannot afford to buy raincoats to protect themselves from the rain. Instead of buying them raincoats, however, Anuj Sharma decided to teach a few children how to make raincoats for themselves. He made use of tarpaulin, rubber bands and buttons to design raincoats that would protect the children during the rainy season.

Internet Links



<http://creativewithkids.com/yarn-wrapped-letters-classic-kids-crafts/>

<http://www.fibre2fashion.com/industry-article/2943/plant-and-animal-fibres?page=1>

OUR HERITAGE

The sari

The *sari* has been worn by women in India for thousands of years. It is made from different fabrics, like cotton, silk and polyester. Cotton and silk were the most popular fabrics used for making *saris*. People in different parts of our country wear the *sari* in different ways.



The Earth and the Solar System

12

Mind Opener

Look up at the sky on a clear night. You can see innumerable twinkling stars. Look carefully. Can you see any object that looks like a star but does not twinkle? Do you know what such objects are called?

Learning Objectives

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

- explain that the Sun and the planets form the solar system
- describe what the inside of the Earth is like
- differentiate between the two movements of the Earth and explain how they cause day and night, and the seasons

THE STARS AND THE SUN

A star is a huge ball of hot, glowing gases. It gives out heat and light. The Sun is also a star. It is the star nearest to us. That is why it appears so big compared to the other stars. All stars other than the Sun appear

as twinkling spots of light in the night sky. They cannot be seen during the day because of the light from the Sun.

Without the Sun's heat and light, the Earth would be very cold. There would be no life on the Earth.



Activity

Do you want to see how powerful the rays of the Sun are? Use a magnifying glass to focus the Sun's rays on a sheet of paper. Watch the paper burn. *Caution:* Never focus the Sun's rays on your body. The skin can get burnt. Also, never look at the Sun directly. It can damage your eyes.



Focusing the Sun's rays

THE PLANETS AND THE SOLAR SYSTEM

A **planet** is a large heavenly body that goes around a star. It does not give out its own heat and light. Our Earth is a planet.

The Earth and seven other planets move around the Sun. The eight planets, in order of increasing distance from the Sun, are as follows:

Mercury (closest to the Sun), **Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune** (farthest from the Sun)

You can see some of the planets as steady points of light in the night sky. They do not twinkle because they are closer to the Earth than the stars. These planets move around the Sun in fixed paths called **orbits**. Six

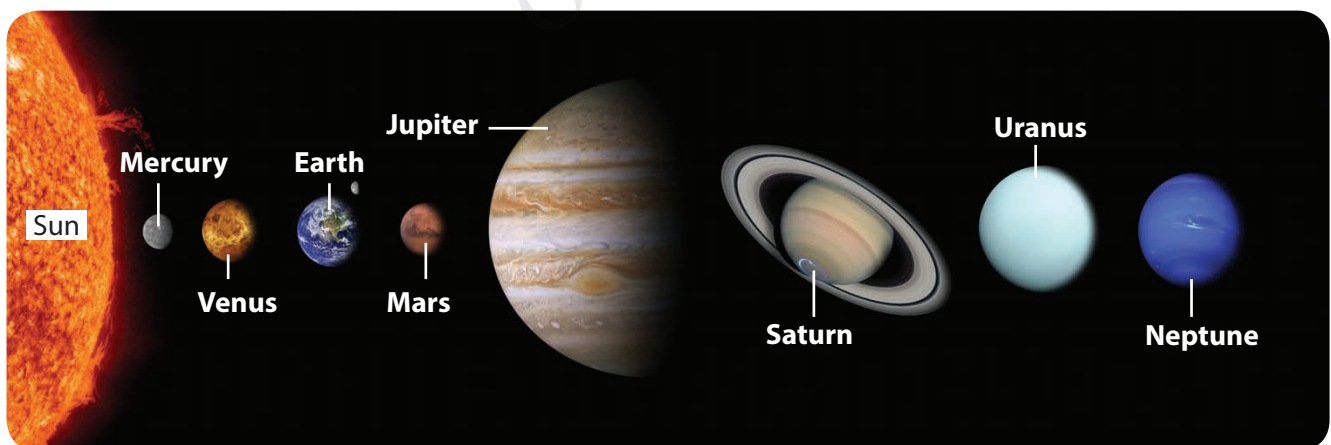
of these planets have smaller objects called **moons** moving around them. Our Earth has only one Moon. Mercury and Venus do not have any moons.

The Sun, the planets and their moons belong to a family of objects called the **solar system**.

Some Facts about the Planets

Mercury, Venus, Earth and Mars—which are close to the Sun—are called the **inner planets**. They are made up of rock.

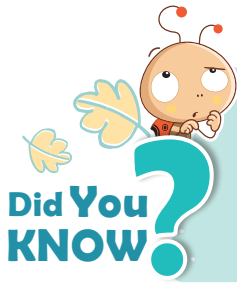
Mercury, the planet nearest to the Sun, is very hot during the day and very cold at night. It has no moons. There is very little air around Mercury.



The solar system

Note: Sizes of objects and distances between them are not to scale.





Till 2006, Pluto was considered the ninth planet in the solar system. However, in the year 2006, scientists decided that it is too small to be called a planet.

Venus is the hottest planet. It is the planet closest to the Earth. It shines the brightest among all planets. It can be seen in the morning and evening. Hence, it is often called the **morning star** or the **evening star**. Venus also does not have any moon.

Our **Earth** is the only planet that is known to have life. It is neither too hot nor too cold. It has water and is surrounded by air containing oxygen. It has one moon.

Mars is known as the **red planet**. It appears red because of the red dust that covers it. It has two moons.

Jupiter, Saturn, Uranus and Neptune are further away from the Sun than the inner planets and are called the

outer planets. They are very cold and are made up mainly of gases.

Jupiter is the largest planet. It has 67 known moons. It has a big red spot on it. This is actually a huge storm that has been blowing for years.

Saturn is the second-largest planet. It has 62 known moons. When we observe Saturn through a powerful telescope, we can see many rings around the planet.

Uranus is the third-largest planet. It has 27 known moons.

Neptune is a very windy planet—strong winds with speeds of 2000 kilometres an hour blow across the planet. It has 14 known moons.

Looking Back



Answer the following questions.

1. We can see planets as steady points of light in the sky. Why can we see them even though they do not give out light of their own?
2. Why do you think Venus shines brightest when seen from the Earth even though there are other planets that are much bigger?



THE EARTH

The Earth is a huge ball of rock. We live on the outer surface of the Earth, which is cool and has conditions suitable for life. This thin outer surface is called the **crust**. But the Earth is not the same inside.

Below the crust is the **mantle**, which is very hot and made up of almost molten¹ rock. In the centre is the **core**. It is the hottest part of the Earth. It consists of metals.

You may have heard of **volcanoes** erupting, sending out hot lava and causing great damage. Volcanoes are actually cracks or holes in the crust of the Earth. Molten rock called **magma** is sometimes forced out from the mantle of the Earth

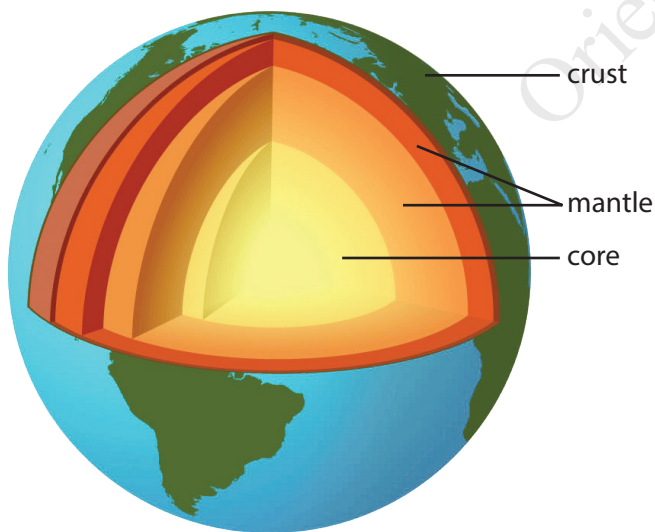
through these cracks or holes. The magma that flows out is called **lava**. It is red hot and hardens to form rocks on cooling. This shows how hot the Earth is deep inside.



Lava flowing from a volcano

HOW THE EARTH MOVES

The Earth is always moving. It spins like a top, and at the same time, it travels around the Sun.



The structure of the Earth

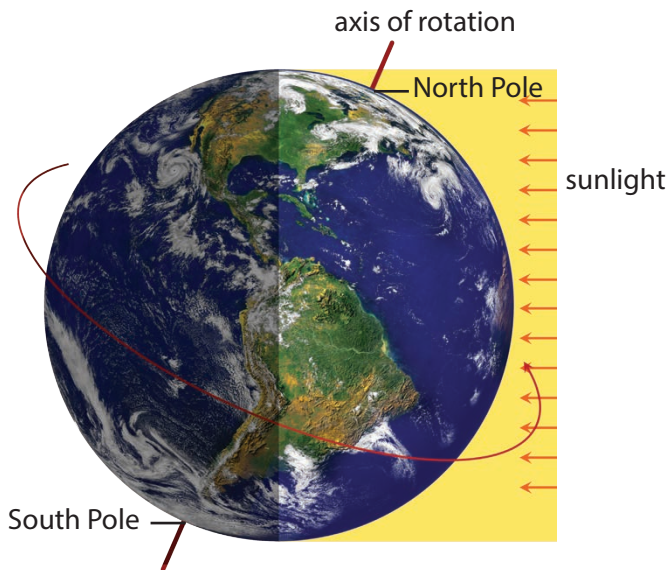
The Earth Rotates on its Axis

The spinning movement of the Earth is called **rotation**. Observe a rotating top. It appears to spin around a line passing through its centre.

The Earth spins in a similar way, around an imaginary line passing through its centre. This imaginary line passes through the North and South Poles of the Earth. It is called the **axis of rotation**.

¹ molten made into a liquid because it is hot





Rotation of the Earth causes day and night.

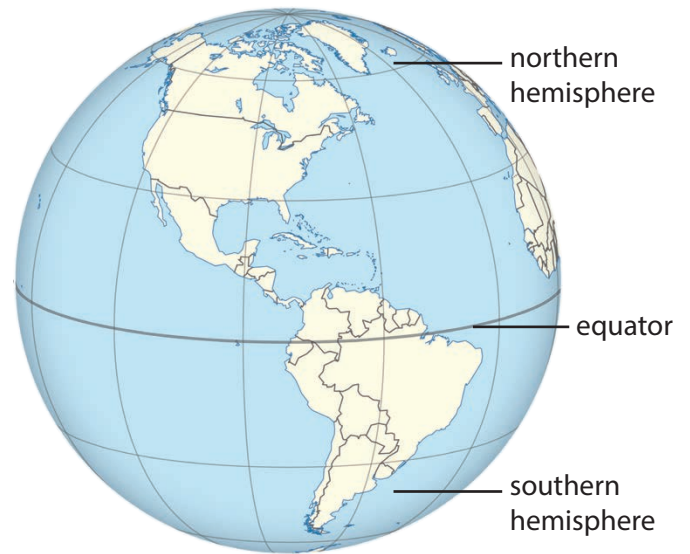
The Earth completes one rotation in 24 hours. The rotation of the Earth causes day and night.

The Earth Revolves around the Sun

The Earth moves around the Sun in a fixed path called an orbit. This movement of the Earth is called **revolution**. The Earth revolves around the Sun once in about 365 days or 1 year.

Revolution of the Earth Causes Seasons

You know that the weather changes throughout the year. It is hot in the summer months and cold in the winter months. Days are longer in summer than in winter. This happens



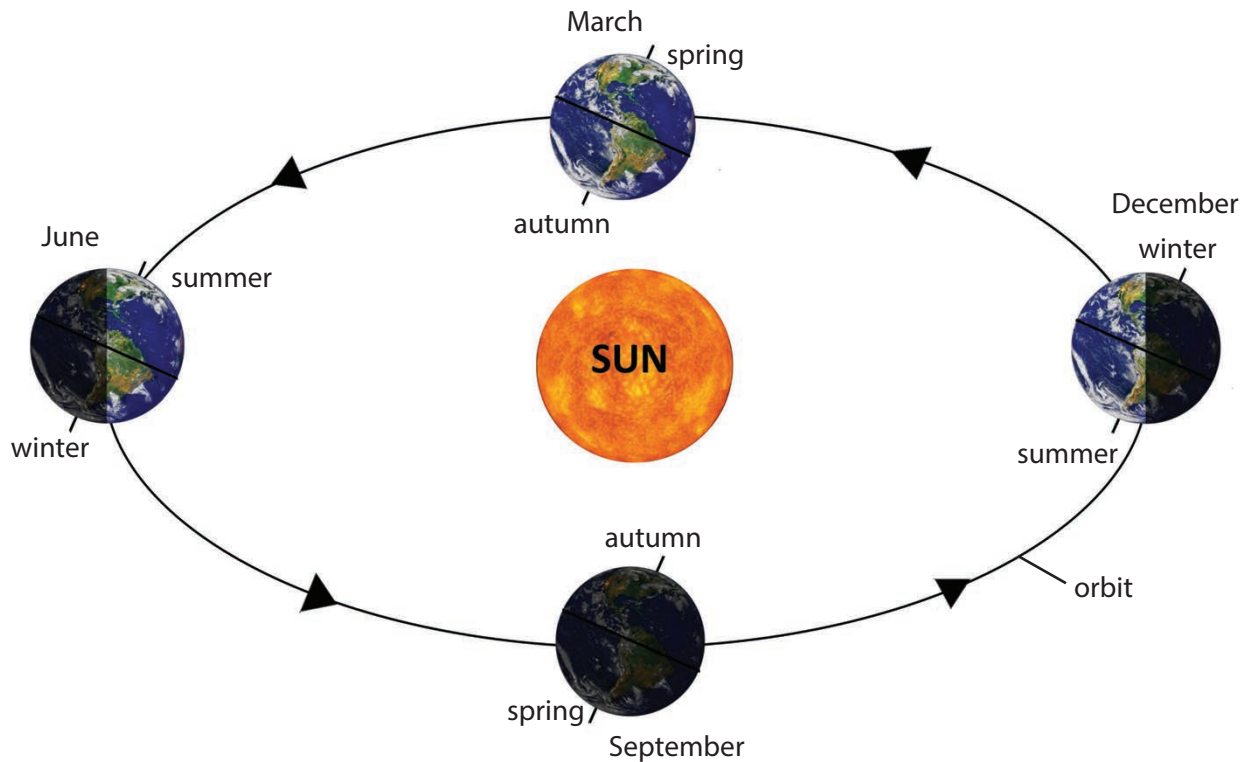
The equator and the hemispheres

because of the revolution of the Earth around the Sun. Let us see how.

There is an imaginary line which divides the Earth into two halves—the northern hemisphere and the southern hemisphere. This line is called the **equator**. India is in the northern hemisphere, whereas Australia is in the southern hemisphere.

When the Earth revolves around the Sun, it is tilted to one side. When the North Pole is tilted towards the Sun, the northern hemisphere gets more sunlight and has summer. At this time, the South Pole is tilted away from the Sun. The southern hemisphere gets less sunlight and has winter. So, when it is summer in India, it is winter in Australia.





Revolution of the Earth causes seasons.

After a few months, when the Earth reaches the other side of the Sun, the South Pole is tilted towards the Sun, and the North Pole is tilted away from the Sun. So, the southern hemisphere has summer and the northern hemisphere has winter.

Looking Back



Answer the following questions.

1. Do you think there is life deep in the mantle of the Earth?
2. How many types of movements does the Earth have? Name the movements and give one effect of each.



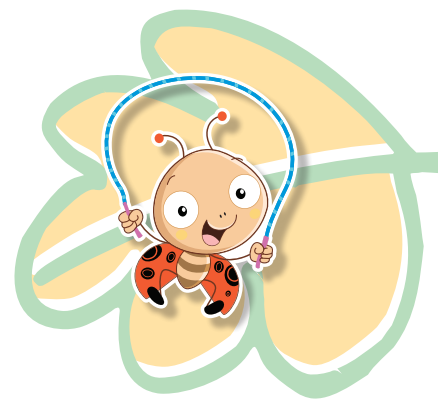
You Now Know...



- 🍃 A planet is a large heavenly body that goes around a star.
- 🍃 The Sun, the eight planets and their moons belong to the solar system.
- 🍃 The crust of the Earth is cool and has life. The mantle and core inside are very hot.
- 🍃 The Earth rotates on its axis and also revolves around the Sun.
- 🍃 The revolution of the Earth and its tilted axis of rotation cause the seasons.



Exercises



A. Multiple choice questions

- Which of these give out their own light?
a) stars b) planets c) moons d) all of these
- Which of these planets is closest to the Sun?
a) Mercury b) Earth c) Mars d) Venus
- Which is the hottest part of the Earth?
a) crust b) core c) mantle d) equator
- The Earth rotates around its _____.
a) orbit b) equator c) axis d) poles
- How many times does the Earth rotate on its axis in one day and one night?
a) once b) twice c) 365 times d) 365×2 times

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

- All stars appear as tiny points of light in the night sky.
- Without the Sun, there would be no life on the Earth.
- Mercury is the hottest planet.
- Venus is called the day star.
- The Earth is the biggest planet.

C. Name the following.

- The planet closest to the Sun: _____
- The morning star: _____
- The red planet: _____
- The planet with the largest number of moons: _____
- The planet farthest from the Sun: _____

D. What are the following?

1. mantle 2. volcano 3. magma 4. lava 5. equator

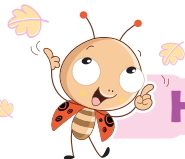
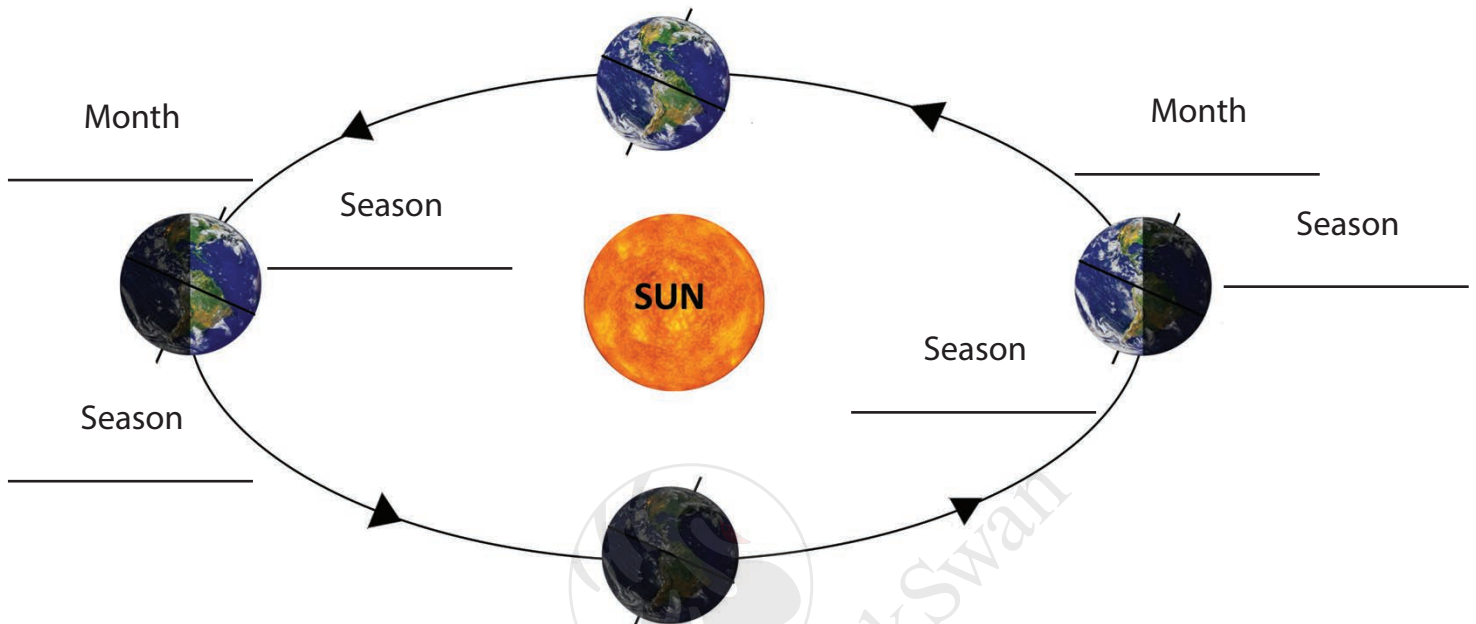
E. Answer the following questions.

- What is the solar system?



2. What is rotation of the Earth? How long does the Earth take to complete one rotation?
3. What is revolution of the Earth? How long does the Earth take to complete one revolution?
4. What causes the seasons?

F. Fill in the blanks with the month of the year and the season.



Higher-order Thinking Skills

1. Suppose the Sun was 10 times as far away from us as it actually is. How do you think this would affect us?
2. Lenny plans to visit her friend in Australia in June. What kind of clothes should she pack?
3. Imagine that the Earth is not tilted. What effect would this have on the seasons?
4. What would happen if the Earth were stationary (did not move)?



Enrichment Activities

1. **Make your own volcano!**

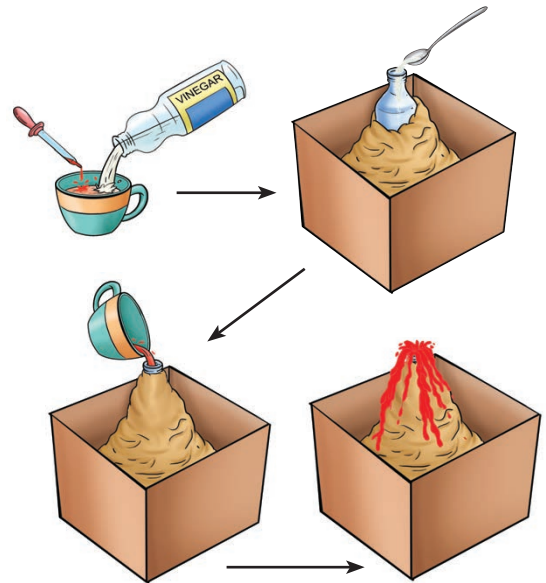
Materials required: a cup, vinegar, red food colour, baking soda, a bottle, clay, a cardboard box

Method

Fill the cup with vinegar and add a few drops of red colour. Half fill the bottle with baking soda and stand it in the cardboard box. Pack clay around it to make it look like a volcano. Leave the top open. Pour the red vinegar down the hole. Watch your volcano erupt!

2. Do a project on the solar system. You can also make a website on the project and share it with your family and friends.

To make and share a website, go to <http://www.students.websiteforever.com>, the safest website builder for students which does not require any technical expertise. This facility is provided by Orient BlackSwan and Akmin Technologies.



Be Inspired!

Aryabhata

Aryabhata (5th century BCE) was a famous Indian astronomer and mathematician. He explained that the Earth spins on its axis, thus causing day and night. He correctly said that the Moon rotates around the Earth and that it reflects the light of the Sun. He also explained how the eclipses of the Moon and the Sun were caused.



A statue of Aryabhata

Internet Links

<http://spaceplace.nasa.gov/solar-system-explorer/en/#/review/solar-system-explorer/game.swf>
<http://spaceplace.nasa.gov/all-about-earth/en/>
<http://www.kidsastronomy.com/fun/memory.htm>

OUR HERITAGE

Mangalyaan

Mangalyaan is a satellite to Mars that was launched by the Indian Space Research Organisation (ISRO) on 5 November 2013. It arrived successfully at Mars on 24 September 2014. The satellite was launched to study the physical characteristics and the atmosphere of the planet. India is the first country to successfully reach Mars on the very first try.



NEW SCIENCE AHEAD

CLASS 4



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		
Collaboration	Enrichment Activities	56
Critical Thinking	Higher Order Thinking Skills	38
Collaboration	Higher Order Thinking Skills	66
Collaboration	Higher Order Thinking Skills	81
Social and Emotional Learning	Life Skills	8
	Text	43
Multiple Intelligences	Enrichment Activities	66
	Enrichment Activities	91
	Enrichment Activities	118

The NEP parameters	Features	Page nos.
Experiential/Constructivist Approach	Enrichment Activities	15
	Activity	53
	Enrichment Activities	110

The NEP parameters	Features	Page nos.
Subject Integration	Did You Know? (History)	95
	Enrichment Activities (General Awareness)	82
	Activity (General Awareness)	93
Art Integration	Enrichment Activities	100–101
	Exercise	109
Health and Wellness	Text	12–13
	Life Skills	23
	Text	75–79

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	Be Inspired!	39
	Be Inspired!	119
Life Skills	Life Skills	15
	Life Skills	66
	Life Skills	118

The NEP parameters	Features	Page nos.
Sustainable Development Goals	Be Inspired!	9
	Life Skills	91
	Life Skills	109

The NEP parameters	Features	Page nos.
Know more about India	Our Heritage	9
	Our Heritage	24
	Our Heritage	110

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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OrientBlackSwanSchools

3-6-752 Himayatnagar, Hyderabad 500 029, Telangana, INDIA
 customercare@orientblackswan.com | www.orientblackswan.com