ELEMENTARY SCIENCE

Class Five

National Curriculum and Textbook Board, Bangladesh

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Elementary Science

Class Five

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A child is a great wonder. There is no end to the thinking about his/her world of wonder. A child is a subject of contemplation for educationists, scientists, philosophers, child specialists and psychologists. The fundamental principles of children education outlined in the National Education Policy 2010 have been defined in the light of these contemplations. The curriculum for primary education has been revised to develop a child on the potentials of his/her innate amazement, unbounded curiosity, endless joy and enthusiasm keeping in view the all-round development of children's potentials. The aims and objectives of primary education were modified in the revised curriculum of 2011.

Children have different objects around them. Every moment various events are taking place in nature. Rainbow in the sky, trees,birds, flowers, the morning sun, the star studded night sky-all are of profound joy and endless amazement. This feeling of joy by a learner awakens in him/her the curiosity and inquisitiveness to ask questions on different objects and events he/she observes. The revised curriculum has due importance to the realization that the aim of science education is to develop the scientific attitude among the learners. In fact, there is no joy in memorizing some dull and unrelated information. Information changes with new discoveries and inventions . Two fundamental streams are very important in **science education.** One is the acquisition of knowledge and the other is raising questions, experimentation, observation and participation through testing of information and theories. These two streams are complementary to each other. Another objective of the revised curriculum is to maintain consistency among different branches of science as well as between science and technology.

To make the young learners interested, enthusiastic and dedicated, Bangladesh Awami League Government under the dynamic leadership of the Honorable Prime Minister Sheikh Hasina has taken initiatives to change the textbooks into four colors, and make them interesting, sustainable and distributed free of cost since 2009. The textbooks of Pre-primary, Primary, Secondary, lbtedaie, Dakhil, Dakhil Vocational and SSC Vocational level are being distributed free of cost across the country which is a historical initiative of the present government.

My sincere acknowledgement and thanks to all who had helped in different stages of composition, edition, rational evaluation, printing and publication of the textbook. Though all cares have been taken by those concerned, the book may contain some errors/lapses. Therefore, any constructive and rational suggestions will be highly appreciated for further improvement and enrichment of the book. We will deem all our efforts successful if the young learners for whom it is intended find it useful to them.

Professor Narayan Chandra Saha

Chairman

National Curriculum and Textbook Board, Bangladesh

Major Features of the Revised Primary Science Textbooks

(1) User-friendly

- Learning contents, illustrations and text presentations are developed considering the developmental stage of pupils, which emphasise mainly on the conceptual development rather than rote learning.
- Enquiring of pupils' prior knowledge and experience are tried to address in the lesson.
- Grade appropriate simple texts and child friendly description.
- Clear titles, subtitles, and large number of illustrations and photographs.
- Abstract things of science are portrayed with pictures/photographs as well as proper description.
- Introduction of characters and symbols to make lesson easy-to-understand & attractive for the children.
- New scientific terminologies used in each chapter are highlighted with coloured and bold letters.
- Addition of glossary at the end of the textbook.

(2) Emphasis on problem-solving based learning

- The key questions highlighted as the core points of teaching learning in each lesson.
- Experiment related alternative equipment/teaching aids are suggested.
- Basic layout of textbooks follows the sequence of problem solving approach.
- Learning activities aimed at the acquisition of scientific process skills necessary for children to solve the problem.

(3) Enhancement of learning activities

- Introduction of a variety of experiments, demonstration, observation and investigation activities to promote scientific attitude.
- Introduction of the discussion activities to foster communication skills, expression ability and positive attitude of the pupils.
- Teaching aids are suggested in consideration with the relevance of the lesson outcomes and the availability.

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Characters and Symbols

1) Characters

Jui

Dipu

Jui and **Dipu** will give you some tips or clues about your learning. Let's learn science together!

2) Symbols

Activity: Let's observe, investigate and experiment!

Discussion: Let's discuss with classmates!

Caution: Let's pay careful attention to remain safe!

Chapter 1

Our Environment

1. Relationship between Living and Non-living Things

All the things in the environment can be classified into living things and non-living things. People, animals and plants are living things. Soil, water, air, cars, chairs etc. are non-living things.

relationship between living and non-living things

QUESTION : How do living things depend on non-living things?

Activity : Needs of living things for survival

What to Do:

1. Make a table like the one shown below.

living things	non-living things needed to survive
human	
other animals	
plants	

2. Make a list of non-living things that living things need for survival in the table.
3. Share your ideas with your classmates.

Are sunlight and air non-living things, or not?

Plants need sunlight, air, and so on to make food.

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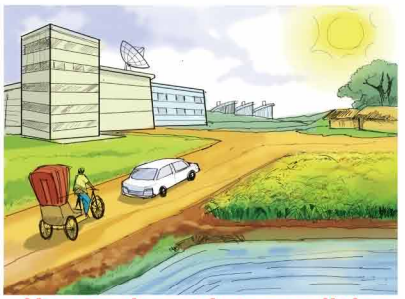
Summary

Human

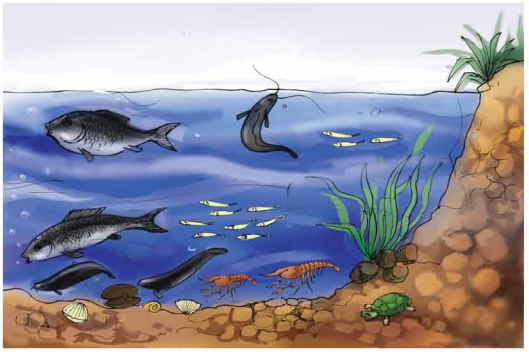
Human depend on non-living things. They need air to breathe, water to drink, and food to get nutrition for survival. They also use soil for growing crops and land to build their shelter. However, human needs shelter, furniture, clothes, appliance etc. to live.



Human depend on non-living things in their life.

Other Animals

Other animals also depend on non-living things for survival. Animals need air, water, and food to live. They use soil and water as habitat. Some animals like insects or earthworms live in soil, some such as fish or prawn live in water.

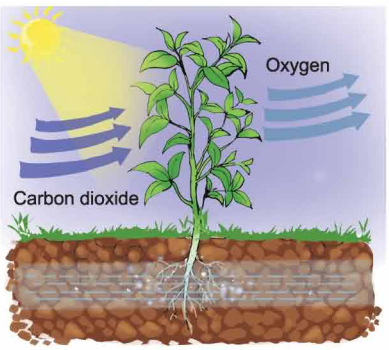


animals in water

animals in soil

Plants

Plants depend on non-living things to survive in their environment. Plants use sunlight, water and carbon dioxide from the air to make their own food. Plants such as water lily and water hyacinth also use water as habitat.



Plants depend on non-living things.

Living things depend on non-living things for survival in the environment. All living and non-living things that exist and interact in one place is called an **ecosystem**.

2. Mutual Dependence between Plants and Animals

QUESTION : How do plants and animals depend on each other?

Activity : Mutual Dependence

What to Do :

1. Make a table like the one shown below.

living things	how they depend on each other?
Plants	
Animals	

2. Seeing the picture below, make a list of how plants and animals depend on each other in the table.
3. Share your idea with your classmates.

Summary

The plants and animals depend on each other in the environment.

Animals

Animals depend on plants in many ways. Animals use the oxygen given off by plants. Animals eat various parts of plants such as stems, leaves, fruits to get energy. Plants are also used as shelter by the animals. Several animals like monkey, squirrel and insects use plants for their shelters. Birds make their nests on trees. Human beings also use plants to make their houses.

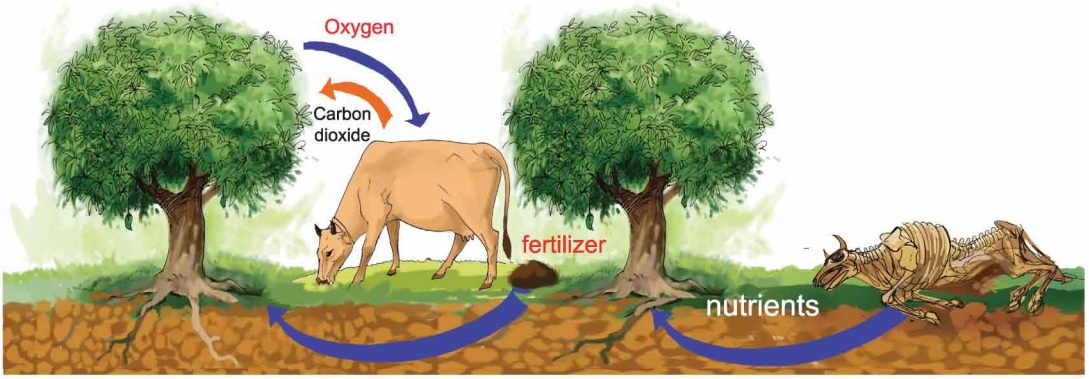
Plants

Plants depend on anmals for growth, making food, pollination, and seed dispersal. Plants use the carbon dioxide given off by animals to make food. Plants depend on animals for nutrients too. When animals die, the dead remains become fertilisers in the soil. Plants use the fertilisers as nutrition to grow. Through pollination plants make seeds.

pollination

New plants grow from these seeds. Animals such as birds, bees help plants in their pollination. **Seed dispersal** means the transport of seeds away from the parent plant. Seed dispersal helps plants to create new colonies.

Like this, plants and animals depend on each other in the environment.



mutual dependence between plants and animals

3. Energy Flow

Living things need energy for survival. Plants get energy from the Sun. Animals get energy from food.

QUESTION : How do animals depend on other living things to get energy?

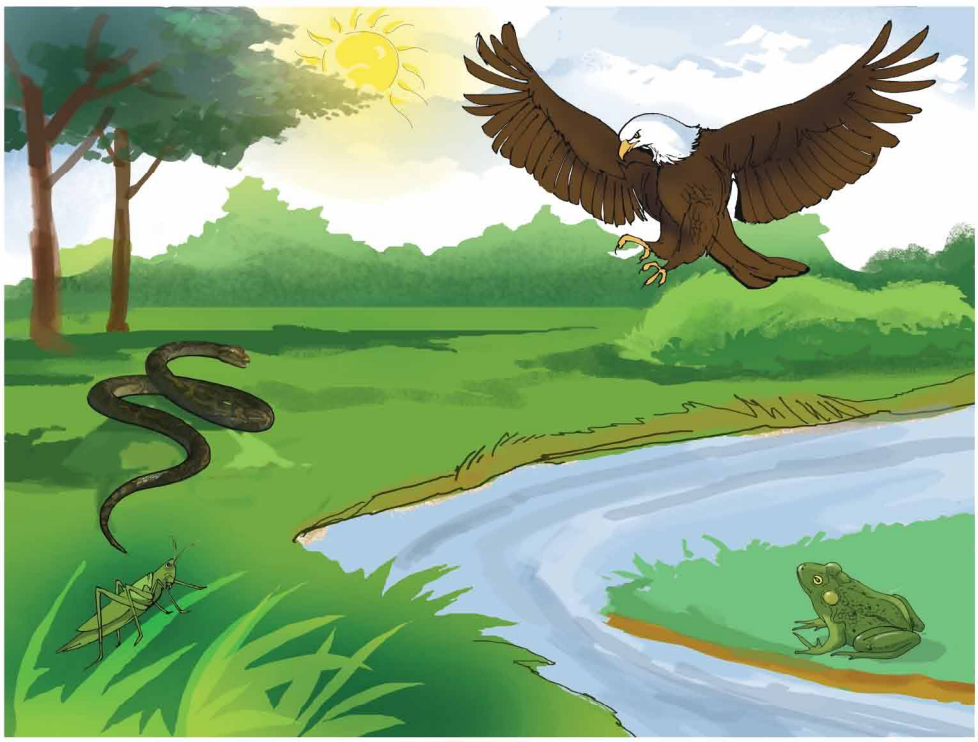
Activity : Eating and Being Eaten

What to Do :

1. Make a table like the one shown below.

Relationship of living things between 'Eat' and 'Be eaten'			
eaten by →	eaten by →	eaten by →	eaten by →

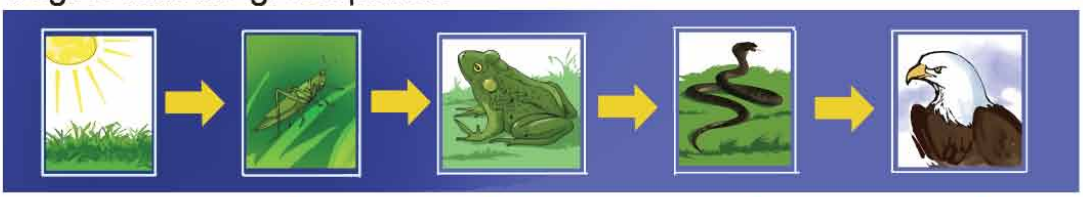
2. Seeing the picture below, write the name of the living things in order of the living thing eaten by another living thing in the table.
3. Share your ideas with your classmates.



Summary

Food Chain

All animals directly or indirectly depend on plants for their energy. A plant produces its own food using the energy of the sunlight. An insect eats the plant, and a frog eats the insect. In the same process the frog is eaten by a snake, and then the snake is eaten by an eagle. Like this, energy is passed from plants to animals. The path of food energy in an ecosystem from plants to animals is called **food chain**. The food chain begins with the green plants.

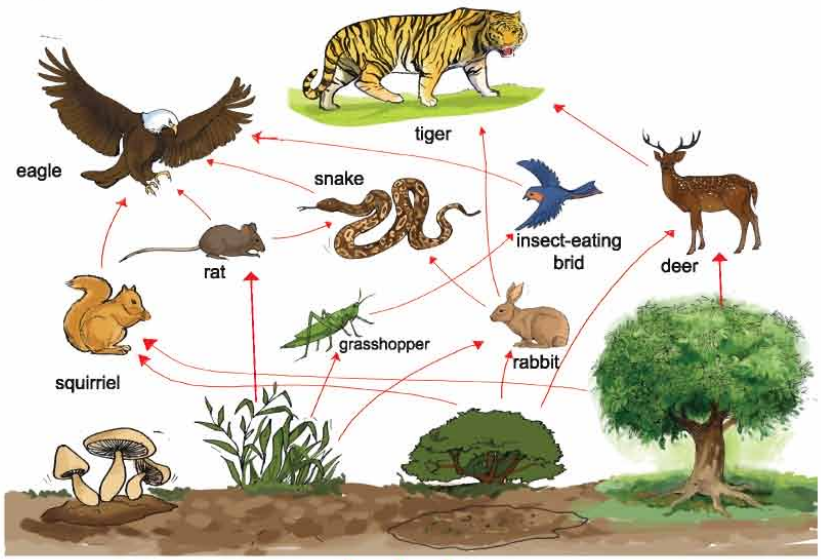


grass grasshopper frog snake eagle

food chain

Food Web

In any ecosystem, there are many food chains. All the plants and animals are part of several food chains. For example, a hawk may eat a mouse, a squirrel, a frog or some other animals. The snake may eat a rabbit, a rat, or some other animals. Several food chains connecting together make a **food web**.



food web

EXERCISES

1. Put a tick mark (✔) on the correct answer.

1) Which one is an original source of energy?
   a. plants b. the Sun
   c. the Moon d. animals

2) For which one do animals depend on plants?
   a. light b. water
   c. food d. air

3) Which one is the correct food chain?
   a. grasshopper → grasses → snake → frog
   b. frog→ grasshopper → grasses → snake
   c. snake → grasshopper → grasses → frog
   d. grasses → grasshopper → frog → snake

2. Short Answer Question:

1) What are the differences between food chain and food web?
2) How do plants depend on animals?
3) Give three examples of non-living things that human depend on.
4) What is pollination?

3. Descriptive Answer Question:

1) Explain how snakes and eagles are similar in a food chain.
2) Describe the correct sequence of food chain that has the following things:
   Eagle, Sun, grasses, insects, snake, frog
3) Explain how living things depend on air.
4) Explain why seed dispersal is important for plants.
5) A plant inside your room appears to be dying. Your friend suggests that you to move the plant at the window. Why?

Chapter 2

Environmental Pollution

We use environment in various ways to survive. As a result, different changes occurred in the environment. When the changes are harmful to living things, we call it environmental pollution. Environmental pollution is the addition of harmful or poisonous substances into the environment.

1. Pollution in our Environment

QUESTION : What causes environmental pollution?

Activity : Pollution of our surrounding environment

What to Do :

1. Copy the observation sheet like the one shown below in your notebook.

Observation Sheet

Observing site: _____ Observation date: _____

Let's sketch the pollution you found

2. Go out of the classroom with your notebook and find the pollution around.
3. Sketch the observations in the observation sheet.
4. Share your ideas with your classmates.

Discussion

- **Think about the following points:**
  1. What kinds of pollution are there around us?
  2. What are the causes of the pollution?
  3. Share your ideas with your classmates.

Summary

One of the great problems that the world is facing today is environmental pollution.

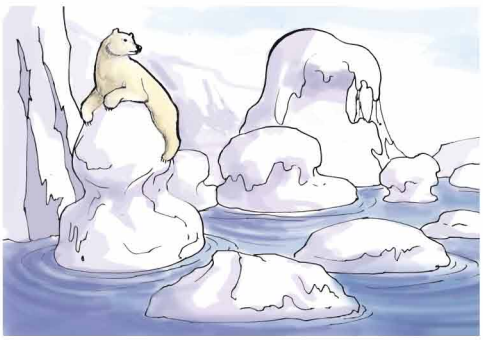
Causes and Sources of Environmental Pollution

Industrialisation is one of the main causes of pollution. Industrialization set in motion the widespread use of **fossil fuels** such as oil, gas, and coal. These are now the main sources of pollution. Population growth is also the fundamental cause of pollution. To meet their need such as food, shelter or natural resources, people are destroying environment. Human activity causes most of the environmental pollution.

environmental pollution

Effects of Environmental Pollution

Pollution is causing a lot of damage to human, animal, and the environment. Pollution causes different diseases such as cancer, respiratory diseases, waterborne diseases, and skin problems. Effects of pollution on animals are the destruction of their habitats and food chains. As a result many animals get extinct. Avarege temperature of the Earth is also increasing. Many glaciers continue to melt and results in sea level rise.



Global warming causes melting of glacier.

2. Types of Environmental Pollution

There are different types of pollution namely air, water, soil and noise pollution.

(1) Air pollution

Air pollution is the addition of harmful gases, dust particles, smoke or odour into the air. Smoke emitted from vehicles and industries is one of the main causes of air pollution. Smoke emitted from burning wood and garbage also cause air pollution. Throwing garbage or urinating anywhere causes the foul odour in the air. Air pollution can have negative effects on the environment such as **global warming** and **acid rain**. It can also make people sick with lung cancer, respiratory diseases etc.

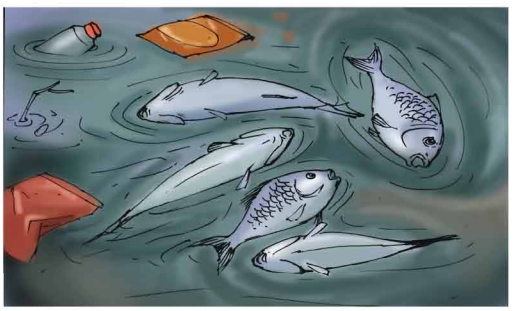
cause of air pollution

effect of acid rain

(2) Water pollution

Water pollution is the addition of harmful things to water. Water pollution is caused by harmful things from sewage, waste water from household or factories. Besides, disposal of garbage and waste into water, washing and clothes in ponds or rivers cause water pollution. Water pollution can cause death of aquatic animals and disruption of food chains in water. Human is also affected by skin disease and waterborne diseases like diarrhoea or cholera.

cause of water pollution



effect of water pollution

(3) Soil pollution

Soil pollution is the contamination of soil with harmful things. Soil contamination is caused by the use of pesticides and fertilisers in agriculture, waste disposal from household and hospital, and leakage of chemicals or oils from factories. Effects of soil pollution are decreased soil fertility, death of plants and animals, and destruction of their habitats. Soil pollution has negative effects on human health too. People may get sick with various diseases including cancer by taking those foods grown in polluted soil.

cause of soil pollution

cause of noise pollution

(4) Noise pollution

Noise pollution is sound in the environment that harms the health of human or animal life. People causing noise pollution by unnecessary use of horns, playing songs in high volume and use of loud speakers or mikes. Using big machinery in industries also causes noise pollution. Noise pollution has severe mental and physical effect on human health. Depression, hearing loss, sleep disruption, and loss of productivity are caused by noise pollution. We can prevent noise pollution by stopping the frequent use of horns, and turning the volume down.

car horns cause noise pollution

Discussion

1. Make a table like the one shown below.

types of pollution	causes	effects
air pollution		
water pollution		
soil pollution		
noise pollution		

2. Write down the causes and effects of the pollution in the table.
3. Share your ideas with your classmates.

3. Conservation of Our Environment

Environmental conservation is the sustainable and wise use and protection of natural environment.

QUESTION : How can we help conserve the environment?

Activity : Good practices for environmental conservation

What to Do :

1. Make a table like the one shown below.

What can we do?

2. Make a list of how to conserve the environment in the table.
3. Share your ideas with your classmates.

Summary

By reducing the use of electricity or fossil fuel we can help conserve the environment. Turning off the lights after finishing the work, walking or riding a bicycle instead of using a car also can help preserve natural resources. Following 3R's, like reducing the use of natural resources, reusing or recycling we can help conserving nature. Oils, chemicals and industrial garbage should go through treatment before throwing off into the environment. We should not throw trash into rivers and lakes, or on land. Dumping garbage in the dustbin and planting trees are good practices to keep our environment clean. Raising public awareness is one of the best ways to conserve our environment.

walking or riding bycycle

planting trees

EXERCISES

1. Put a tick mark (✔) on the correct answer.

1) Which one mostly causes air pollution?
   a. use of pesticide b. smoke from industries
   c. playing loud music d. leakage of chemicals

2) What is the effect of water pollution?
   a. loss of hearing b. sleep disruption
   c. diarrhoea d. decreased soil fertility

3) Which one is the cause of soil pollution?
   a. global warming b. use of machines in agriculture
   c. use of pesticides d. decreased soil fertility

4) Which one is a good practice for environmental conservation?
   a. using non-renewable energy b. using cars
   c. using fossil fuel d. recycling

2. Short Answer Questions

1) What is the environmental pollution?
2) What are the effects of air pollution?
3) Write down the ways of environmental pollution.
4) What are the sources of environmental pollution?
5) Write the five ways of environmental conservation.

3. Descriptive Answer questions.

1) Explain the harmful effects of environmental pollution.
2) What is noise pollution? what is the harmful impact of noise pollution.
3) What is environmental conservation? How can we conserve our environment?
4) Explain the negative impacts of soil pollution on human health.
5) Why does population growth cause environmental pollution?
6) How are soil pollution and water pollution alike?

Chapter 3

Water for Life

We are surrounded by water. We can get water from natural sources such as rainfall, river, or sea. We also can get water from man-made sources such as lake, pond, well, tubewell etc. We can not survive without water.

natural source of water

man-made source of water

1. Water for Plants and Animals

QUESTION : Why do plants and animals need water?

Activity : Use of water

What to Do:

1. Make a table like the one shown below.

	how do they use water
plants	
animals	

2. Make a list of how plants and animals use water for their life in the table.
3. Share your ideas with your classmates.

Animals drink water, but plants do not drink it. How do plants use water?

Animals use water not only for drink but also for other purposes. Do you remember?

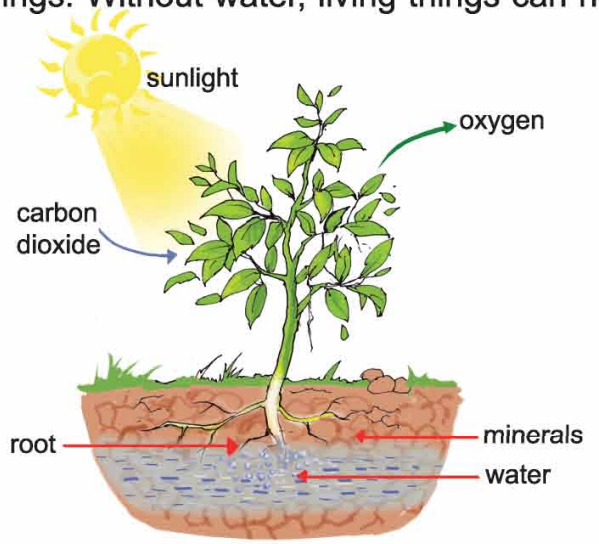
2019

Summary

Water is essential for living things. Without water, living things can not survive.

Plants

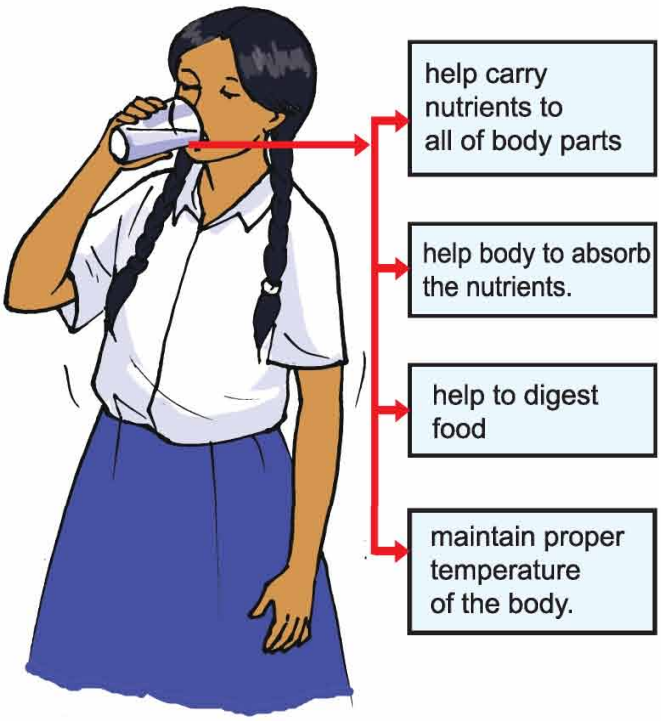
Plants need water for their life. Plants contain about 90% of water in their bodies. Plants use water to make their food. Plants need water for the collection of nutrients from the soil and to transport into different parts. Without water, they cannot absorb the nutrients from the soil. Water also plays an important role of cooling the plants in extreme heat.



Plants use water for making food and other purposes.

Animals

Animals also need water to survive. The human body is made up of about 60-70% of water. No animal can survive without water. When we eat food, water helps to **digest it**. Water helps to carry nutrients to all parts of the body. It also helps the body to absorb the nutrients. Water is essential to maintain the proper temperature of our body.



We need water to survive.

2. Water Cycle

(1) Changing State of Water

Have we ever seen the drops of water on the surface of grasses in the morning? Where do the droplets come from?

water droplets on the surface of grasses

QUESTION : How are the water droplets formed?

Activity : water droplets on the glass

What to Do :

1. Prepare two clean glasses, water, and ice cubes.
2. Make a chart like the one shown below.

A. room temperature water	B. water with ice cubes

3. Pour room temperature water into two glasses, and then put ice cubes in one glass.

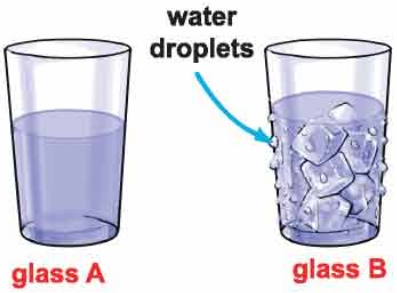
Glass A

Glass B

4. After a while, observe the surface of two glasses and sketch your observation in the chart.
5. Share your idea with your classmates.

Result

We found the droplets of water on the surface of glass **B**. On the other hand, the droplets were not found on the surface of glass **A**.



Discussion

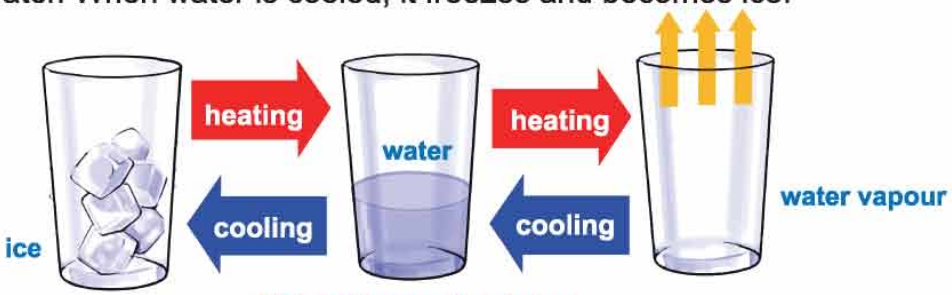
◆ **Think about the following points based on the result**

1. What condition is different between two glasses?
2. Can you guess where the droplets come from? How?

Summary

The drops of water that form on cool surfaces such as grass and leaves at night are called **dew**. When the air comes into contact with some cold surface, water vapour in the air forms into water drops on the cold surface. Water vapour in the air is changed into water by cooling. The change of state from a gas to liquid is called **condensation**. When water is heated, it changes into water vapour. The change of state from a liquid to a gas is called **evaporation**. The state of water is changed due to heating and cooling. When ice is heated, it changes into water. When heat is added to water, it evaporates and changes into water vapour. When water vapour is cooled, it condenses to form water. When water is cooled, it freezes and becomes ice.

dew on the spider web



Water changes its states.

(2) What is Water Cycle?

After rain, there is a puddle on the ground. After a short time, the puddle of water disappears.

Where has the water gone?

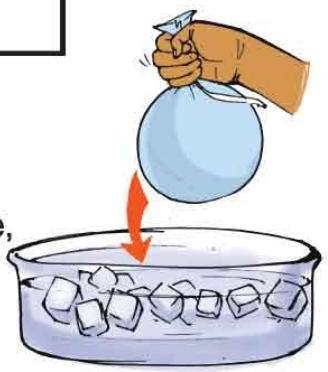
QUESTION : Where does water go and come from?

Activity : Water in the air

What to Do :

1. Prepare a clear plastic bag, and a vessel filled with ice water.
2. Make a chart like the one shown below.

what we observed inside of the bag



3. Catch the air with a clear plastic bag and tie the bag closed tightly.
4. Put the bag into the vessel for a while, and then take it out from the vessel.
5. Guess what changes may happen inside the bag.
6. Observe the inner side of the bag and sketch your observation in the chart.
7. Share your ideas with your classmates.

Discussion

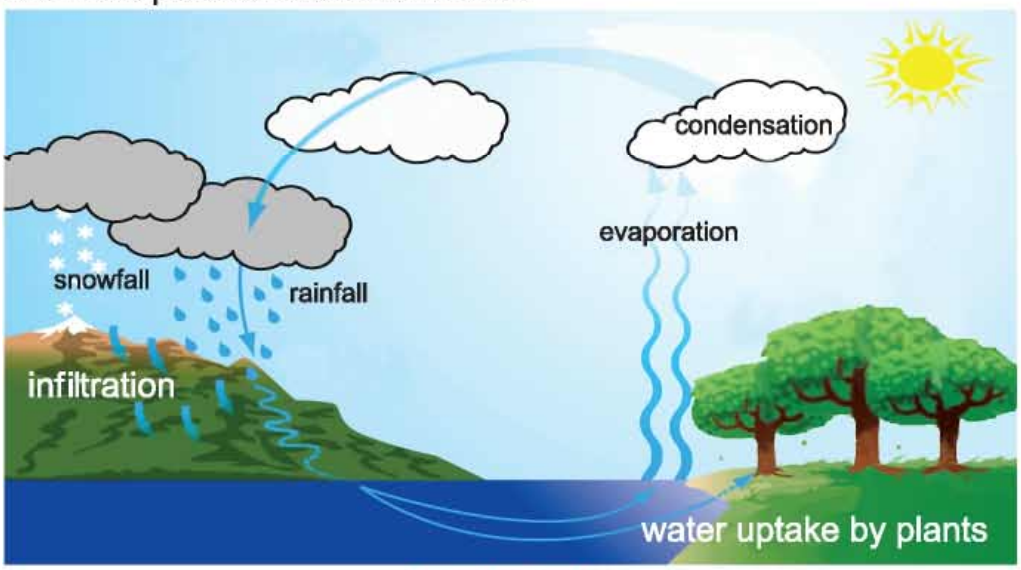
◆ **Think about the following points based on your observation**

1. What happened to the inner side of the bag? Why?
3. Can we guess what the air contains?

Summary

We have already known from the experiment that air has water vapour. Water from earth surface mostly evaporates due to the heat of the sun and get into the air. This means that the water changes its state from liquid to water vapour.

The way that water moves all around the Earth as it changes its state is called the **water cycle**. State of water is always changing through this cycle. Water in oceans and rivers evaporates and becomes water vapour. As water vapour rises in the air, it cools and condenses into tiny droplets. These tiny droplets accumulate and form clouds. Large water droplets fall back to the Earth as **rainfall**. In arctic countries snow also fall from cloud to the earth. Water from the rainfall either is absorbed into the ground or runs off into rivers. Water absorbed into the ground becomes groundwater. Water that runs off into rivers flows to sea where it evaporates back into the air.



the water cycle

3. Water Pollution

Water pollution is the addition of harmful substances to water. Water pollution is harmful for living things.

The Causes of Water Pollution

Water pollution is mainly caused by human activity. Water pollution caused by insecticide in agriculture, waste water and chemicals from factories, and waste and trash from household. Besides, bathing cattle and washing clothes in the river or pond also caused water pollution.

water pollution

Effects of Water Pollution

Water pollution causes death of aquatic animals and disruption of water food chains. Humans are also affected by water pollution. When they drink contaminated water, they get waterborne disease such as diarrhoea or cholera.

picking up trash helps clean water.

How to Prevent Water Pollution

We can prevent water pollution by reducing the use of pesticides and chemical fertilizers in agricultures. We should not throw chemicals and oils down the sink drain or the toilet. We should not throw trash into ponds, rivers, lakes or seas. Picking up trash at the beach, river or canal helps keeping water clean.

Discussion

- **How can we prevent water pollution?**
  1. Make a list of what we should do to prevent water pollution in the exercise book.
  2. Share your idea with your classmates.

4. Safe Water

The safe water is necessary not only for plants and animals but also for people to stay healthy.

QUESTION : How can we get safe water?

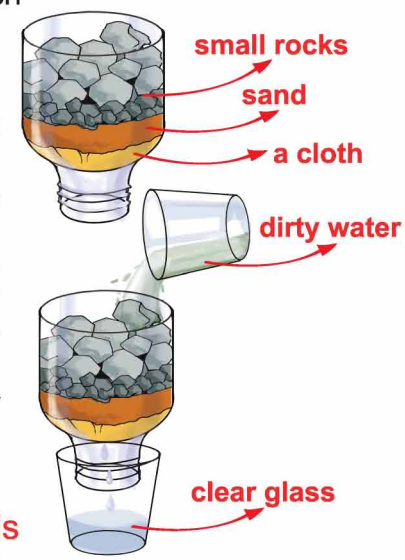
Activity : Simple water filter

What to Do :

1. Prepare enough dirty water collected from pond or river, a plastic bottle, a thin cloth, sand, large gravel or small rocks, and clear glass.
2. Make a chart like the one shown below.

before filtering	after filtering

3. Observe the dirty water and sketch your observation in the left column of the chart.
4. Make a water filter as shown in the picture right.
5. Set up the filter, and pour the dirty water into the filter.
6. Observe the water that passed through the filter, and sketch it in the right column of the chart.
7. Share your idea with your classmates.



Be careful not to cut your hands at the edge of pet bottle funnels.

Summary

The safe water is water that will not harm people. Some fresh water is safe to drink for people such as water from tubewell. Some fresh water is not safe for people, such as water from ponds and rivers. So, it is important to purify water before we drink and use it for cooking. **Water purification** is a treatment of water to make it safe and acceptable for human use.

clean but unsafe fresh water

The following shows the ways to get safe water from unsafe fresh water.

Filtration

Filtration is the process of filtering water with filter. Water may be cleaned by filtration through a thin cloth or filter. Though we get clean water in this way, it is not free from germs. The filtered water needs to be boiled to make it free from germs.

Sedimentation

Pour water from pond or river into a pitcher, and leave it for a while. We will see some particles settled at the bottom of the pitcher. The water in the upper part of the pitcher is clean. A water treatment process to remove suspended particles such as mud and sand from water is called **sedimentation**.

Boiling

Boiling is one of good ways to make it free from germs. Water should be boiled in a sealed pot to kill the germs for more than twenty minutes.

Purifying Water with Chemicals

Sometimes due to floods or tidal bores, it is not possible to boil water. In such situations, we can purify the water by using prescribed amount of some chemicals such as alum, bleaching powder, and water purifying tablet. However, we should remember that arsenic contaminated water can not be purified by these treatments.

process of filtration

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EXERCISES

1. Put a tick (✔) mark on the correct answer.

1) What do plants use to absorb nutrients?
   a. water b. soil
   c. light d. air

2) Which one is the source of water pollution?
   a. smoke b. harmful gas
   c. using horn d. sewage

3) What is the good way to remove suspended particles like mud, sand etc. from water?
   a. filtration b. sedimentation
   c. boiling d. condensation

2. Short Answered Questions:

1) What is the water cycle?
2) Give three examples of how we can help prevent water pollution.
3) Give four ways to get safe water from unsafe fresh water.
4) After rain, there is a puddle on the ground. After a short time, the puddle of water disappears. Where has the water gone?
5) What are the three states of water?

3. Descriptive Questions:

1) Explain why the surface of the glass with ice water gets wet.
2) Explain the process of water cycle.
3) Why do animals need water?
4) How can we explain that water is in the air?
5) How can we get safe water from pond's water?
6) Why are dew and water droplets on the surface of a glass with ice water alike?

Chapter 4

Air

Air is important for living things. Without air, living things can not survive. Plants use carbon dioxide from air to make food. Again animals need oxygen from the air to breathe.

1. Air in Daily Life

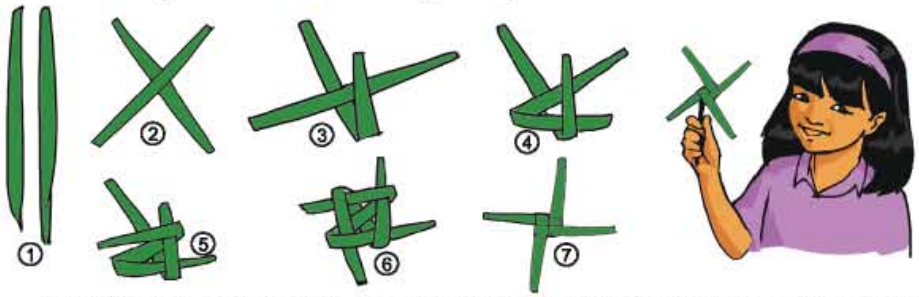
People need air to survive. People also use air in many ways for their daily life.

QUESTION : How do people use air in daily life?

Activity : How does wind work?

What to Do:

1. Prepare palm or coconut leaves, and a pin.
2. Make a pinwheel following the pictures below.



3. Put the wheel on the tip of a pin and hold it against the wind.
4. Observe what happens to the wheel.
5. Share your idea with your classmates.

Discussion

◆ **Think about the following points based on your observation.**

1. What happened to the wheel?
2. Can you guess what wind can do?
3. Make a list of uses of wind in daily life in the table.

use of wind in daily life

Summary

People use air for their daily life in many ways.

Use of Wind

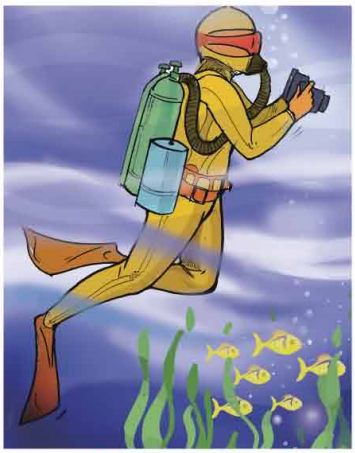
From the activity above we have observed that wind can move wheels. Wind is used to move big wheels or blades of turbine to produce electricity. People also use wind in their daily life. People use wind from a hand fan or electric fan to cool themselves. A sailboat uses wind to travel across the river. Wind is used to dry wet clothes because it can take away water from something wet quickly. We hang out wet clothes in open place to dry them with the wind. We use a dryer to dry wet hair.

drying wet hair using a dryer

drying wet clothes outside

Use of Air

People use air to inflate something such as footballs, tyres of cars, bicycles and rickshaws. People also use the elements of air in different ways. Patients with breathing problems, divers, and alpinists are given oxygen from oxygen cylinder. People use nitrogen to make fertilisers called urea, and to preserve foods such as fish, meat, and chips in tins or packages. Carbon dioxide is used in soft drinks such as sodas to give it a fizz, and in fire extinguishers to put out fire. Thus air plays a vital role in our daily life.



use of oxygen in cylinder

use of carbon dioxide

2. Air Pollution

We often hear that air is being polluted. What makes air polluted? Why it is important to prevent air pollution? How can we help keeping air clean?

QUESTION : What are the causes and effects of air pollution?

Activity : Cause and effect of air pollution

What to Do:

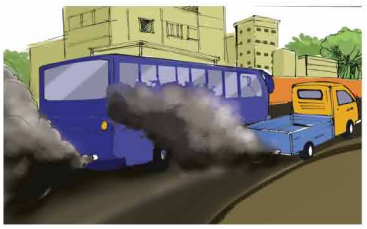
1. Make a table like the one shown below.

causes of air pollution	effects of air pollution

2. Make a list of the cause and effects of air pollution in the table.
3. Share your ideas with your classmates.

Summary

Air pollution is the introduction of unwanted chemicals, gasses, dust particles, smoke or odour into the air. It causes harm to living things and damage the natural environment.



causes of air pollution

Causes of Air Pollution

Human activity is a major cause of air pollution, especially the burning of fossil fuels. It releases different types of gasses into the air. Those gasses come from factories, cars and landfills. The smoke from burning woods is the causes of air pollution too. Throwing garbage or urinating anywhere causes air pollution by spreading odour.

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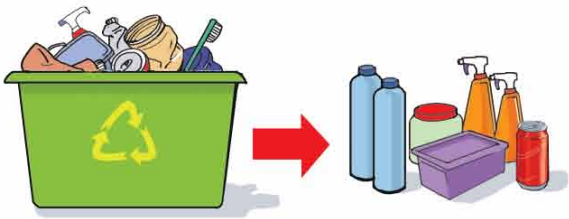
Effects of Air Pollution on Human Health and the Environment

diseases caused by air pollution

Air pollution is harmful for human health. It can cause diseases such as lung cancer, respiratory infections, and heart disease. Air pollution also has negative effects on the environment. The smoke from burning fossil fuel includes carbon dioxide or other different types of harmful gasses. When those gasses increase in the air, they cause **global warming** or **acid rain**. Acid Rain is caused by smokes of industries mixed with clouds. Due to acid rain living things can be harmed or killed.

How to Prevent Air Pollution



recycle

Using less energy we can reduce more consumption of fossil fuel.

For example, turning off the lights, and walking or riding bicycle instead of using car. We can also follow 3 R's like **reducing** use of natural resources, **reusing** and **recycling** to preventing pollution. Cleaning garbage and planting trees are also good practices to keep air clean.

Discussion

what shall we do?

◆ **How will we help prevent air pollution?**

1. Make a table like the one shown right.
2. Make a list of what we will do to prevent air pollution in the table.
3. Share your idea with your classmates.

EXERCISES

1. Put a tick mark (✔) on the correct answer.

1) Which gas is used in the packet of chips?
   a. oxygen b. carbon dioxide
   c. nitrogen d. water vapour

2) Which gas is taken in the cylinder by the alpinist?
   a. oxygen b. carbon dioxide
   c. nitrogen d. water vapour

3) Which gas cause global warming?
   a. oxygen b. carbon dioxide
   c. nitrogen d. hydrogen

2. Short Answered Questions:

1) How do people use wind in their daily life?
2) What are the negative effects of air pollution on human health?
3) Give three ways to prevent air pollution.
4) What are the causes of air pollution?

3. Descriptive questions:

1) We want to dry wet clothes as soon as possible but it is raining outside. How can we dry them quickly in our house?

2) How does recycling help to reduce air pollution?
3) What are the causes of air pollution? How do people pollute air?

Chapter 5

Energy and Matter

1. Energy

Energy is the ability to do things. We use energy in everything that we do.

(1) Energy around Us

QUESTION : What is energy?

We use energy to walk to school and to ride a bicycle. We need energy to run a computer or to cook our food. A car uses energy to run. Energy can change the form or position of something.

Forms of Energy

There are many different forms of energy like below.

Forms of Energy

forms of energy	description	example
electrical energy	This energy is used to run electric appliances such as fan, TV, light washing machine etc	
mechanical energy	The form of energy that a moving object has. Wind can be an example of mechanical energy because it can run windmill. Energy of a moving car is also mechanical energy.	
light energy	The energy that can create different types of light and helps us to see is called light energy. It can pass through transparent matter. We get light energy from sun, electric light, candle etc.	
sound energy	The energy that helps us to hear is called sound energy. Sound comes from the vibration of objects. It travels through air or other matter. We use it to enjoy music.	
thermal (heat) energy	Heat is a form of energy. We get heat energy from the fire of stove or electric iron.	
chemical energy	Chemical energy remains stored in food, fuel, coal etc.	

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Sources of Energy

You have observed that energy is used in various work in different ways. We get energy from different sources. Sometimes energy comes from coal, oil or food and sometimes it comes from wind or water current. Sometimes we get energy from battery or generator. We get heat, light, electricity, sound energy from those sources. If we observe closely, we found that the main source of all energy is the sun.

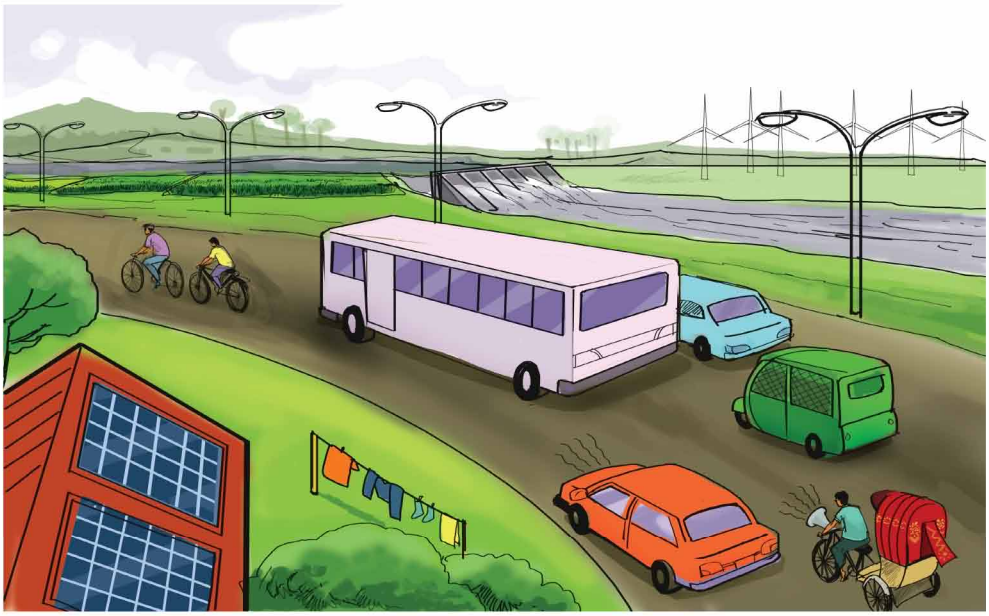
Discussion

◆ **Let's find the energy around us!**

1. Make a table like the one shown below.

the way that the energy is used	forms of energy	sources of energy

2. Find the ways that the energy is being used in the picture below, and make a list of the way, its form and source in the table.
3. Share your idea with your classmates.



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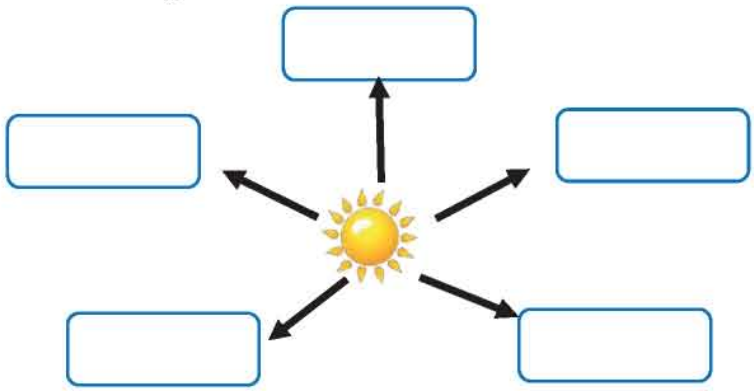
(2) Transformation of Energy

QUESTION : How does energy change its form?

Activity : Energy transformation

What to Do :

1. Make a diagram like the one shown below.



2. Observing the pictures below, make a list of the forms of energy that come from the Sun in the diagram.
3. Share your idea with your classmates.

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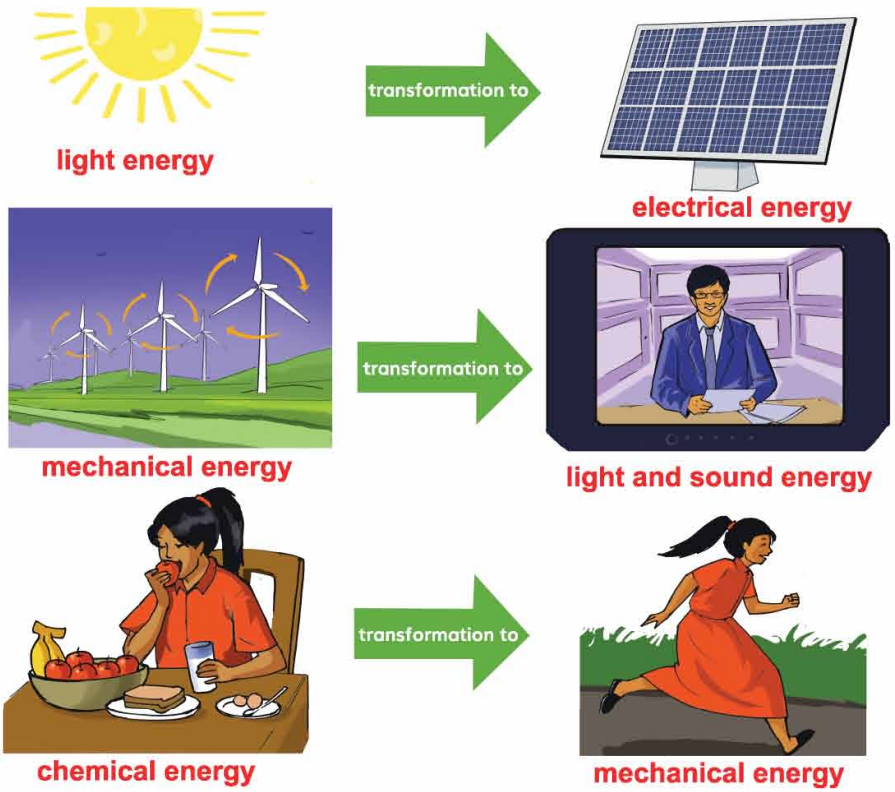
Summary

Energy can be changed from one form to another. The change of energy from one form to another is known as **energy transformation**. For example, We get solar energy directly as light and heat. But solar energy can change its forms. When plants make food by themselves, they change the light energy from the Sun to chemical energy. When animals eat these plants as food, they transform the stored chemical energy into heat and mechanical energy. Solar panels can change light energy into electrical energy. When we switch on TV, electrical energy is transformed into light, heat, and sound energy.



Discussion

◆ **Energy Transformation around us**

1. Find the energy transformation around you, and list them.
2. Share your idea with your classmates.

(3) Transfer of Energy

QUESTION : How does energy transfer?

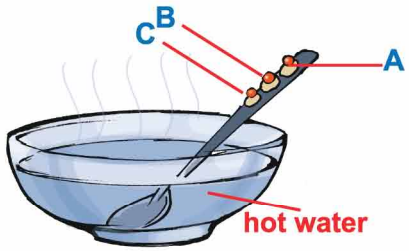
Activity : Transfer of Heat

What to Do:

1. Prepare cold ghee, a thin metal spoon, small beads, glass jar or tea cup, timer, and hot water.
2. Make a table like the one shown below.

	prediction about dropping (first, second,third)	time to drop
Bead A		
Bead B		
Bead C		

3. Using the same amount of cold ghee, place the three beads to the spoon handle.
4. Fill the jar with enough hot water, and then place the spoon in the water slowly.
5. Write your prediction which bead will fall off the spoon first, second, and third in the table.



6. Measure the time that beads A, B, and C fall off the spoon and keep a record of the time in the table.
7. Share your idea with your classmates.

Do not touch the spoon or the jar with bare hands because it is very hot.

Discussion

➢ **Think about the following based on the result of the activity;**

- Which bead fell off the spoon first? Why?
- How does the heat transfer in the solid of metal spoon?

Summary

Energy can be transferred from one place to another in many different ways.

(1) Transfer of Heat

Transfer of **Heat** is the flow of thermal energy **from warmer place to cooler place**. Thermal energy is transferred through three different processes: **conduction**, **convection**, and **radiation**.

Conduction

Transfer of heat through solid matter is called **conduction**. For example, if we place a metal spoon in the hot water, soon it begins to feel hot. This is because the spoon is heated by hot water, and then the heat spreads to the colder end of the spoon.

conduction of heat

Convection

Transfer of heat energy through the gases and liquids is called **convection**. For example, when we put a pot of water on a stove, the heated water near the bottom of the pot rises top. At the same time the cold water near the top sinks to the bottom of the pot, and then it is heated and rises to the top. Through This process heat spread from top to bottom of the pot.

convection of heat

Radiation

Radiation is the process in which energy is emitted from a source without any **medium**. Conduction can work through solids, and convection can work through liquids and gases, but radiation can even work without any medium.

radiation of heat

This is why we can feel the heat of the Sun even though it is millions of kilometres away in space. With the same process we feel the heat from fire or light bulbs.

(2) Transfer of Light

Light is the form of energy that helps us to see. Light travels as radiation. Light can transfer without any medium such as solids, liquids, and gasses. Light does not need any medium to transfer. This is how light from the Sun, the Moon, and stars reaches the Earth.

light can travel through space

Discussion

◆ **Let's find where and how heat transfer is taking place.**

1. Find where and how heat transfer is taking place in the picture below.
2. Share your idea with your classmates.

(4) Proper Use and Saving of Energy

QUESTION : How can we save energy?

Why is Saving Energy Important?

We use energy in many work everyday. Most of the energy we depend on come from non-renewable energy resources such as oil, coal, and natural gas.These cannot be replaced once we use them up. Therefore, we have to use energy resource wisely. Wasting energy is not good for the environment. By saving energy we can help to preserve energy resources and prevent pollutions.

How to Save Energy

Here are a few ideas of what you can do to save more energy:

- Turn off lights and appliances when you are not using them.
- Do not leave the refrigerator door open any longer than you need to.
- Plant trees to help shade houses on hot summer days.
- Open the curtains and use the sunlight instead of turning on the lights.
- Walk or use bicycle instead of using car as much as possible.

close the refrigerator door as soon as possible.

open the curtain to get sunlight.

Discussion

◆ **How can we save energy?**

1. Make a table like the one shown right.
2. Make a list of what you will do for saving energy in your exercise book.
3. Share your idea with the classmates.
4. Make rules for saving energy in the class.

ways for saving energy

2019

2. Structure of Matter

Matter is anything that has weight and takes up space. Everything around us is matter even the things that we cannot see such as air.

QUESTION : What makes up matter?

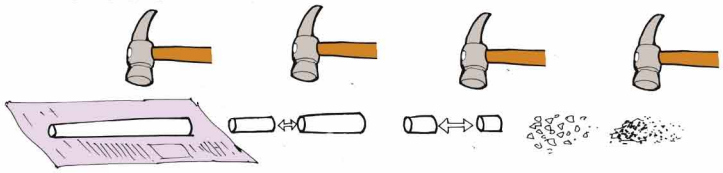
Activity : Crush a piece of chalk

What to Do :

1. Prepare some pieces of chalk, newspaper, and a hammer.
2. Make a table like the one shown below.

a piece of chalk	broken chalk	chalk powder

3. Observe a piece of chalk, and draw it in the table.
4. Place a piece of chalk on the newspaper, and use a hammer to crush it into smaller pieces.
5. Observe the crushed chalk, and record your observation in the table.
6. Use a hammer to grind the chalk into fine powder.
7. Observe the powdered chalk, and draw your observation in the table.

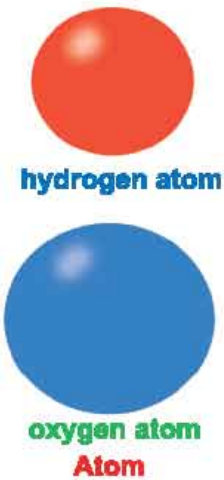


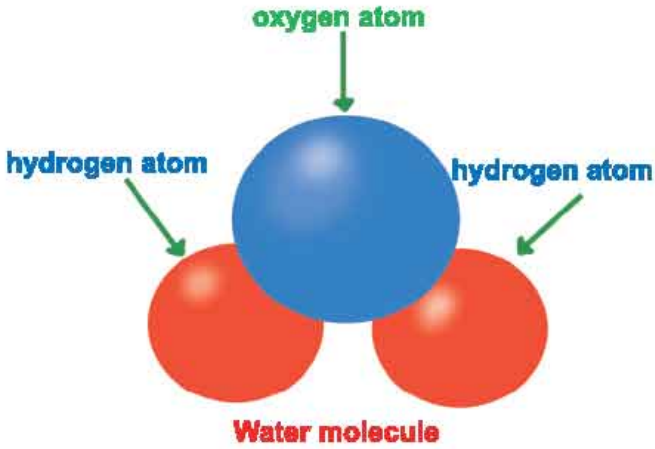
Discussion

- **Based on your observation, think about the following points.**
  - Do you think that the powder is the same as a piece of chalk?
  - Do you think that we can make the powder smaller and smaller?

Summary

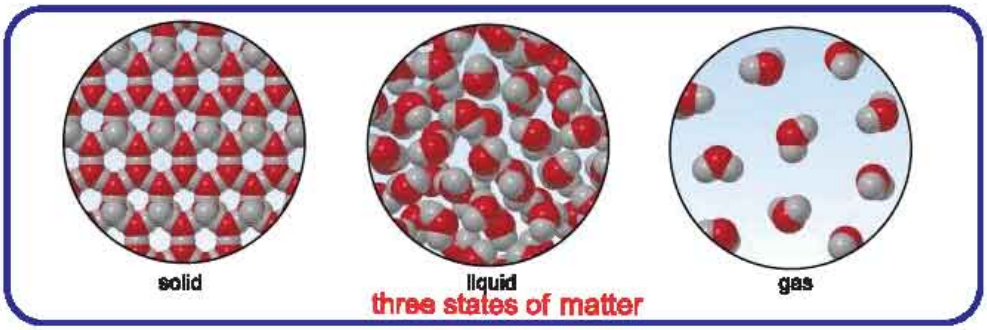
All matter is made up of very tiny particles that we cannot see with the naked eyes. Those tiny particles are called **atom.** Two or more atom makes **molecule**. A **molecule** is a group that is made up of two or more atoms joined together. A matter is the collection of innumerable molecules.





States of Matter

Matter can exist in three states : solids, liquids, and gases. The state of a matter depends on the arrangement and the bonding among the molecules of that matter. For example, water is a matter and also consists of innumerable water molecules. Those molecules are always in motion. In solids like ice, water molecules are closely bound to one another in place. In liquids like water, the molecules are quite close together, but they have a little space to move around. In gases like vapour, the molecules are spread very far apart. They are randomly arranged and are constantly moving freely at high speed.



three states of matter

EXERCISES

1. Put a tick mark (✔) on the correct answer.

1) Which one is mechanical energy?
   a. wind b. fuel
   c. fire of stoves d. food

2) What energy do plants mainly use to make food by themselves?
   a. sound energy b. light energy
   c. heat energy d. electrical energy

3) Which energy does a food contain?
   a. light energy b. heat energy
   c. mechanical energy d. chemical energy

2. Short Answered Questions:

1) Give 5 examples of forms of energy.
2) What are the three processes of heat transfer?
3) How does light travel?
4) What is atom?
5) What form of energy does a guitar produce?

3. Descpriptive Questions:

1) What energy change takes place when you switched on a TV?
2) You hold a cup of ice water, and your hand becomes cold. Your friend says that it is cold because the cold from the cup moved to your hand. Is it correct or not? Explain why.
3) How does heat travel when you cook rice in a pot?
4) How planting trees around house can save energy?

Chapter 6

Food for Good Health

In grade four, we learned that a balanced diet provides essential nutrients that we need to stay healthy. However, the demand of food and nutrition varies according to the age and work of a person. So we should know how much nutrients we need for our body and which food we should eat to stay healthy.

1. Balanced Diet

(1) Importance of Balanced Diet

Eating balanced diet is important. Our body needs proper nutrition to remain healthy. Without proper nutrition, our body becomes more prone to disease, infection, fatigue, and poor performance.

overeating causes overweight issues

Children suffering from malnutrition run the risk of growth and developmental problems. Eating too much food may cause overweight issues. We should eat a healthy balanced diet in the right amounts according to age and work. For example, people who do laborious works need more food.

(2) Amount of Food We Need

QUESTION : How can we choose balanced diet?

Activity : Amount of Food

What to Do:

1. Make a table like the one shown below.

when have taken	what have taken	how much have taken
e.g. morning	parata and banana	2 pieces and 1 piece

2. Make a list of when, what, and how much you ate yesterday in the table.
3. Share your idea with your classmates.

Summary

Eating a balanced diet means that you choose the proper amount of foods from each of the food groups. The following table shows a general guide to the amount of food needed for 6-12 year olds.

Food Guide Serving Amount for 6 to 12 Years

food group	food example	ammount	daily serve
grain & potato (carbohydrate)	ruti, parata, bread	1-2 slices/pieces	3 - 4 serves each day
	rice, potato, or noodles	1 cup	
vegetables (vitamin, mineral)	cooked or fresh vegetables	half a cup	3 or 4 serves each day
fruits (vitamin, mineral)	any fruit e.g. mango,apple, orange	1 piece	2 or 3 serves a day
	fruit juice	1 small glass day	
	dry fruit	4 pieces	
fish, meat & pulses (protein)	beef	$\frac{3}{4}$ cup	1 - 2 serves each day
	chicken	1 leg	
	fish	1 medium fillet	
	egg	1 piece	
	pulses	half a cup	
milk group (calcium, vitamin)	milk	250ml	1-2 serves each day
	yogurt	200g	
	cheese	40g	
oil and fat	ghee, butter, or soybean oil	1 table spoon	1 serving

Discussion

- **Is our diet a balanced diet?**
  1. Make a table like the one shown right.
  2. Classify the food you ate yesterday into six groups and calculate the total size of servings in the table.
  3. Comparing the table above, see if how your diet is balanced.
  4. Share your idea with your classmates.

food group	food we ate	daily serve
grain & potato		
vegetables		
fruits		
fish, meat & pulse		
milk & dairy		
oil and fat		

2. Food Preservation

All types of food are not available throughout the year. So we need to peserve food in different ways.

QUESTION : How can we preserve food?

Activity : The ways for food preservation

What to Do:

1. Make a table like the one shown below.

food items	how to preserve
meat (beef, chicken) , fish	
dairy food (milk, butter, yoghurt)	
vegetables	
fruits	

2. Make a list of how the foods are preserved in the tables.
3. Share your idea with your classmates.

Summary

The Ways of Food Preservation

People have used scientific methods to preserve foods. Crops like rice, wheat, pulses etc. can be preserved by sun drying. Fish, meat, vegetables and fruits can keep in good condition for some days in refrigerator. Vegetables, fishes, meats can also be preserved in the cold storage in order to supply in the market throughout the year. Jam, Jelly, pickles are processed from fruits and preserved in airtight pot. Besides, fishes can be preserved by using salt or ice. We can also use sugar, vinegar or oil to preserve olives, plums, mangoes etc. for long time.

ways of food preservation

Importance of Food Preservation

Food preservation can stop wastage and slow down spoilage of food. Foods such as fish, meat, vegetables, and dairy products are frequently contaminated with bacteria and spoiled. Food preservation helps prevent the growth of bacteria that causes spoilage. Food preservation makes the seasonal food available throughout the year. It makes easy to transport food to far places.

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3. Food to Eat Limited

We should eat a balanced diet to get the nutrients we need, but what food should we eat to keep our body healthy?

QUESTION : What food should we avoid to eat?

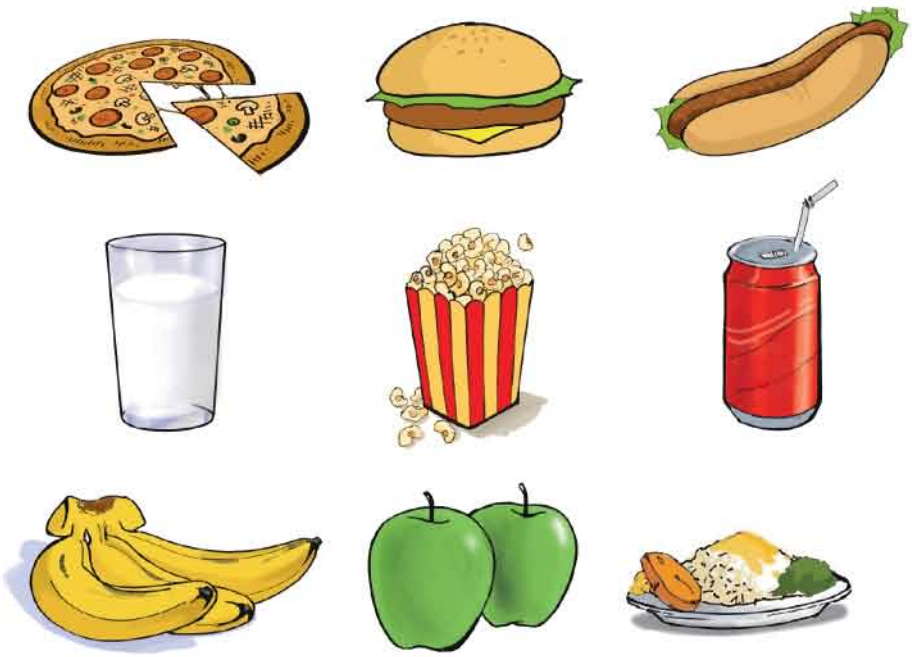
Activity : Classification of Food

What to Do :

1. Make a table like the one shown below.

healthy food	unhealthy food

2. Observing the pictures below, classify the food into 'healthy food' and ' unhealthy food' in the table.
3. Share your idea with your classmates.



Summary

It is important to know which foods we should take regularly and which foods we should eat limited. Some foods are not good for our health. Some foods include too much nutrients that are not necessary for our health.

Food Containing Artificial Colours and Chemicals

Artificial colours are added to foods to make them more appealing and desirable. There are so many foods such as sweet, jelly, candy, ice cream, cakes and soft drinks that contain artificial colour. Food containing artificial colours may have health problems such as cancer, attention-deficit disorder and hyperactivity. Dishonest dealers add harmful chemicals to foods. Formalin is used for preserving foods. Chemicals such as Carbide is used for ripening fruits. Foods containing chemicals can cause many diseases such as dysfunction of liver and kidney. People may get cancer by those chemicals.

artificial colours in food

Junk Food

Some of you may heard about the 'Junk food'. Popular junk food includes burgers, pizza, potato chips, fried chicken, soft drinks etc. Junk foods are delicious, but they do not make a balanced diet . Many junk foods have a lot of sugar, salt, or fat that our body needs a little bit. Eating too much junk food instead of regular food may cause nutritional deficiencies, overweight, and obesity.

eating too much junk food causes obesity

2019

EXERCISES

1. Put a tick mark (✔) on the correct answer.

1) Which one is junk food?
   a. bread b. yoghurt
   c. porata d. potato chips

2) Which one may be caused by eating too much junk food?
   a. dysfunction of liver b. obesity
   c. asthma d. cancer

3) Which one can cause spoilage of fish and meat?
   a. carbide b. formalin
   c. bacteria d. salt

2. Short Answered Questions:

1) Give 3 ways of food preservation.
2) What are the benefits of food preservation?
3) Why do we have to eat balanced diet?
4) How can we get a balanced diet?
5) What foods include artificial colours?

3. Descriptive Questions:

1) A burger contains a variety of food such as beef, chicken, tomato, lettuce, cheese and bread. Why is eating burgers too much harmful to our health?
2) How does food preservation give us many benefits.
3) Using chemicals in food is harmful to our health. Explain why.

Chapter 7

Healthy Lifestyle

A healthy lifestyle helps to keep and improve our health and well-being. However, we may get diseases though we have a healthy lifestyle. Why do we get diseases? How can we prevent and cure diseases?

1. Infectious Diseases

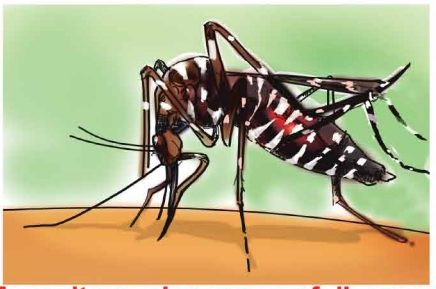
(1) What is Infectious Disease?

Infectious diseases are the diseases that caused by the entrance of germs such as bacteria, viruses, fungi into the body. The diseases can spread, directly or indirectly, from one person to another.

(2) Ways of Spreading Infectious Diseases

Infectious diseases can spread in different ways. Some diseases can pass from person to person through the air when someone coughs or sneezes. We may get infectious diseases by using glass, plate, chair, table, clothes, toilet etc. that used by an infected person. Some infectious diseases are transmitted by bites of insects such as mosquitoes and animals such as dog. Another way of causing infectious diseases is eating of contaminated food and drinking of contaminated water.

Sneezing spreads germs.



Mosquito carries germs of diseases.

Discussion

◆ **How the infectious diseases spread?**

1. Make a table like the one shown right.
2. Make a list of ways that infectious disease spreads in the table.
3. Share your idea with your classmate.

How infectious disease spread?

2019

(3) Types of Infectious Diseases

There are many types of infectious diseases as follows.

Airborne Diseases

Airborne diseases are the diseases caused by germs and transmitted through the air due to coughing, sneezing, or talking. Airborne diseases include swine flu, measles, chicken pox, tuberculosis, and influenza.

chicken pox

Waterborne Diseases

Waterborne diseases are the diseases caused by taking water contaminated with germs. There are many types of waterborne diseases, including diarrhoea, cholera, dysentery and typhoid.

Contact Diseases

Contact diseases are diseases caused by direct or indirect contact with an infected person. Flu, Ebola and Measles are such kind of diseases. **AIDS** is different kind of infectious disease caused by **HIV** virus. However, we will not be infected by AIDS even if we touch and shake hands with a HIV infected person or use things that a HIV infected person uses.

Diseases Transmitted by Animals and insects

Some infectious diseases are transmitted by animal and insect bites. For example, rabies is transmitted through bites of rabies-infected dogs. Malaria and Dengue is caused by mosquito bites

rabies infected dog

Discussion

- **Classification of infectious diseases.**
  1. Make a table like the one shown right.
  2. Make a list of infectious diseases in the table.
  3. Share your idea with your classmate.

type of disease	name of diseases
Airborne	
Waterborne	
Contact	
Animal & Insect	

(4) Prevention and Cure of Infectious Diseases

The Ways to Prevent Infectious Diseases

Infectious diseases spread through germs. The most important thing that we can do is to improve our **immune system** and to stop the spread of germs. We can keep our body healthy by eating a balanced diet, using safe water and washing hands regularly. We can prevent the spread of diseases by adequate ventilation in our rooms. We can also prevent infectious disease by covering face during coughs and sneezes with tissue, handkerchief or elbow and keeping our environment clean. We should remove any objects that hold water such as tub, tyre or canister around our house. Dengue and **Malaria** germs carrier mosquito lay their eggs there. Getting vaccination and avoiding unhygienic foods helps reduce the risks of the diseases.

covering face with tissue

taking polio vaccine

How to Cure Infectious Diseases

When we get diseases, taking rest, eating nutritious food and drinking enough safe water will help us get better. If we have mild fever or headache, some medicine help us feel more comfortable initially. But we must need to see a doctor soon if we have a fever which is not getting well and have continuous vomiting and serious headache.

Discussion

◆ **What shall we do to prevent diseases?**

1. Make a table like the one shown right.
2. Make a list of what you will do to prevent infectious diseases in the table.
3. Share your idea with your classmate.

What shall we do

2. Puberty

(1) What is Puberty?

Puberty is the time in life when our body begins to develop and change from the body of a child to the body of a teenager. Usually, puberty starts between age 8 and 13 in girls and age 9 and 15 in boys. During puberty physical, emotional and behavioural changes occur for boys and girls.

(2) Changes in the Body during Puberty

Several physical changes occur in puberty like growing taller, changing shape of body, sweating more, getting oilier skin and often some pimples on the face. Body weight increases during puberty. For boys changing of voice, well shaping of muscles and getting beard and moustaches are common changes. At puberty, girls muscles are also start shaping but not as much as boys.

(3) Taking Care of the body during Puberty

During puberty, someone might feel confused about something or haveing strong emotional change. Some of you might feel overly sensitive or become upset easily. Some of us also may feel anxious about how our changing body looks. Maintaining personal hygiene and taking nutritious food is very important at this time. Remember, everyone goes through puberty and it is a natural change. If you are worried about something, you do talk to your parents, teachers or your elder brother or sister.

Discussion

◆ **What are your problems?**

1. Form two groups; girls group and boys group.
2. Talk about your worries in a group and share its solution with group members.

EXERCISES

1. Put a tick mark (✔) on the correct answer.

1) By which typhoid germs can spread through?
   a. water b. air
   c. soil d. insects

2) Which one is the carrier of malaria or dengue germs?
   a. dog b. butterfly
   c. mosquito d. fly

3) Which one usually happens during puberty?
   a. getting friendly with all b. more keen to studies
   c. changing shape of body d. getting more diseases

2. Short Answered Questions:

1) Give 5 ways of how to prevent infectious diseases.
2) What is airborne disease?
3) How can we cure the infectious diseases?
4) What are the causes of infectious diseases?
5) What is a good way to manage your anxiety about changing body looks during puberty?

3. Descriptive Questions:

1) Explain how infectious diseases spread.
2) We can prevent Dengue or Malaria by removing object holding water like bowl, tyre etc. Why?
3) How are waterborne disease and airborne disease alike and different?
4) We can prevent the spread of diseases by covering the face during coughs and sneezes with elbow. Why is elbow better than hands when you cover coughs and sneezes?

Chapter 8

The Universe

When you look up at the night sky, you can see countless numbers of stars in the space from the Earth with naked eyes. If you use a telescope, you can see these objects more clearly. A **telescope** makes far away objects seem larger. It helps us see farther into space. Scientist uses telescope to research on planets, stars and galaxy.

telescope

1. Universe and The Earth

(1) Size of Universe

QUESTION : How big is the Universe?

Activity : How fast can light travel?

What to Do:

1. Make a list like the one shown below.

	distance from earth	how long does it take?
the moon	3,84,400 km	
the sun	15,00,00,000 km	

2. Light can travel 3,00,000 km a second. Calculate how long it takes light to travel from the Moon and the Sun to the Earth.
3. Fill in your answers in the table.
4. Share your idea with your classmates.

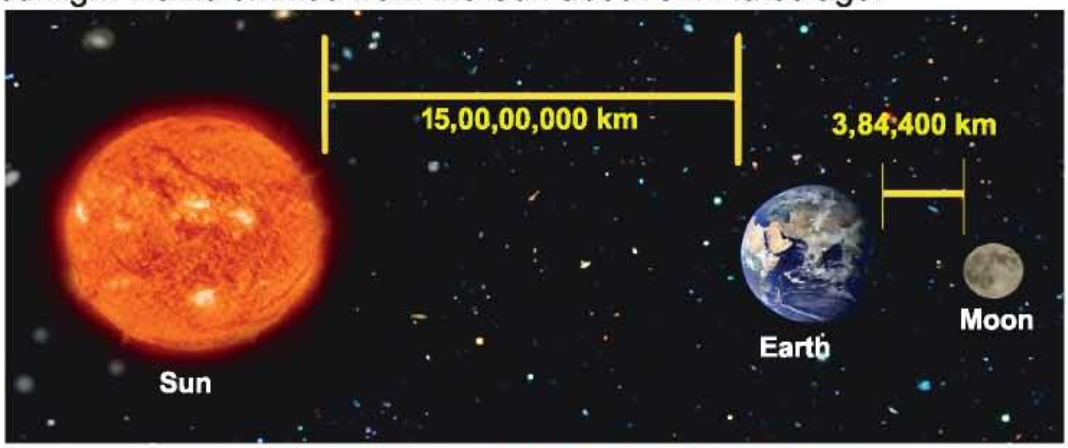
How can we calculate the time that taken by the light from the moon and the sun to reach earth?

We can calculate the time as distance divided by the speed of light.

2019

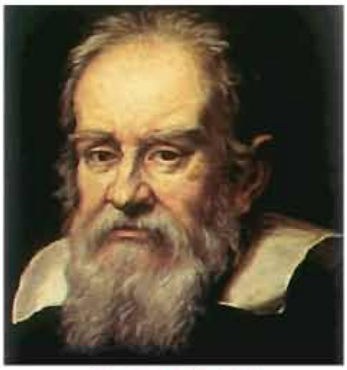
Summary

The distance from the Moon to the Earth is 3,84,400 km. Light can travel at approximately 3,00,000 km a second. So, light takes about 1.3 second to travel from the Moon to the Earth. A distance from the Sun to the Earth is about 15,00,00,000 km. Light takes about 8 minutes to travel from the Sun to the Earth. This means that we always see the sunlight that is emitted from the Sun about 8 minutes ago.



distance between Sun & Earth and Earth & Moon

If we were able to travel as fast as light, it would take 1,30,000 years to go across the Milky Way galaxy. Milky Way is one of the galaxies in the Universe. According to Sir Eddington, on an average a galaxy has ten thousand crores of stars.



Galileo Galilei

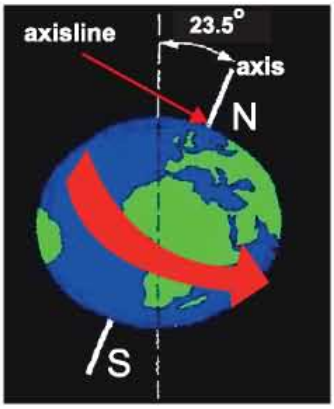
The Universe is still expanding. No one knows for sure about the size of the Universe. However, we can get an impression how big the Universe is from different scientific research. **Astronomy** is the study of the universe such as stars, planets and space. Scientists use different technologies such as telescope to study the Universe. Galileo invented an improved telescope that allowed him to see far into space. Using the telescope, he proved that the planets actually revolved around the Sun. Scientists are now using space telescopes and are building a space station to study the Universe.

(2) Motions of Earth

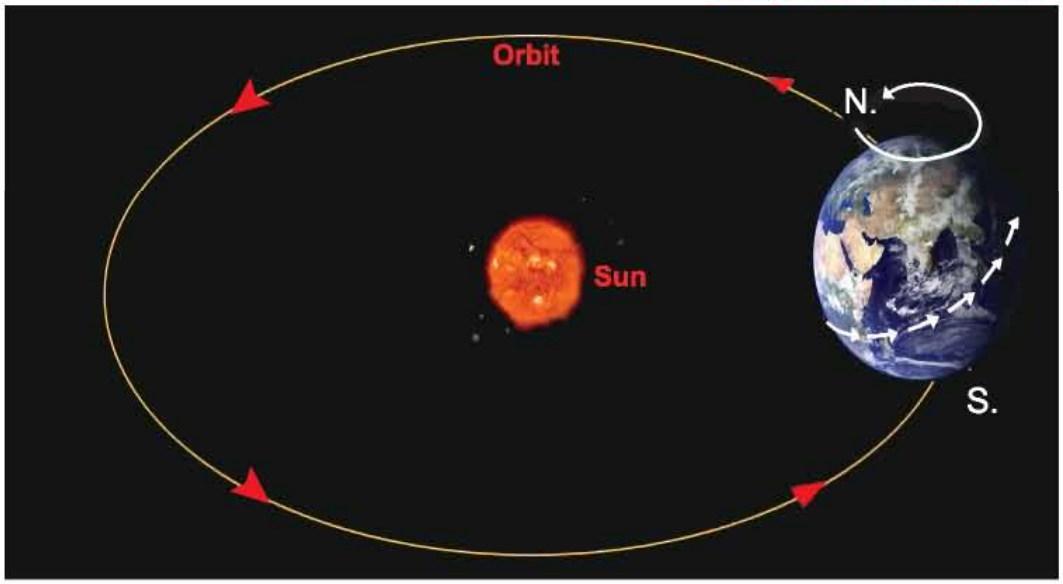
QUESTION : How does the Earth move?

The Earth is one of the planets in the solar system. The Earth moves in a path around the Sun like other planets. The path that Earth and other planets move around the Sun is called **orbit**. The orbital motion of the Earth around the Sun is called **revolution**. It takes 365 days and 6 hours for the Earth to complete one trip around the Sun.

While revolving the Sun, Earth also spins or rotates on its **axis** like a spinning top. The spinning motion of the Earth on its axis is called Earth's **rotation**. It takes 23 hours and 56 minutes for the Earth to complete one full rotation on its axis, which is measured as one day. An **axis** is the imaginary line through the centre of an object . Earth's axis goes through the North and South Poles. Earth's axis is tilted at some degree.



Earth's rotation and its axis



Earth's orbit around the Sun and rotation on its axis

2. Day and Night

QUESTION : What causes day and night?

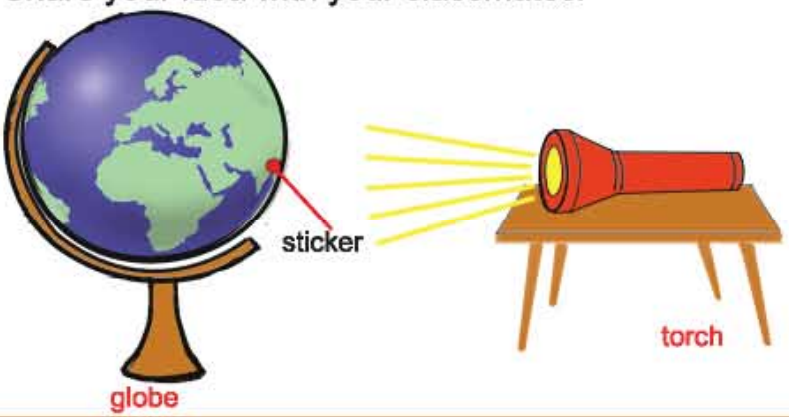
Activity : Cause of Day and Night

What to Do:

1. Prepare a globe or a football to represent the Earth, a sticker, and a bright torch to represent the Sun.
2. Make a table like the one shown below.

your observation

3. Put the sticker on Bangladesh of the globe.
4. Make the classroom dark, and then shine the torch on the globe.
5. Observe what happens to the globe and make a record of your observation in the table.
6. Spin the globe anticlockwise slowly, and observe the position of the sticker.
7. Think about which part of the globe is day or night, and how day and night happen.
8. Record your idea in your notebook.
9. Share your idea with your classmates.



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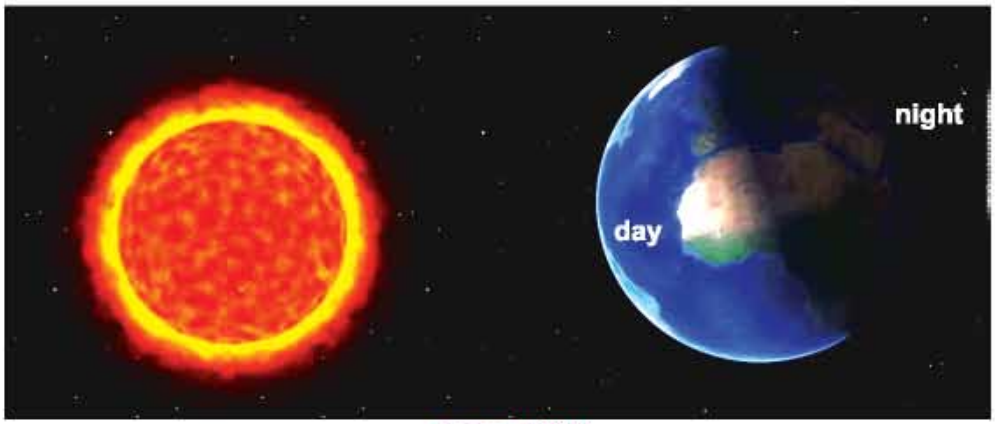
Summary

The Earth's rotation causes day and night.

Day and Night

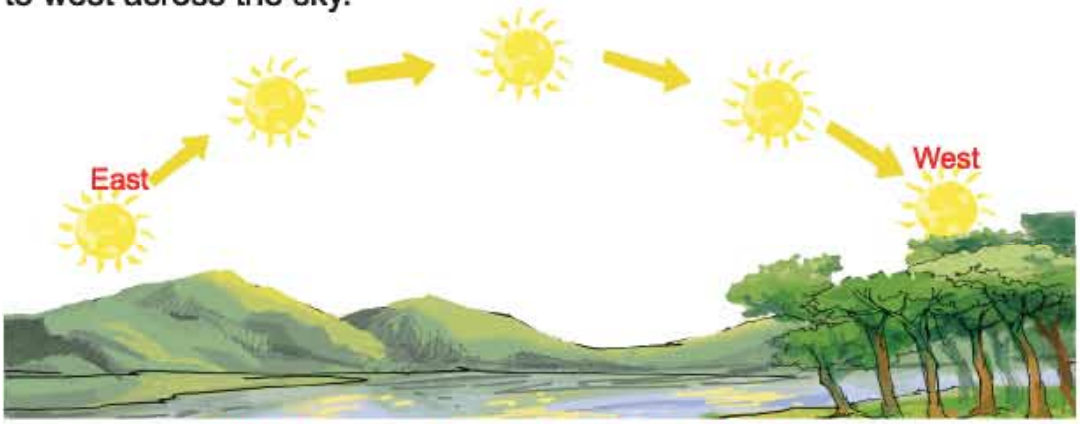
The Earth is spinning on its axis once every 24 hours. That is why the Sun rises in the morning and sets in the evening everyday. One side of the Earth is facing the Sun, whereas the other side of the earth is not facing the Sun. The part of the Earth that is facing the Sun has daytime. On the other hand, the part of the Earth that is facing away from the Sun has night.



day and night

Sunrise and Sunset

The Sun seems rising in the east in the morning, and then sets in the west as the day ends. This is because the Earth is spining on its axis from west to east. As Earth rotates, the Sun appears to move from east to west across the sky.



The Sun seems to move from the east to the west.

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3. Season

We have six seasons in a year. They are the Summer, Rainy season, Autumn, late Autumn, Winter, and the Spring in a year.

QUESTION : Why does the season change?

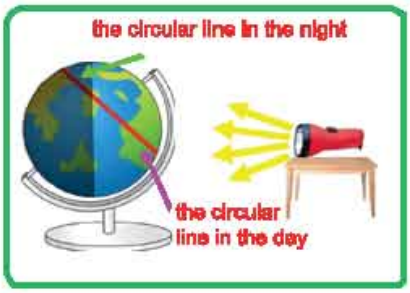
Activity : Length of Day and Night

What to Do :

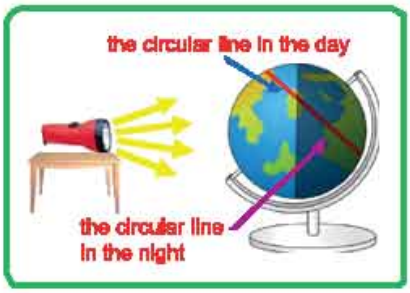
1. Prepare a globe to represent the Earth, erasable marker pen, measuring tape, and a bright torch to represent the Sun.
2. Make a table like the one shown below.

	the north pole toward flashlight	the north pole away from flashlight
length of day (cm)		
length of night (cm)		

3. Using the marker, draw a circular line along the latitude so that the line passes through Bangladesh.
4. Place the flashlight on a table.
5. Place the globe like the picture **A** as shown below.
6. Using the measuring tape, measure the length of the circular line that is in the day and in the night, and record it in the table.
7. Place the globe like the picture **B** as shown below.
8. Using the measuring tape, measure the length of the circular line that is in day and in night, and record it in the table.
9. Share your idea with your classmates.



picture A



picture B

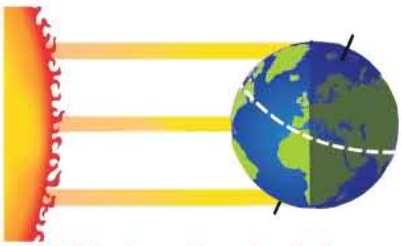
Summary

The tilt of the Earth's axis and its orbit around the Sun causes seasons. As the Earth revolves around the Sun, different parts of the Earth tilt toward or away from the Sun.

Summer

When the **northern hemisphere** tilts toward the Sun, it is **summer** there. In summer, the sunlight shines more directly on the northern half of the Earth giving more energy.This causes the temperatures to rise and the period of daytime to be longer. Opposite season occures in the southern hemisphere and it is winter there.

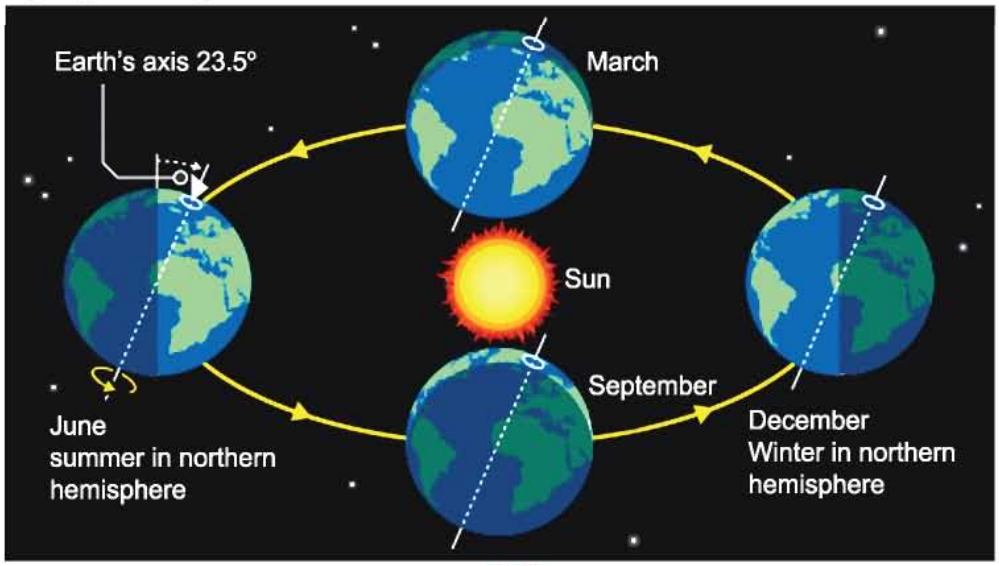
Summer in northern hemisphere



Winter in northern hemisphere

Winter

When the Northern Hemisphere tilts away from the Sun, it is **winter** there. In winter, sunlight hits this part of the Earth less directly, The temperature is lower, and the period of daytime is shorter but the period of night gets longer.



seasonal changes

4. The Phases of the Moon

The Moon seems big or small, and round or half round-shaped on some nights. The changing shapes of the bright part of the Moon that we see are called the **phases of the Moon**.

QUESTION : Why do the phases of the Moon happen?

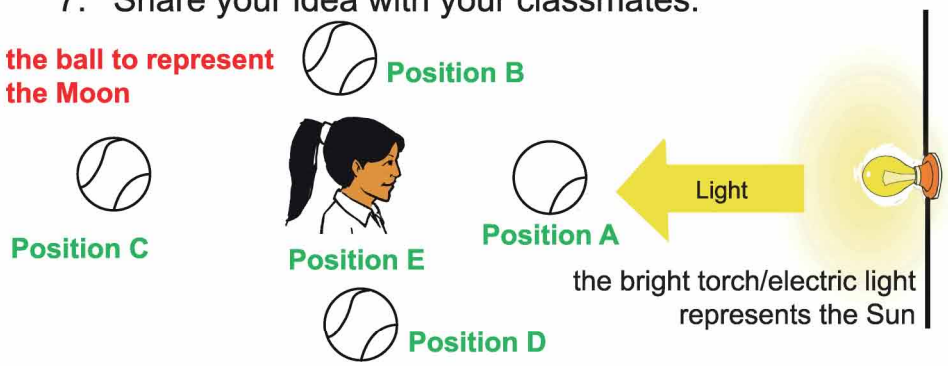
Activity : The Phases of a Ball

What to Do:

1. Prepare a bright torch or light blub to represent the Sun, a white ball (e.g. tennis ball, cricket ball) to represent the Moon.
2. Make a table like the one shown below.

position A	position B	position C	position D

3. Place the bulb or the torch in the classroom, and make the room dark.
4. Set the ball at position A, B, C and D.
5. Observe the surface of the ball at each position from the position E. (Note: Be careful not to make a shadow on the ball when you observe the ball at position C.)
6. Sketch your observation in the table.
7. Share your idea with your classmates.



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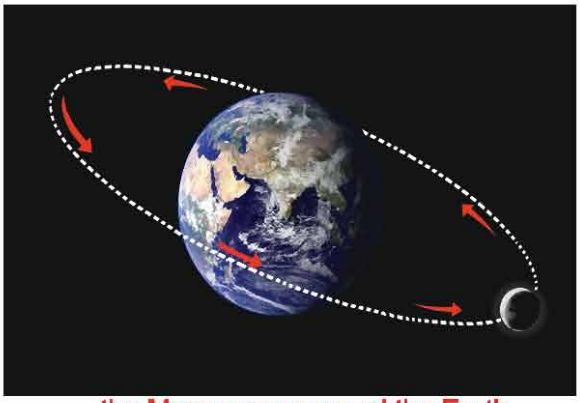
Summary

Motion of the Moon

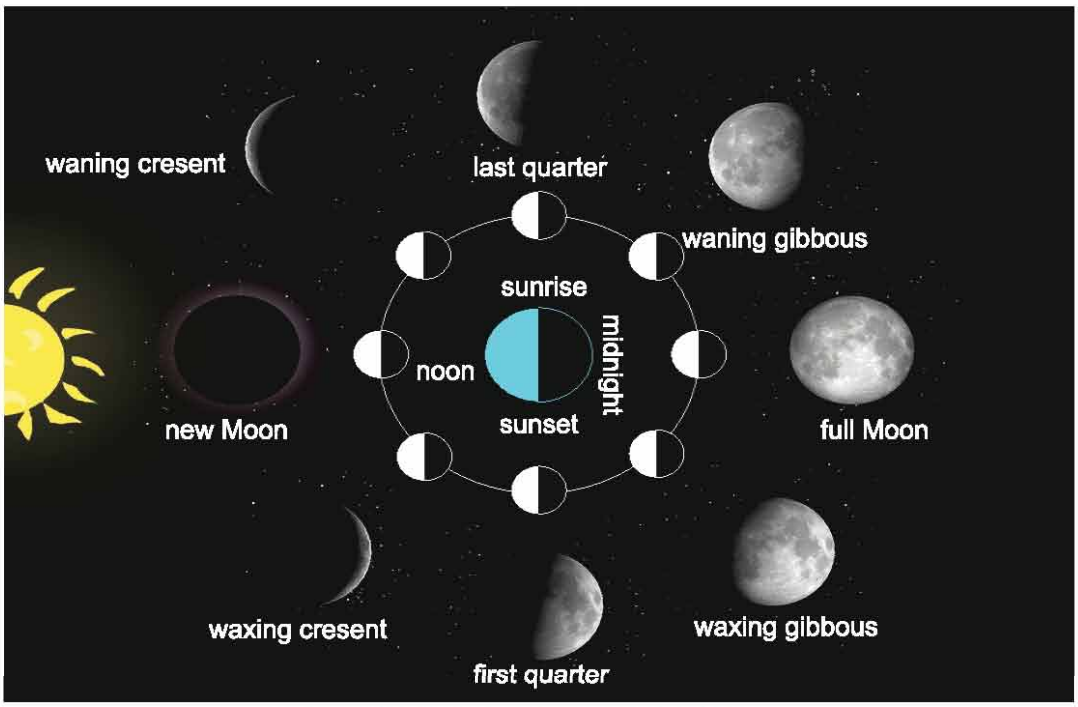
The Moon is the only **satellite** of the Earth. A **satellite** is an object that revolves around a planet. The Moon rotates on its axis once every about 28 days and it also moves around the Earth once every about 28 days.



the Moon moves round the Earth

The Moon in Rotation

The Moon does not produce its own light, instead it reflects the sun's light. Half of the moon is always lighted by the sun. But as the Moon orbits around the Earth, the area of the lighted side facing the Earth changes. These changes cause the phases of the Moon. We can only see the lighted side of the Moon. When we can see full of the side lighted, this is a **full Moon**. When we can't see any of the lighted side, this is called a **new Moon**.



the position and the phases of the Moon

EXERCISES

1.Put a tick mark (✔) on the correct answer.

1) Which one is correct?

a. The Moon gives off its own light
b. The Moon is a satellite
c. The Moon is a planet
d. The Moon moves around Sun

2) How many days does the Earth take to complete one trip around the Sun?

a. 24 days
b. 28 days
c. 365 days
d. 7 days

2. Short Answered Questions:

1) What are two motions of the Earth?
2) What causes day and night?
3) Why do the phases of the Moon take place?
4) What is the difference between planet and satellite?
5) Why does the temparature rises in the Summer?

3. Descriptive Questions:

1) Explain the causes of seasons.
2) The Sun does not move around the Earth, but it seems to move from east to west across the sky. Explain why.
3) When the northern half of the Earth tilts toward the Sun, what happens to the length of day and night?
4) How are the solar system, the Milky Way Galaxy, and the Universe related?
5) Look at the pictures below. Both of the pictures were taken at the same time and same place, but they look different. Why does it happen?

5:00 pm. in June

5:00 pm in December

Chapter 9

Technology in Our Life

Now, we are studying by using technologies such as books, pen, table, electric bulb, clock. Scientific knowledge is used to invent these technologies. What are the differences between science and technology? What relationships are there between them?

1. Science and Technology

QUESTION : How do we use science for innovating technology?

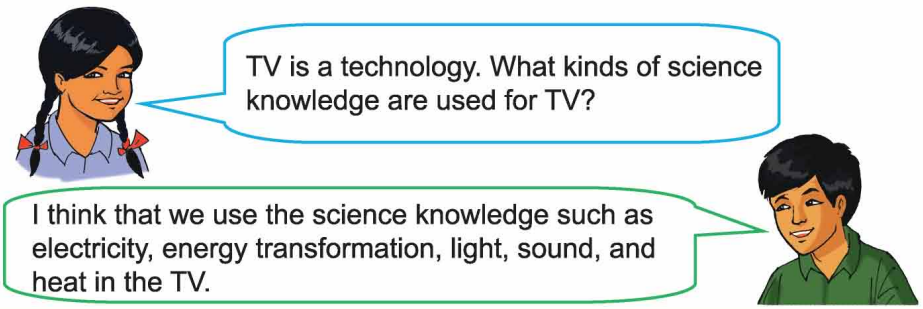
Activity : Use of Science and Technology

What to Do :

1. Make a table like the one shown below.

situation	technology	science knowledge
Transportation	e.g. car	e.g. heat, mechanical energy
Medical Care		
Agriculture		
House		

2. Make a list of technology and science knowledge that used to make the technology in each situation in the table.
3. Share your idea with your classmates.

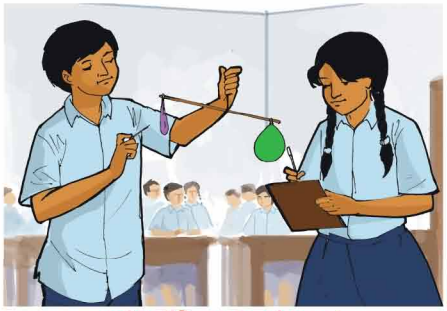


2019

Summary

Difference between Science and Technology

Science is the knowledge or study about the natural world. It is based on the facts learned through observation and experimentation to describe and explain natural phenomena. When scientists investigate and answer questions about the world around us, they follow the **scientific method** that includes the steps as shown in the table below.



scientific experiment

scientific method

steps	description
observation	By observing the world around you, you can notice the things happen or the phenomena, or you may have a particular topic of interest.
question	When we saw, heard, or read something, we may have questions about that. Choose a question that can be answered by making observations or experiment-
hypothesis	By using previous knowledge, make a guess that answer your question. Write it down. This is your hypothesis.
experiment	Design a test to justify if the hypothesis is true or not. List the materials you will need. Write the steps you will follow. Collect data and record the results of your experiment.
conclusion	Analyse the data you collected and summarised your results. Think about your results that either support your hypothesis or not.
sharing	Report your results and share it to others.

Technology is the practical application of science to solve the problems of our life. Technology uses to design products, tools, and processes that improve the quality of human life. For example, scientists have studied about electricity and built up our understanding of electricity. This scientific knowledge is applied to create technologies such as refrigerator, TV, mobile and light. Technology is used in many feilds such as education, medical care, communication and transportation.

science is applied for technologies

Relationship between Science and Technology

Science and technology have different purpose, but they are closely related to each other and both playing a vital role in our life.

In the past, science and technology did not have a deep relationship. Scientists have studied the natural world to explain natural phenomena without a purpose of solving practical problems. They have discovered scientific knowledge such as electricity and light. On the other hand, people have invented technologies to solve practical problems for improving their life. They have invented simple technologies such as stone tools, fire, clothing, metal tools, and wheels.

ancient tools

microscope

The 18th century was a period of great **industrial** revolution particularly in the field of agriculture, manufacturing and transportation. People invented steam engine by applying scientific knowledge of steam power. The steam engine was used for factories, trains or ships.

space telescope

Technology applies science knowledge to create products and tools. Scientists also use technology when they study the natural world. For example, a telescope makes it possible for scientists to see objects far into space. Scientists use a microscope when they investigate the objects that can not be seen with naked eyes. Today, science and technology depends on each other.

2019

2. Technology in Agriculture

People have developed different types of agricultural technology to meet the demand of food.

Mechanical Technology

People invented agricultural tools such as shovel, spade, plough. Today, people use agricultural machinery such as tractor, irrigation pump and threshing machine. It helps to produce a lot of food in the shortest period of time.

tractor

Chemical Technology

In many crops, farmers use chemical fertilisers and pesticides to increase the production. The fertiliser helps plants grow well and produce more food. Chemicals are used to resist harmful pests and weeds in order to grow more food.

using pesticide

Biotechnology

Biotechnology is a technology that uses living things to make new product for human welfare. For example, agricultural biotechnology is a way to make plants with special qualities. This technology allows farmers to grow plants that are more nutritious, more resistant to pests and more productive.

Biotechnology can create new crops.

Discussion

◆ **How does agricultural technology helps to produce food?**

1. Make a chart like the one shown below.

agricultural technology	how does it help to produce food?
mechanical technology	
chemical technology	
biotechnology	

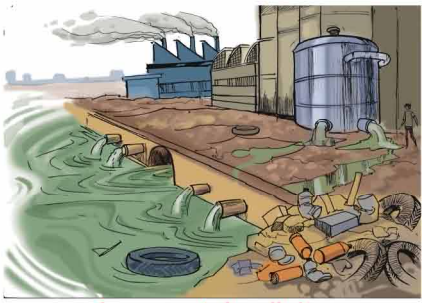
2. Make a list of how technology helps to produce food in the table.
3. Share your idea with your classmates.

3. Negative Effects of Technology

Technologies make human life safe, comfortable and better by solving various problems. However, technology also can cause some problems.

Environmental Pollution

Burning coal in power plant provides power to generate electricity for us, but the burning coal also can cause air pollution. It can have negative effects on the environment such as global warming and acid rain. Chemical fertiliser and pesticide help to produce more food, but chemical fertiliser and pesticide can cause soil and water pollution that is very harmful to living things.



environmental polluiton.

Weapons

Horrible applications of science knowledge are the improvement of weapon technology like bombs, tanks or guns.

tank

Other Negative Effect

Sometimes using technology turned to an addiction. If we do not use TV and computer for productive work, it will waste our time. It hurdles in our regular sports, physical exercise and limits free thinking ability. Watching TV or using computer more than one hours at a strech is harmful for our health.

Discussion

◆ **What are the negative effects of technology?**

1. Make a chart like the one shown below.

negative effects of technology

2. Make a list of the negative effects of technology in the table.
3. Share your idea with your classmates.

2019

EXERCISES

1. Put a tick mark (✔) on the correct answer.

1) Which one is correct?
   a. There is no relationship between science and technology.
   b. Science and technology are the same.
   c. Science and technology have close relationship.
   d. Science is not necessary for technology.

2) In which century industrial revolution was happened?
   a. the 17th century
   b. the 18th century
   c. the 19th century
   d. the 20th century

3) Which one is a chemical technology?
   a. fertiliser
   b. tractor
   c. more productive plants
   d. irrigation pump

4) Which one is a process of scientific method?
   a. studying
   b. exercise
   c. reading
   d. observation

2. Short Answered Questions:

1) How do scientists study the natural world?
2) What types of agricultural technology do people use to grow more food in the shortest period of time?
3) Give two examples of the negative effects of technology.
4) What technology do scientists use when they study the Universe?
5) How has the scientific knowledge of steam power been applied?

3. Descriptive Questions:

1) Explain the difference between science and technology.
2) How does agricultural technology help to improve our life?
3) How does technology use science knowledge?
4) Science and technology have different purpose, but they are closely related to each other. Explain how.

Chapter 10

Information in Our Life

We receive a lot of information everyday. This information is increasing at a rapid pace. Some information is correct, but some are incorrect. We need to acquire the proper skills to find, understand, evaluate and use information.

1. Importance of Information Sharing

QUESTION : Why is information sharing important?

Activity : What will happen if we do not know the information?

What to Do :

1. Make a table like the one shown below.

information	what will happen?

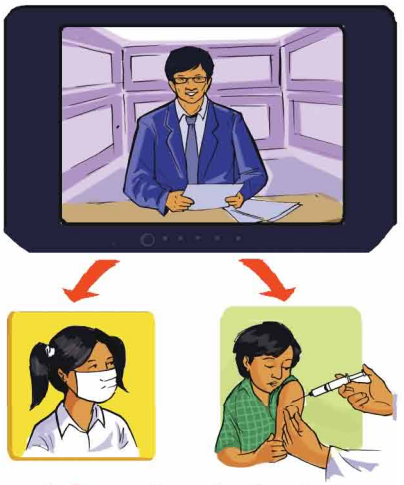
2. Make a list of information as many as possible in the table.
3. Think about the situation in our life if we do not get the information you listed.
4. Make a list of your ideas in the table.
5. Share your idea with your classmates.

Summary

Information is very important for our life. Information enables us to know something new and to decide what to do. Therefore, we have to know and share information among us. **Information sharing** is an activity through which information is exchanged among friends, families, and other people. It can help people to keep safe, promote their wellbeing and prevent harm.

Information sharing is important for us.

Importance of sharing information in our personal, social and national life is immense. For example, when any contagious disease like flu goes around in our country, the information would be shared through media to reduce the risk of that flu. If **meteorologist** forecasts that there will be a tidal upsurge, this news should be shared through different media so that life and assets of the many coastal people can be saved. National assets like fishing boat and cargo of the sea can be saved by finding a safe place.



Information sharing helps us prevent harm.

We can share information in many ways such as having a talk with others, or writing letters. Today, **Information and Communication Technology (ICT)** is common tool that help people share information. Computer, **internet**, email, TV, radio, and mobile phone are the examples of ICT. ICT makes it easier for people to communicate with others, and collect, store, exchange, spread or use information.

ICT helps us to share information easier.

2. Collection, Storage, and Exchange of Information

QUESTION : How can we collect, store, and exchange information by using technology?

(1) How to Collect Information through Internet?

We can collect information by using books, newspapers, TV, or radio. The **internet** enables us to collect information more easily. The internet is a huge network of computers together all over the world. We can collect information we need through the internet by using computers, or mobile phones. Besides, we can share our innovation and collected information with the help of internet also.

computer

mobile phone

The followings are the basic steps for collecting information through the internet:

1) Use search engines such as Google, Yahoo or Pipilika.
2) Type keywords relevant to the topic you are searching for into the 'search bar', and click 'search' or press the 'enter key' on your keyboard.
3) Search through the list of web pages to find the information you need.
4) Repeat above **3 Steps** as necessary, or choose new keywords that are more or less specific and thus search the information you need.

search engine: google

website

(2) How to Store Information

After web search, we can store the information by taking a note on a notebook or paper, taking pictures or shooting a video. Today, we use storage devices such as pen drive, CD, DVD, memory card etc. to store the information.

storage devices

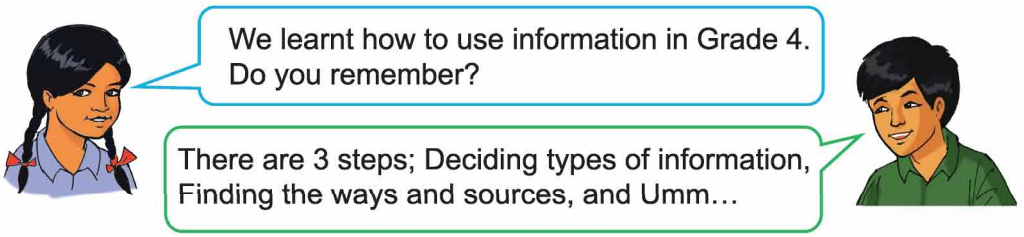
(3) How to Exchange Information using Technology

As we learnt in Grade 4, we can exchange information with others by using technology. For example, we talk with people by using telephone or mobile phone. We exchange information by writing letters too. We can also share information by taking picture or making video with cameras. Now a days, we can exchange information through email, Short Message Service (SMS), Social Networking Service (SNS) like Facebook or Twitter using the internet.

Activity : Collect, Store, and Exchange Information

What to Do :

1. Divide the class into some groups.
2. Make a plan by discussing about the type of information you will collect, the ways and the sources for collecting information with technology, and how to store the information in a group.
3. Collect and store the information with technology by following the plan you made.
4. Exchange your information with technology among your classmate.



2019

EXERCISES

1. Put a tick mark (✔) on the correct answer.

1) Which device is used for storing information?

a. TV b. radio
c. newspaper d. CD

2) Which technology is used for sharing information?

a. bus b. thermometer
c. mobile phone d. tractor

2. Short Answered Questions:

1) Give three names of devices for storing information.
2) What are the technologies that enable us to exchange information?
3) Why is information important?
4) What is internet?
5) Name three major search engines used in Bangladesh.

3. Descriptive Questions:

1) You have got the information from TV that a cyclone is coming toward Bangladesh. What will you do?
2) Explain how to collect information through the internet.
3) Why do we need to acquire the proper skills to find, understand, evaluate and use information?
4) What will happen to our life without information sharing?
5) You want to share the information you collect with your friend who lives in Japan. What are the ways by which you can share the information with him? What type of technology will you need?

Chapter 11

Weather and Climate

Weather affects how you dress and what to do. Using the experience on climate we can decide when we have to cultivate which crops .

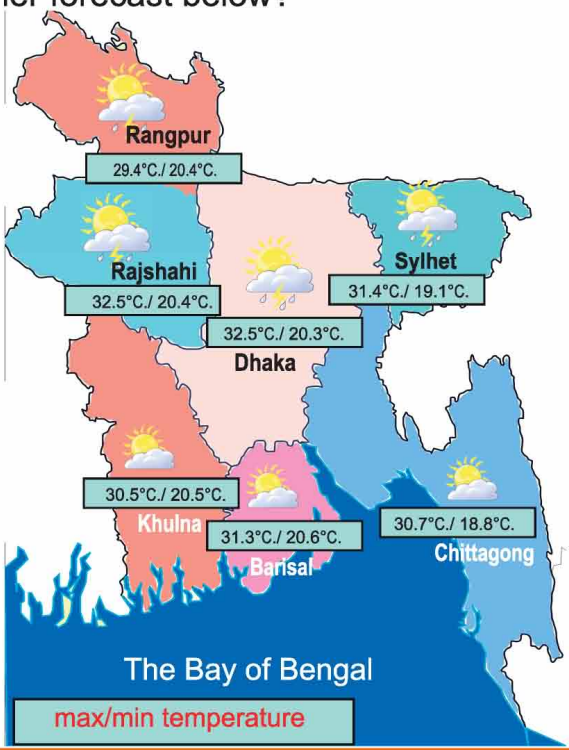
1. Relationship between Weather and Climate

QUESTION : How do you use weather forecast?

Activity: **Using Weather Forecast**

What to Do:

1. What kind of weather do you expect for Dhaka based on the weather forecast below?
2. Where do you expect the highest and lowest temperature in the country based on the weather forecast below?
3. Do you bring your umbrella if you visit Rangpur based on the weather forecast below?



weather forecast for 24/02/2015

Discussion

◆ **When is the best time of year to plan a picnic? why?**

1. What is the usual weather condition of Bangladesh in February?
2. How can we guess about the weather condition of coming April of the next year in advance?

Summary

Weather

Weather is the temporary state of sky and the atmosphere at a certain place. Therefore, weather is different in different places and at different time of the day. We can use weather forecast in order to decide what to wear and what to do on the weekend.

Climate

Climate is the changes of usual weather pattern in a certain area. Climate can also be described as the average weather condition of a certain area for a long period of time. Therefore, we can predict daily weather based on the experience and knowledge of climate on our place. However, our personal prediction may not always correct.That is because weather is changing all the time.

Weather and climate are not the same, though there is a close relation between them. Weather is the condition of sky and the atmosphere of a place for a short time. Climate is the general condition of weather of a place for many years.

Climatologically, the rainy season of Bangladesh starts in the middle of June (begining of *Ashar*) and ends in August (Srabon-Vadro). The onset date of monsoon rain changes every year. However, we do know the probable time when the rainy season starts from our experience about climate.

2. Air Pressure and Wind

Air pressure is the force produced by the weight of the air pressing down on the Earth's surface. Wind blows from high pressure to low pressure area.

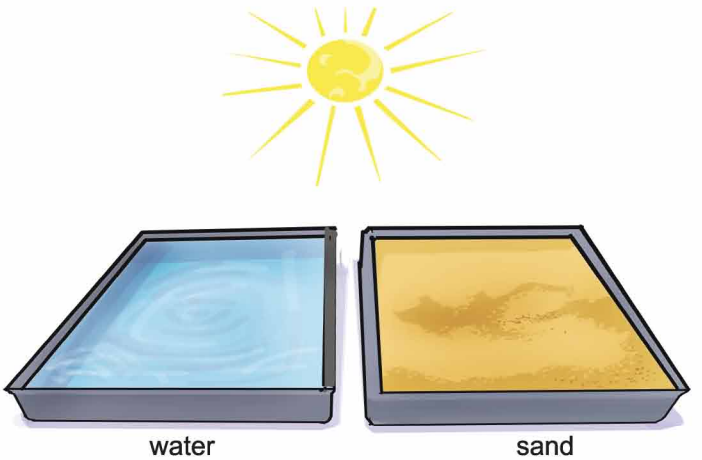
QUESTION : What makes high and low pressure of air?

Activity : Heating sand and water

What to Do:

1. Fill one tray with sand 1 cm deep and another tray with water 1 cm deep.
2. If possible put one thermometer into the sand and the other thermometer into the water.
3. Check the warmth of water and sand surface by using palm.
4. Place two trays under the sunlight.
5. Predict which tray will heat up faster?
6. After 20 to 30 minutes, compare the warmth of water and sand surface by using palm and confirm the prediction. If possible, use a thermometer and measure the temperature of sand and water.
7. Move both trays to a cool shaded area and leave it for an hour.

Note: Water and sand should be kept in classroom at least for one-day in order to indicate same warmth before the experiment. Also, sand should be dry.



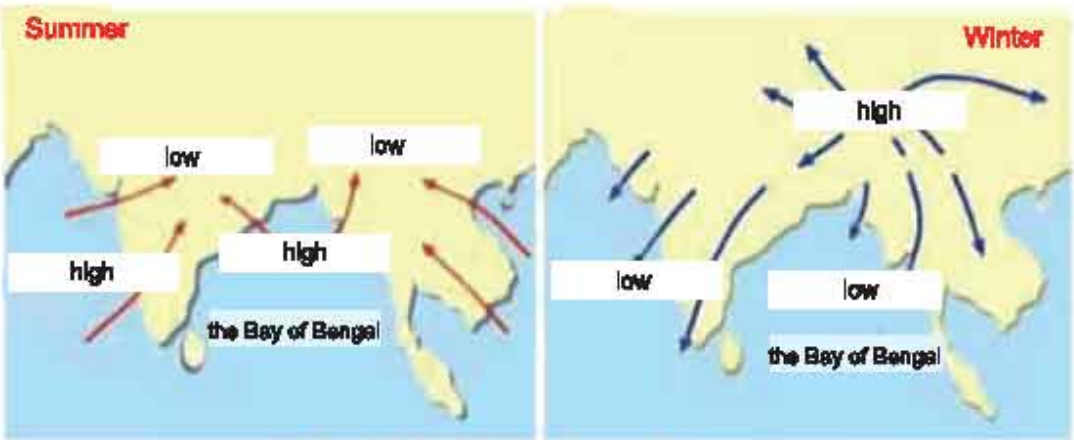
Summary

Sand surface becames warmer than water after placing under the sunlight. Also, sand surface cools down fast under the shade. Based on this experiment, we can conclude that the land/sand heats up and cool down faster than the water.

Low pressure and High pressure

During the day time, land become warmer than the water and the warmer land warms the air above. Air that is warmed becomes lighter than the surrounding air, so it rises up. As a result, low pressure develops over the land. On the other hand, air over the ocean is cooler and heavier so it sinks. Then high pressure develops over the ocean. The wind blows from high pressure to low pressure area in order to replace the rising warmer air by the cold air. At night, the land is cooler than the ocean. Therefore, high pressure develops over the land and low pressure develops over the ocean.

In Bangladesh, we experience southwest monsoon wind during rainy season and northeast monsoon wind during winter season as shown below. In rainy season i.e. June - August, the land of Bangladesh is warmer than the Bay of Bengal. In winter season i.e. December - February, the land is cooler than the Bay of Bengal. These seasonal temperature contrasts of the land and the ocean develop high and low pressure systems. It produces monsoon wind system.



the south-west and north-east monsoon

3. The Components of Weather and Climate

We have already learned about the weather components such as temperature, humidity, wind, cloud, rain and air pressure. The components of weather are also the components of climate.

QUESTION : Is there any relationship among the weather components?

Activity: **Humidity and rainfall**

What to Do:

1. Ovserve monthly rainfall and average humidity in Dhaka as shown in table below.
2. Determine the relationship between rainfall and humidity. Comparing should focus on rainy season and winter.
3. Share your idea with your classmates.

	monthly rainfall (mm)`	monthly average humidity (%)
January	8	54
February	32	49
March	61	45
April	137	55
May	245	72
June	315	79
July	329	79
August	337	78
September	248	78
October	134	72
November	24	66
December	5	63

Summary

Humidity is the measure of how much moisture is in the air. The lower the humidity, the lesser the moisture in the air. During rainy season, the monthly average humidity and rainfall is higher than those in other months. The southwest seasonal wind brings much moisture from the Bay of Bengal during rainy season. This moisture causes heavy rainfall. The northeast monsoon wind brings cold dry air from the northern land in winter.

4. Extreme Weather

Each of the weather components changes all the time. When one of the weather components changes beyond a normal range, we experience the severe and/or extreme weather. We face various damage such as loss of human life and resources.

Heat wave and cold wave

A heat wave is a prolonged period of excessively hot weather. We experience **heat wave** every year but we face extraordinary spells of heat wave that may occur only once a century. These severe heat waves can cause catastrophic crop failures. It also causes thousands of deaths of animals including human being.

Occurrences of extreme low temperature in association with incursion of dry cold winds from north into our country are known as **cold waves**. Severe cold which is intolerable for plants and animals is very rare in Bangladesh.

Flood and draught

In every rainy season about one-fifth of Bangladesh is flooded, and extreme years, two-third of land can be submerged in floodwater. It is because of our topography and climate.

A usually long period of dry weather is called as drought. Droughts are due to abnormally less rainfall and higher temperature than usual. Sometimes Bangladesh faces drought especially in the northwestern part of the country.

flood

drought

Nor'wester (Kal-Baishakhi)

Thunderstorms which is common during Summer in our country is known as Nor'wester or *Kal-Baishakhi*. Nor'wester grows by surface heating. It is more frequent in the late afternoon. The size of Nor'wester is from several kilometers to 20 km. Nor'wester is the vertically grown-up convective cloud called 'Cumulonimbus' that brings thunder and lightning, heavy rain, hail, gusty/squally winds and even tornadoes. This is called *Kal-Baishakhi*.

Tornado

Tornado is a narrow, violent, funnel-shaped column of spiral winds. This wind extends downward from a Cumulonimbus to the ground. The size of tornado is usually less than 1km. Tornado can cause various damages such as removing the roofs, collapsing some exterior walls of poorly built structures and severe crop destruction. The very strong wind due to tornado can even destroy well-built structures.

Cyclone

Cyclone is a large low pressure system and a revolving storm that consists of numerous thunderstorms. The size of the cyclone is 500-800km. Cyclones are created by getting heat and water vapour from the warm Indian Oceans and the Bay of Bengal. Cyclone hit our country bringing extremely powerful winds and torrential rain. Some time strong surge is created due to cyclone.

Greatest damages during cyclones are resulted from the devastating inundation caused by storm surge. Sometimes storm surge associated with high tide wash away everything in the coastal areas.

tropical cyclone

tornado

EXERCISE

1. Put a tick mark (✔) on the correct answer.

1) What does air temperature mean?
   a. how much hot or cold b. more vapours or less vapours
   c. heavy or light air c. sunlight bright or dim

2) What does happen when air pressure falls down excessively?
   a. storm b. rain
   c. fog d. cold wave

3) Which one is seen every year in Bangladesh?
   a. flood b. earth quake
   c. heat wave d. snow fall

4) Where is the difference between weather and climate?
   a. in time b. in place
   c. in direction d. in strength

2. Short Answered Questions:

1) Name three natural disasters of Bangladesh.
2) What is weather?
3) What are the components of climate?
4) When does air blow from the ocean to land ?
5) How does weather forecast help you in your life?

3. Descriptive Questions:

1) What is air pressure ?
2) How does low air pressure create?
3) Why is there more rainfall during rainy season in Bangladesh?
4) Explain the cause of *Kalboishakhi*.
5) How do weather and climate alike and different?
6) Which month is better for going on a picnic, July or January? Why?

Chapter 12

Climate Change

Climate is the average weather pattern for a long preiod of time. Therefore, the actual weather condition varies within the normal range to extreme condition for a particular region. This changes of weather is measured as temperature, rainfall, and frequency of events such as Cyclone, Nor'wester and so on. This variability is a natural phenomenon. On the other hand, a significant and persistent change in the climate and its variability is called "**Climate Change**". The climate of an area does not change suddenly. However, we feel that climate is changing now. Let's check it!

1. Global Warming

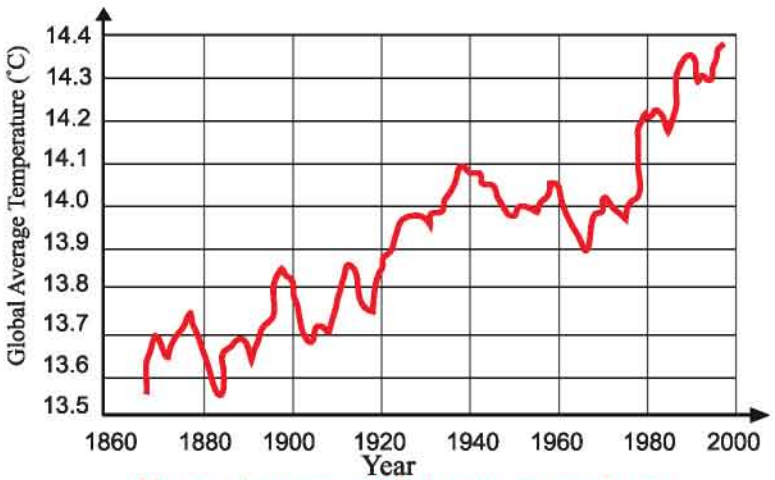
Using temperature measurement all over the world, we can compute the average global temperature.

QUESTION : Is there any change in average global temperature?

Activity: Change in average global temperature

What to Do:

1. Look at the graph of the average global temperature and write the average temperature of different years in your exercise book.
2. Share your idea with your classmates.

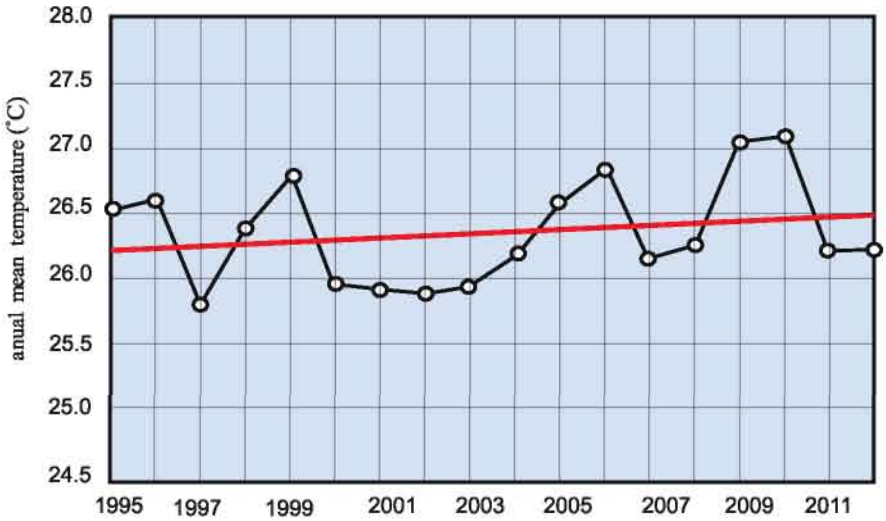


Observed average global temperature change

Summary

According to the graph, average global temperature fluctuates every year. However, scientists have found that the average global temperature is increasing gradually. This gradual increase of the earth's temperature is called "**Global Warming**". Global warming can lead to other changes in climate conditions, such as changes in rainfall patterns. The climate of our earth is changing gradually due to this global warming.

The annual mean temperature in Dhaka is gradually increasing as shown below. Due to the increase of the temperature a lot of changes occur in the natural enviroment.



Change in annual mean temperature in Dhaka

Discussion

- **Based on your experience and what you have learned in this lesson, discuss the following questions in your class.**
  1. Do you think the climate is changing? Why do you think that way? Please state your opinion with evidences.
  2. If you think that climate is changing, is that good or bad for us?

2. Greenhouse Effect

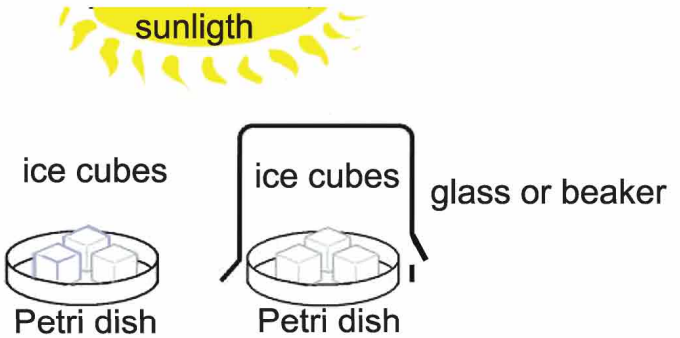
QUESTION : What causes the global warming?

Activity : Greenhouse effect

What to Do:

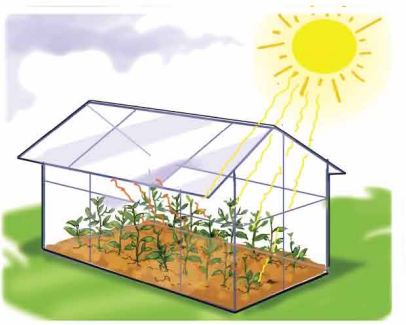
1. Put three ice cubes each of two petri dishes.
2. Cover a petri dish by the glass jar or beaker as shown below.
3. Expose the two petri dishes into the sunlight and guess which ice cubes will melt first.
4. Now wait for 30 minutes.
5. Observe which ice cubes melt first. Does it match with your prediction?

note: This activity can be done by using clear plastic bag and glass instead of Petri dish and beaker.



Summary

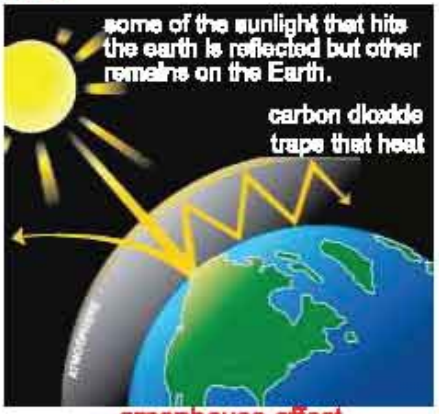
It is observed that the ice cubes covered by a beaker melted first than in the open air. Because the heat of the sunlight can enter inside the beaker, but heat could not come out and resulted to warm up the inside of the beaker faster. It is the principle of the greenhouse. A greenhouse is made up of glass. It traps the Sun's heat. It helps to keep plants warm and alive in extreme cold weather.



green house

Greenhouse Effect and Greenhouse Gases

Earth's atmosphere does the same thing as the greenhouse. An **atmosphere** is the layers of air that surround Earth's surface. Gases in the atmosphere such as water vapour and carbon dioxide do what the glass roof of a greenhouse does.



greenhouse effect

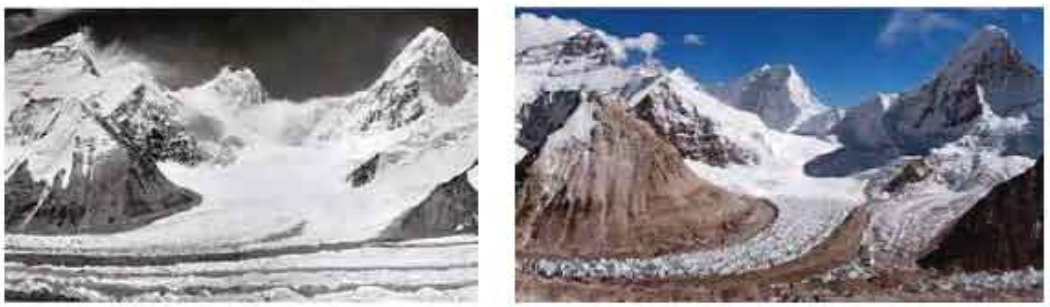
During the day time, the Sun shines through the atmosphere. Earth's surface warms up with the sunlight. At night, Earth's surface cools by releasing the heat back into the air.
But some of the heat is trapped by the gases in the atmosphere and further warming the Earth. This effect is called as **greenhouse effect** and these gases are called **greenhouse gases**.

Human Activities and the Global Warming

Fossil fuel such as coal, oil, natural gas etc. is burnt in energy plants, factories and vehicles. A lot of carbon dioxide emits into the air due to the burn of these fossil fuel. At the same time, due to the deforestation, the absorption of carbon dioxide by the tree is decreasing. As a result the carbon dioxide in the air is increasing. The increased carbon dioxide traps much heat. In a consequence the earth's temperature is increasing day by day. Average increase of earth's temperature is called global warming.

Observational Facts of the Global Warming

In addition to the temperature observation, we can confirm the global warming by the glacial retreat over Himalayan mountain range and polar region. Besides, we observe the sea level rise due to the melting of ice and thermal expansion of sea water.


glacier over Himalayan mountain range (left: 1921, right: 2009)

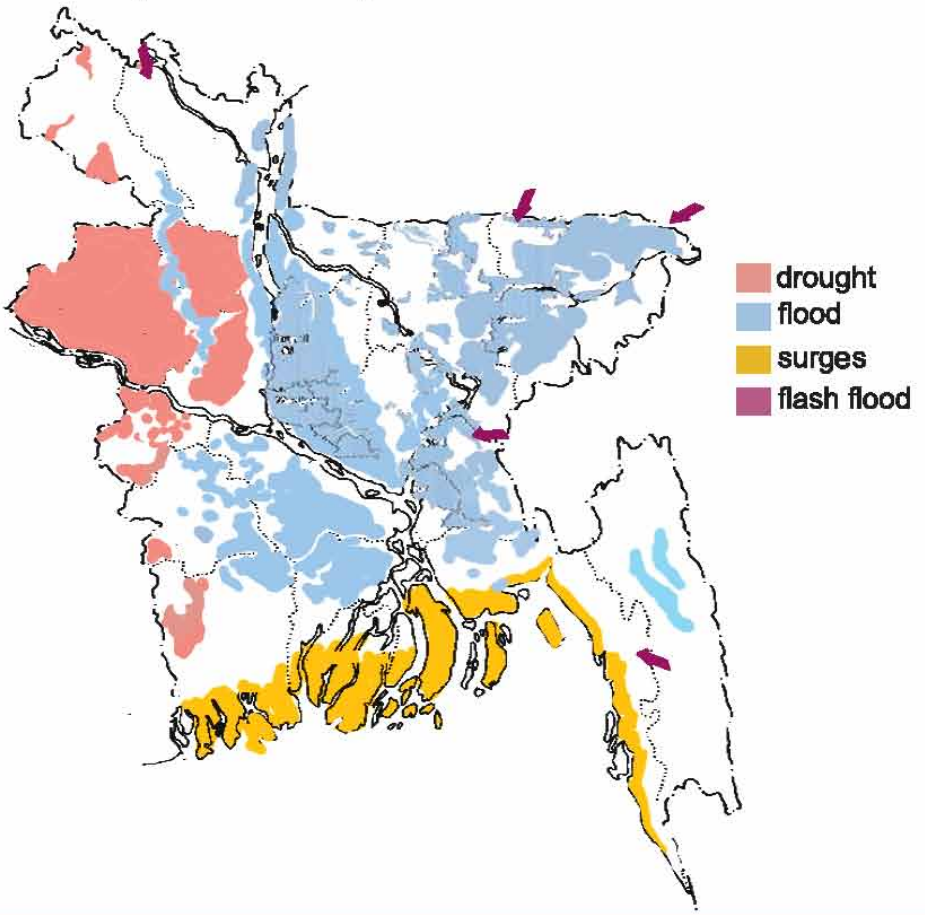
3. Climate Change

QUESTION : What can we do to mitigate the climate change problem ?

Activity : Adaptive Measure

What to Do :

1. Form a group of some students. Observe the map below. The map below shows the vulnerability to different natural hazards in Bangladesh.
2. Identify the natural hazards of your own area and discuss about disaster preparedness and local adaptations.
3. Share your idea with your classmates.



2019

Summary

Scientists predict that climate change will worsen many of the current problems and natural hazards. Climate change will lead to following risks of natural disasters:

- increasing frequency and severity of tropical cyclone and storm surge
- occuring heavier and more erratic rainfall causing flood
- occuring lower and more erratic rainfall causing drought
- sea level rise and salt-water intrusion in the river

Confronting the risks of climate change, we can take two strategies. They are "climate change **mitigation**" and " climate change **adaptation**".

Climate Change Mitigation

The main cause of climate change is the increased carbon dioxide in atmosphere. So we can reduce the risks by reducing the carbon dioxide emission by decreasing the use of fossil fuel such as coal, oil and natural gas. Increasing the use of renewable energy sources such as solar energy and wind can reduce the carbon dioxide emission. Also, we can reduce carbon dioxide in the atmosphere by planting trees. We can reduce energy consumption in our daily life to reduce carbon dioxide emission. These actions will limit the magnitude and rate of long-term climate change.

Climate Change Adaptation

Various mitigation efforts have taken by different countries to reduce climate changes. However, we still need to deal with the climate changes that have already been set in motion. The measure to survive in the changing climate is called **climate change adaptation**. The adaptation is to lower the risks against actual or expected climate change effects.

The followings are examples of adaptation activities:

- developing the infrastructure such as houses, schools and factories
- constructing of flood and cyclone shelters
- creating coastal afforestation
- inovating salt tolerant crops
- changing our lifestyle
- disseminating knowledge of climate change

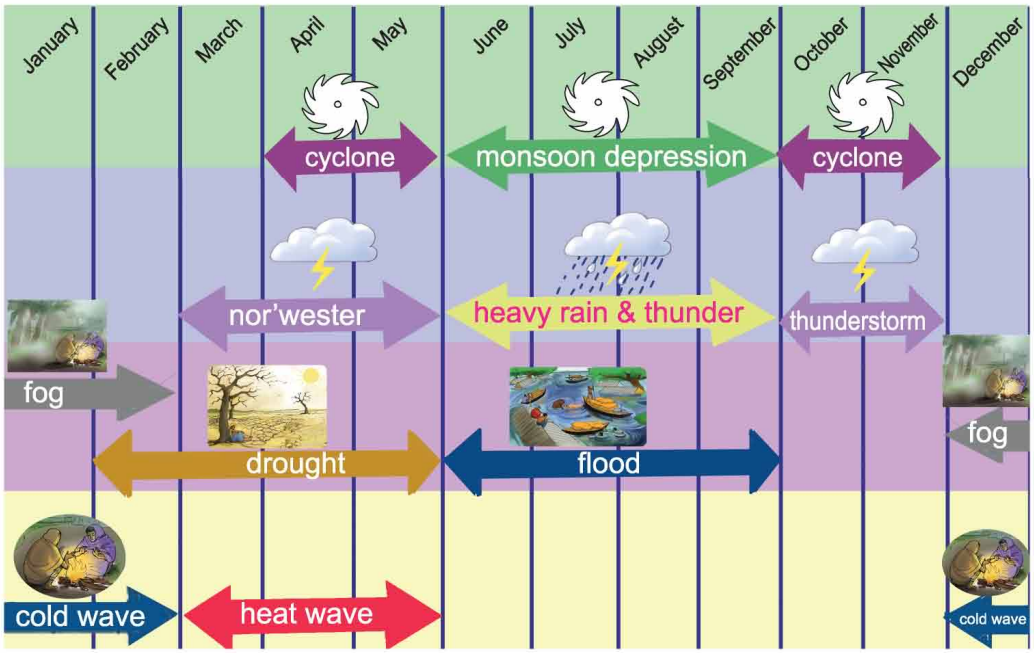
Climate Change

Climate change leads to increase different natural disasters. Following pictures show different measures of adaptation.

planting trees

cyclone shelter

Bangladesh is one of the most disaster-prone countries in the world. We exposed to a variety of natural disasters including tropical cyclones with associated storm-surges, floods, droughts, tornadoes and river erosions and so on. We should know about climate and be prepared for face the natural disaster risks.



disaster calendar of Bangladesh

EXERCISE

1. Put a tick (✔) mark on the correct answer.

1) Which one is a greenhouse gas?
   a. Nitrogen b. Oxygen
   c. Carbon dioxide d. Hydrogen
2) How does climate change happen?
   a. suddenly b. quickly
   b. evenly e. gradually
3) Which one is the climate change mitigation?
   a. use of coal and oil b. use of solar energy
   c. deforestation c. use of natural gas
4) Which one is not the natural hazard of Bangladesh.
   a. cyclone b. hurricane
   b. Nor'wester d. flood

2. Short Answered Question:

1) What is global warming?
2) What is the main cause of the global warming?
3) Give an example of the climate change in Bangladesh.
4) What are the effects of global warming on the environment?

3. Descriptive Question:

1) Why the inside of greenhouse remains warm? Explain.
2) How do climate change mitigation and climate change adaptation related to each other?
3) How can we mitigate climate change?
4) Why the atmosphere of the earth works as the glass of greenhouse?
5) What is climate change adaptation? Explain.
6) As the average temperature of the Earth is increasing, how will it effect our life?

Chapter 13

Natural Resources

We can find many things around us. All these things can be classified into natural things and man-made things. Man-made things are also made by using natural resources.

1. Our Resources

QUESTION : What types of resources do we have?

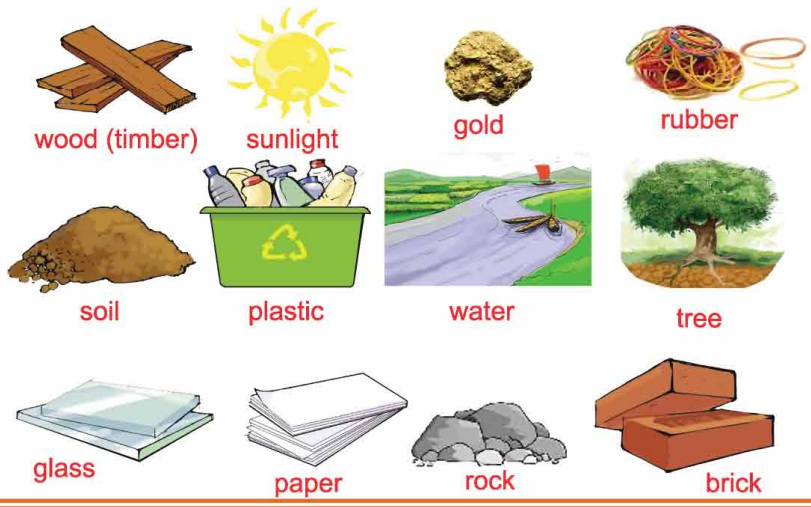
Activity : Identify the types of Resources

What to Do :

1. Make a table like the one shown below.

natural resource	man-made resource

2. Observing the pictures below, identify the pictures as either natural resource or man made resource in the table.
3. Share your idea with your classmates.

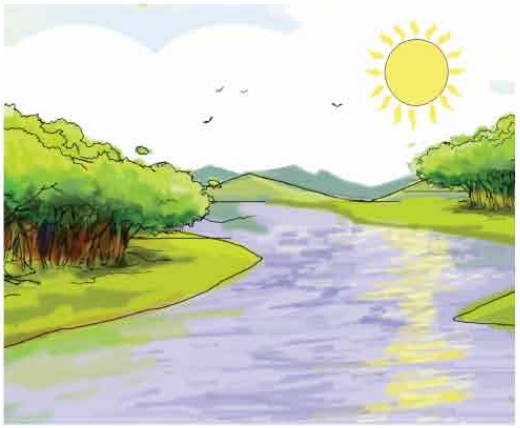


Summary

Resources are something that can be used by people for support or help. Resources can be classified into two types: **Natural resources** and **Man-made resources**.

Natural Resources

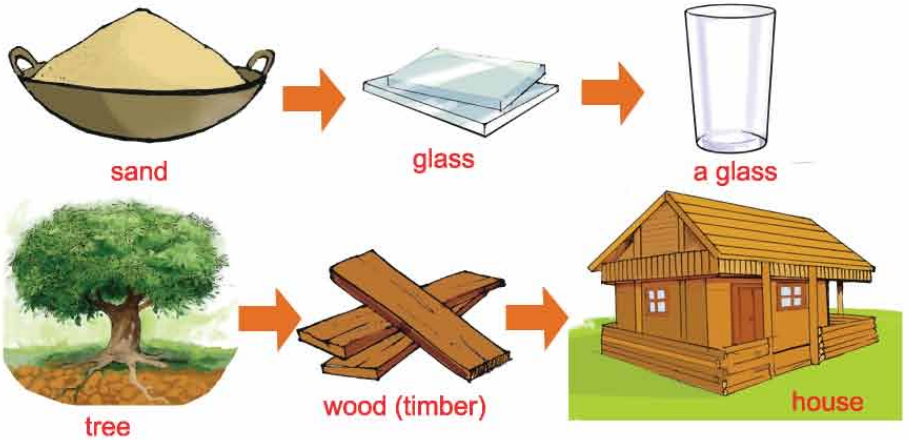
Natural resource is a resource found in nature that people can use to meet their needs. People can not make natural resources. Sunlight, soil, water, air, plants, and animals are natural resources. Minerals and fossil fuel are also natural resources. Natural resources provide us with food, clothing, shelter, and energy.



natural resources

Man-made Resources

Man-made resource is a resource that is made by people. Paper, plastic, glass and electricity are examples of man-made resources. Man-made resources also come from nature. People use the trees to make new things. Trees are cut down to make timber to build houses. We can also change trees into paper. Nobody makes the sand, it is found naturally in the environment. People use the sand to make glass. Man-made resources are also used to create other man-made resources.



2. Wise Use of Natural Resources

People depend on natural resources to make new things and produce energy. The demand for natural resources is increasing as the human population is growing. But some natural resources, especially oil, coal, and natural gas, are limited. Therefore, people have to find alternative resources and the good ways to use natural resources wisely.

Alternative Resources

Oil, coal, and natural gas are non-renewable resources. They can not be replaced for millions of years once used up. On the other hand, renewable resources can be replaced or reused. Therefore, renewable resources can be used as alternative resources. We can use sunlight, wind, and water as renewable resources. The sunlight is an importent and unlimited energy resource. People use solar panels to get electrical energy from the sunlight. Wind is another alternative energy resource. When the wind turns the blades of a wind turbine, electricity is produced.

solar panel

wind turbine

Wise Use of Natural Resources

It is very important to use natural resources wisely for conserving natural resources. We can conserve natural resources by using less energy, reusing, and recycling things. Conserving natural resources help us reducing environmental pollution gradually.

Discussion

wise use of resources

- **How do we use resources wisely?**
  1. Make a table like the one show right.
  2. Make a list of wise use of resources in the table.
  3. Share your idea with your classmates.

EXERCISES

1. Put a tick mark (✔) on the correct answer.

1) Which one is a natural resource?
   a. sand b. paper
   c. glass d. electricity

2) Which resource is limited?
   a. the Sun b. coal
   c. wind d. water

3) Which technology is used for getting electricity from the sunlight?
   a. solar panel b. wind turbine
   c. dam d. electric fan

4) Which one is a man-made resource?
   a. rock b. animals
   c. tree d. glass

2. Short Answered Questions:

1) Give five examples of man-made resources.
2) Give three examples of the alternatives to non-renewable resources.
3) How can we use natural resources wisely?
4) What is man-made resource?
5) Where do man-made resources come from?

3. Descriptive Questions:

1) Why do renewable resources become alternatives to non-renewable resources?
2) Why do people need to use natural resources wisely?
3) How does Natural resource and man-made resource alike and different?
4) What natural and man-made resources do you need to build a beautiful house?

Chapter 14

Population and Natural Environment

World human population is steadily increasing. We need more food, land and other natural resources for growing population. What are the problems with population growth? Do we have any solutions to these problems? How do we resolve these problems?

1. Population Growth and Human Needs

(1) Population Growth and Population Density

In early 1800s, there were almost 100 crore people on Earth. Today, almost 700 crore people live in the world. In the last 200 years, world population has grown by almost 600 crore. The population of Bangladesh was 14 crore 97 lac 72 thousand and 364 as of 2011. But, there were almost 7 crore 60 lac people in 1970s. The population of Bangladesh almost doubles in the last 40 years.

Population density is the number of people per square kilometre land area. Population density can found by dividing total population by total area of a country. Population density in Bangladesh is very high.

Population of Bangladesh (apro.)

Year	Population
1961	5 crore 52 lac
1974	7 crore 64 lac
1981	8 crore 99 lac
1991	12 crore 14 lac
2001	12 crore 93 lac
2011	14 crore 97 lac

Population of Bangladesh is growing.

Discussion

◆ **What is the population density in Bangladesh?**

1. Total area of Bangladesh is 1,47,570 square kilometres. According to the table above, calculate the population density of Bangladesh in different period of time.
2. Share your idea with your classmates.

Population density = the number of people ÷ total area

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(2) Population Growth and Human Needs

QUESTION : What will happen to our life if population increases?

Activity : What do we need?

What to Do:

1. Make a table like the one shown below.

What do we need more for growing population?

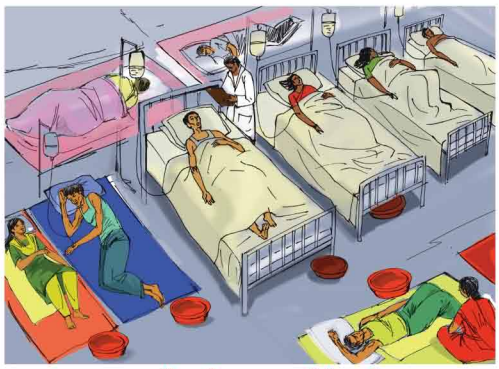
2. Make a list of what we need more if population grows in the table.
3. Share your idea with your classmates.

What do we need to survive?

We need food, water, shelter…Umm…

Summary

The more population grows the more human needs increases. This can create pressure on natural resources. Aditional needs will cause various problems in our life. For example, we will face the issue of a shortage of food, clothing, housing, and land when population grows. Population growth makes people easy to get diseases. Because germs spread faster in denser populations.

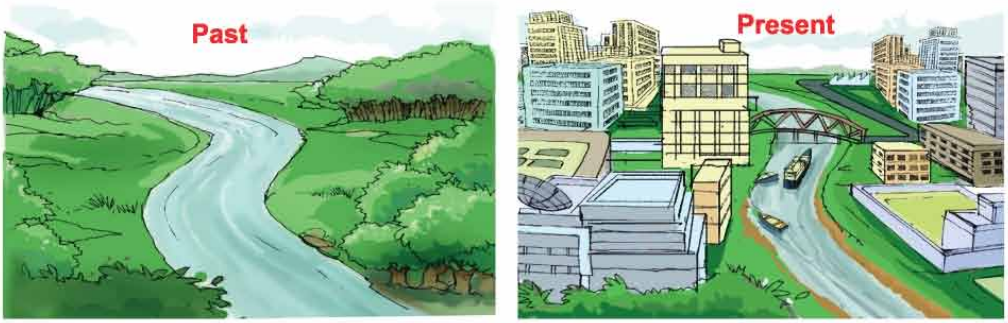


diarrhoea epidemic

We may have less chance of getting medical and education services. Opportunities for using natural resources may get reduced.

2. Impact of Population Growth on Environment

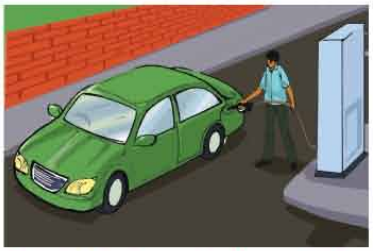
Population growth has several impacts on the environment. People clear forests to cultivate more crops or farm more livestock. They use more land for shelters, roads, and industries. The loss of forests causes the changes of ecosystem, the destruction of habitats of living things, and their extinction. Deforestation also can cause soil erosion and landslides.



change of ecosystem due to population growth

Chemical fertilizers and pesticides are used in agriculture to grow plant well and produce more food. Excessive use of chemical fertiliser and pesticide can cause soil pollution and water pollution.

Fossil fuel is burnt in power plants and factories to produce more electricity and goods. People use fossil fuel to run vehicles for transportation. Harmful gases emited from factories and vehicles cause air pollution that results global warming and acid rain.



Fossil fuel uses in the vehicles.

Discussion

◆ **How does population growth affect the environment?**

1. Make a chart like the one shown below.

negative effect	causes

2. Make a list of the negative effects of population growth on the environment and its cause in the table.
3. Share your idea with your classmates.

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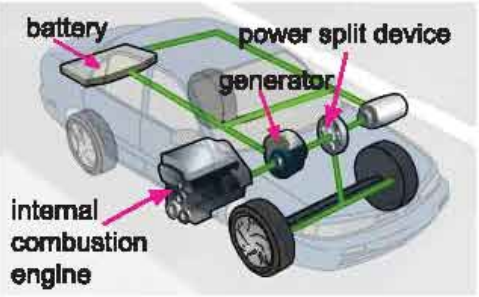
3. Role of Science and Technology to solve Population problems

Contribution of Science and Technology to solve Population problems

Science and technology help to produce more food to meet the needs of growing population. People use agricultural machinery that helps people growing a lot of food in the shortest period. Today, **Biotechnology** is used to grow plants that are more nutritious, disease resistant and more productive.



Hybrid car uses gasoline and electricity

Science and technology can help people to use less non-renewable resources, save energy, and reduce pollution. People have developed technology such as solar panel that uses renewable resources to produce electricity. These technologies can be used as alternatives to non-renewable resources.

Today, new mode of transportation such as **hybrid car** has been developed by using science and technology. This car uses gasoline and electricity as their two sources of energy. It can help reducing the use of fossil fuel.

Learning science and technology is important

Importance of Learning Science

Science and technology play a vital role to solve various problems related to population growth in many ways. Therefore, it is very important for us to learn science and technology. Learning science and technology help us to change our attitude and to solve population growth issues. Science and technology also have an important role in developing human resources.

Discussion

- **How does science and technology contribute to solve population problems?**

1. Make a list of how science and technology contribute to solve population problems in your notebook.
2. Share your idea with your classmates.

EXERCISES

1. Put a tick mark (✔) on the correct answer.

1) Which one is a basic human need?
   a. recreation b. food
   c. hybrid car d. sports

2) Population density is-
   a. number of people per square kilometer
   b. land area per number of people
   c. weight of people per square kilometer
   d. square kilometer per weight of people

3) Which one is a non-renewable energy resource?
   a. water b. tree
   c. air d. coal

4) What does fossil fuel burning cause?
   a. global warming b. population growth
   c. earthquake d. soil erosion

2. Short Answered Questions:

1) Which needs will increase due to population growth?
2) Give three examples of negative impact of population growth on the environment.
3) How does science and technology contribute to produce more food?

3. Descriptive Questions:

1) Why do we have to learn science and technology?
2) Why do people use chemical fertilizers and pesticides in agriculture?
3) What are the effects of clearing forests on environment?
4) Why does population growth make people get diseases easily?

Glossary

Terms	Meaning of Terms	Page No.
acid rain	Rain that contains harmful chemicals /substances.	28
AIDS	A contact diesease causes by HIV infection.	48
air pressure	The force produced by the weight of the air pressing down on the Earth.	75
airborne disease	Any disease caused by germs transmitted through the air due to coughing, sneezing, or talking.	48
artificial colour	Coloured chemical substances used for making food attractive.	45
atmosphere	The layer of air surrounding the Earth.	84
atom	The smallest particle of matter.	39
axis	The imaginary line through the centre of the earth.	54
biotechnology	A technology that uses the living systems and living things for human welfare.	65
chemical	A substance (such as an element or compound) that is made through a chemical process.	45
climate	The usual weather pattern at particular place for a long period of time.	73
climate change	A significant and persistent change in the climate and/or its variability.	86
climate change adaptation	The measure to survive in the changing climates.	86
climate change mitigation	The actions that will limit the magnitude and/or rate of long-term climate change.	86
cold waves	Occurrences of extreme low temperature in association with incursion of dry cold winds from north into our country.	78
colony	A group of plants or animals living or growing in one place.	5
condensation	The process of changing state from a gas to liquid.	18
conduction	The process of heat transfer through solid.	35
convection	The process of heat transfer through the gases (air) and liquids.	35

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day	Condition of the part of the Earth that is facing the Sun.	54
digestion	A process by which the ingested food is broken down into simple, soluble and diffusible substances.	18
drought	A long period of dry weather with abnormally low rainfall.	78
ecosystem	All the living and non-living things and their interaction in a place.	3
energy	The ability to do things.	30
energy transformation	Change of energy from one form to another.	33
environmental conservation	The sustainable wise use and preservation of natural resources.	13
environmental pollution	Environmental changes harmful to living things. Environmental pollution is caused by the introduction of harmful and poisonous substances into the environment.	9
evaporation	The process of changing state from a liquid to gas.	18
filtration	Act or process of filtering water.	23
food chain	The flow of energy in an ecosystem from plants to animals.	7
food web	Several food chains connected together.	7
glacier	A very large piece of ice that moves slowly down a slope or valley or over a wide area of land.	10
global warming	Gradual increase of the earth's average temperature.	82
greenhouse effect	The phenomena of tarpping heat in the atmosphere through water vapour, carbon dioxide and other gases.	84
greenhouse gases	The gases that trap heat causing greenhouse effect.	84
habitat	The part of an environment where a plant or an animal lives.	3
heat transfer	The flow of thermal energy from warmer objects to cooler objects.	32
heat wave	A prolonged period of excessively hot weather.	78
HIV	Germ that causes AIDS.	48
humidity	a measure of how much moisture is in the air.	77
hybrid car	Car that uses two kinds of fuel e.g. gasoline and electricity, as two sources of energy.	96
immune system	Our body's natural ability to fight disease.	49

industrial revolution	A rapid major change in an economy (as in England in the late 18th century) marked by the general introduction of power-driven machinery or by an important change in the prevailing types and methods.	64
industrialisation	To build and operate factories and businesses in a city, region, country etc.	10
infectious disease	The diseases caused by germs such as bacteria, viruses, fungi etc.	47
Information sharing	The process of exchanging information among people, friends, families, or communities.	69
internet	A huge network that links computers together all over the world.	70
junk food	A food conatining excesive sugar, salt and fat and can be prepared and served easily .	45
man-made resource	A resource that is not made by nature but made by people.	90
matter	Anything that has weight and takes up space.	38
medium	Objects, tools or methods used for transfering something.	36
molecule	Particles of an object that is made up of two or more atoms joined together.	39
mother plant	Parts or seeds of the plants from which new plants grow.	5
natural resource	A resource found in nature that people can use to meet their needs.	90
night	Condition of the part of the Earth that is facing away from the Sun.	56
northern hemisphere	The northern half of the Earth.	58
orbit	The path through which the Earth and other planets move around the Sun.	54
oxygen cylinder	Container for holding or storing oxygen.	26
pesticide	A chemical that is used to kill animals or insects that damage plants or crops.	12
phases of the Moon	The changing shapes of the bright part of the Moon that we see.	59
pollination	Transfer of pollen from one flower to another flower so that plants can make seeds.	5
population density	Number of people per square kilometer of land area.	93
precipitation	Any form of water that falls from clouds down to Earth's surface.	77

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puberty	The period of life when our body begins to develop and change from the body of a child to the body of an adult.	50
radiation	The process of emitting energy without any medium from the source.	36
revolution	The orbital motion of the Earth around the Sun.	54
rotation	The spinning motion of the Earth on its axis.	54
satellite	An object of the universe that revolves around a planet.	60
science	Study about the natural world through observation and experimentation to describe and explain natural phenomena.	63
sedimentation	A process to remove suspended particles from water.	23
seed dispersal	Transport of seeds away from the parent plant.	5
soil erosion	The washing or blowing away of the top layer of soil by wind or water.	95
technology	The application of science to solve the practical problems of our life.	63
telescope	A device shaped like a long tube that is used to see the things that are far away.	52
water cycle	The ways that water moves all around the earth as it changes state.	20
water purification	A treatment of water to make it safe and acceptable for human use.	23
waterborne diseases	The diseases caused by taking water contaminated with germs.	11
weather	The temporary state of sky and atmosphere at a certain place and time.	73

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