Orient BlackSwan

Inspired SCIENCE

For the CISCE curriculum

NEP Compliant inside

4

WITH APP

Inspired Science

has been developed in accordance with the CISCE Primary Science curriculum. Its aims are:

- to enable students to relate their daily life experiences and science by following a practical, thematic approach
- to focus on the development of scientific temper through skill and process development
- to encourage knowledge construction through information collection, organisation and reflection

Students' book

- complete syllabus coverage
- carefully graded text
- appropriate, well-labelled illustrations and photographs
- appropriate activities and exercises

Let's learn

Learning outcomes
encourage students to take responsibility for their learning

Get going
helps focus and direct students' attention to the lesson

Activities
help students learn through practical exercises

Stop and check
provides checkpoints for teachers and students to evaluate progress

Spotlight
focuses on important topics in greater detail

Go further
provides additional, interesting, relevant information

Science and life
links scientific concepts with real life occurrences and applications

Eco corner
presents issues that are an environmental concern

Let's revise

In a nutshell
is a comprehensive revision corner

Concept map
is a graphic presentation of concepts linked logically

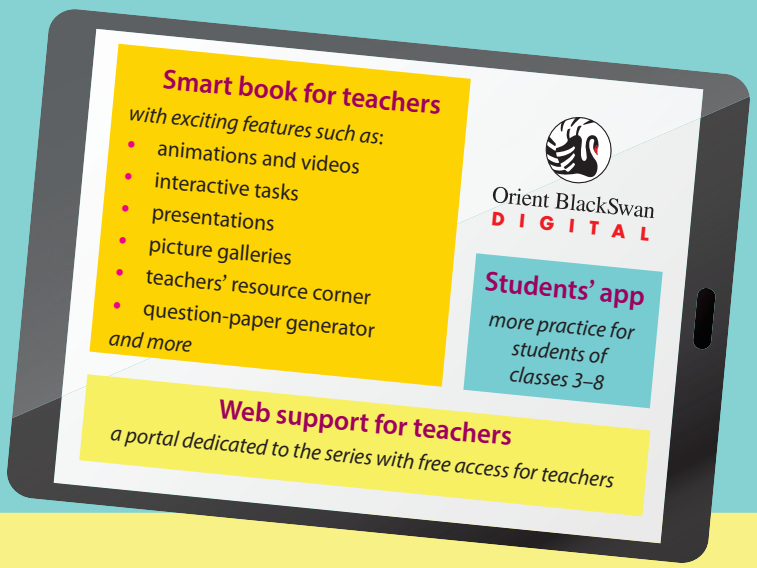
Summary
lists the main points of the lesson briefly

Keywords
lists important words and their definitions

Glossary
presents important words for quick revision at the end of the book

Teachers' resource pack

- lesson plans
- question bank with answers
- worksheets with answer key
- activities for internal assessment
- question papers with answer key
- answer key to the exercises in the students' book



Let's apply

Checkpoint
covers a variety of exercises (objective type, short answer and long answer)

Think and answer
encourages students to develop higher-order thinking skills necessary for the 21st century

Picture study
offers picture-based questions that encourage students to observe, identify and relate concepts to real life

Hands-on
offers a variety of projects that reinforce 21st century skills through experiments, model-making, discussion, role-play, research work, report writing and so on

Subject integration
presents additional activities explicitly linking multiple subjects

Life skills and values
help children develop skills needed for everyday life and values needed to be well-adjusted members of society

Let's know more

Scientist in focus
describes the life and work of famous scientists to inspire students

Heritage corner
presents exciting and accurate information on India's scientific heritage

Internet links
provides sources for further study and research

Let's work

- ***Worksheets*** a workbook corner with worksheets covering all lessons
- ***Test papers*** based on the ICSE pattern

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6 Adaptation in Animals

Learning outcomes

By the end of this theme, you will be able to:

- explain the need for adaptations in animals
- describe the various adaptations in animals
- explain how animals are adapted to suit their food habits
- explain why we should protect animals

Did you spot the stick insect?

Get going

Can you see the insect in the picture? What does it look like?

This insect looks different from other insects. It looks like a stick! In what way do you think looking like a stick helps the insect?

Did you spot the stick insect?

INTRODUCTION

You find animals and plants living around you. You also find them living in the mountains, deserts, lakes and seas on the Earth. As you know, the place where an animal or plant normally lives is called its habitat. A habitat contains everything that a living thing needs in order to live.

Desert habitat

THE NEED FOR ADAPTATIONS IN ANIMALS

Every environment gradually changes as time passes. A dry area might gradually become drier or wet over hundreds of years. The animals that live in that area have to change their features[1] and behaviour to flourish[2] in that environment. The animals that do not change may not be able to survive and might slowly become **extinct**.[3]

Animals that live in different habitats have different adaptations to help them survive in their particular habitat.

A gazelle walking

ADAPTATIONS TO HABITAT AND CLIMATE

Terrestrial Animals

*Animals that live on land are called **terrestrial animals**.* Lions, tigers, camels, elephants, deer and gazelles are examples of terrestrial animals.

Most terrestrial animals have legs that help them move. Some terrestrial animals like lions and deer have long powerful legs that help them to run fast to catch their prey[4] or to run away from predators.[5]

Prairie dog in burrow

Some animals like rabbits, prairie dogs and moles live in burrows. They have strong front legs that help them to dig into the ground.

[1] **feature** a property or quality that makes something different from others
[2] **flourish** develop and grow in a healthy way
[3] **extinct** has/have died out
[4] **prey** an animal that is hunted and killed for food
[5] **predator** an animal that kills other animals for food

Some animals like the monkey, koala, squirrel and chameleon live in trees. They have strong **limbs**. *Animals that mainly live in trees are called* ***arboreal animals***. They have claws on their feet to help them climb trees. Some of them have strong tails that help them to hold on to tree trunks and branches. Animals like tigers, deer, dogs and humans have a nose and lungs to breathe. Insects breathe through holes called spiracles.

Arboreal animal—monkey

Animals like the camel, coyote and fennec fox that live in hot deserts have thick skin to decrease loss of water. Some of them are active only at night. *Animals that are active only in the night are called* ***nocturnal animals***.

Desert animal—camel

Some animals in hot deserts sleep through the hot summer months. This sleep is called **aestivation**.

Camels have long eyelashes to protect them from the blowing sand in the desert. They can also shut their nostrils to prevent sand from entering. Their wide feet help them to walk on hot sand without sinking in. Their long legs help them to keep their bodies away from the hot sand. They also have a **hump** that is filled with fat to help them survive for long periods without food.

Cold desert animal—
Arctic hare

Animals like the Arctic hare, Arctic fox and polar bear that live in cold deserts have thick **fur** to protect them from the cold. Their fur is usually white and helps them to hide in the snow.

Polar bears are good swimmers and have feet that are covered with fur to help them walk in the snow.

Cold desert animals—
polar bears

Cold desert animal —penguin

Go further...

Some animals move from their habitat to other areas at a certain time every year. This seasonal movement of animals in search of warmth, food, water and so on is called **migration**. The Arctic tern, monarch butterfly, Siberian crane and wildebeest are some examples of animals that migrate.

Aerial animal—pigeon

They also have a layer of fat called **blubber** under their skins to keep them warm.

Some animals in cold regions sleep through the cold winter months. This sleep is called **hibernation**.

Penguins have waterproof feathers and their front limbs are modified into **flippers** to swim. Penguins also have blubber.

The colouring of some terrestrial animals like lions, tigers and polar bears helps them to blend in with their surroundings. *The natural characteristic of an animal that helps it to blend in with its surroundings is called **camouflage**.* The colour of chameleons' bodies helps them to blend in with their surroundings.

Some animals look like something else found in their environment. This helps them escape from predators or hide from their prey. The stick insect looks like a stick and the leaf butterfly looks like a leaf. *The appearance of an animal that enables it to look like something else is called **mimicry**.*

Some animals have protective coverings like **shells** (for example, the snail and tortoise) or **spines** (for example, the porcupine).

Aerial Animals

*Animals that can fly are called **aerial animals**.* Birds and bats are examples of aerial animals.

Aerial animals have modified front limbs. The front limbs of birds and bats are modified into **wings**. Wings help these animals fly.

Birds have feathers that help them fly and keep them warm. They also have a streamlined[6] body that helps them move through the air easily. They have hollow bones, which their body light.

Aquatic animal—dolphin

Aquatic Animals

Animals that live in water are called ***aquatic animals****.* Fish, dolphins, sharks, crabs and so on are examples of aquatic animals.

Aquatic animals have modified limbs to help them swim. Fish have **fins**, turtles have flippers and ducks have **webbed feet** to help them move in the water.

Aquatic animal—fish

Most aquatic animals have a streamlined body to help them move through water.

Most of them have **gills** to help them breathe in water. Some animals like whales and dolphins have **lungs** to breathe.

Amphibians

Amphibians *are a group of animals that live on land and in water.* Frogs, toads and salamanders are examples of amphibians.

Amphibians have webbed feet that help them move through water easily. They have powerful **hindlimbs** that help them leap and jump on land.

Amphibian—frog

They have lungs, but they can breathe through their **moist skin** in water.

[6]**streamlined** having a shape that is suitable for moving easily through air or water

Stop and check

Answer the following questions.

1. Describe some adaptations seen in animals that dig burrows.
2. Name two animals that have flippers.
3. What is mimicry? Give an example of an animal showing mimicry.
4. Name two animals that breathe through lungs.

Herbivore—sunbird

Herbivore—wallaby

Carnivore—wolf

ADAPTATIONS TO FOOD HABITS THROUGH BODY MODIFICATIONS

Animals can be divided into three kinds based on the kind of food they eat.

Herbivores

Animals that eat only plants are called ***herbivores****.* Deer, elephants, cows, horses and goats are examples of herbivores.

Herbivores have sharp cutting teeth to bite off leaves and branches, and broad back teeth for grinding the food. Elephants have a long **trunk** and giraffes have a long neck to eat the leaves on trees and tall plants.

Parrots and pigeons have strong beaks to break nuts and seeds. The hummingbird and sunbird have long, thin beaks to reach the **nectar** in flowers.

Carnivores

Animals that eat only other animals are called ***carnivores****.* Lions, tigers, wolves and leopards are examples of carnivores.

Carnivores have sharp tearing teeth to tear the meat that they eat. The bones of a snake's jaw are loosely connected. This helps them to swallow prey that is larger than their head.

Birds that eat meat, for example, eagles, have sharp, curved beaks to tear the meat. They also have sharp claws on their feet to catch their prey. Woodpeckers have strong, pointed beaks to dig out insects from under the bark of trees. Herons have long, sharp beaks to catch fish.

Woodpecker searching for insects under tree bark

Omnivores

Animals that eat both plants and other animals are called ***omnivores****.* Bears, dogs and human beings are examples of omnivores.

Omnivores have sharp cutting teeth to bite food, sharp tearing teeth to tear meat, and broad back teeth to grind the food.

Ducks have broad beaks to filter worms, insects and small animals from water before they eat them. Crows have strong beaks and claws.

Omnivore—crow

THE IMPORTANCE OF ANIMALS

Animals play an important role in seed dispersal. When animals eat the fruits of plants, the seeds are excreted in their **dung**. Small animals like bees and butterflies help in plant reproduction.

Carnivores depend on herbivores for food. So, an increase or decrease in the number of herbivores in an area affects the numbers of carnivores too.

Bee drinking nectar from a flower and helping to pollinate the flower

Activity

Select a tree near your house or school. Note how many animals you see in the tree. Write down the number of animals you see; animals that eat the fruits, seeds or leaves; animals that use the shade of the tree and so on.

CARING FOR ANIMALS

You can protect the animals around you by taking the following steps.

- Trees are the homes of many animals like squirrels and birds. Make sure that you plant more trees and also stop trees from being cut down in your neighbourhood.
- When you go into a forest, make sure that you do not disturb the animals there. Do not throw waste in the forest since the animals may eat it.
- Do not buy items that are made from the skin, claws, hair and other parts of animals.
- Do not keep birds and other animals in **cages**.

If you have pets at home, take good care of them.

- Feed your pets at regular times. Make sure that they always have water.
- Keep their homes (**kennel**, **stable**, **shed** and so on) clean and tidy.
- Give them a bath regularly. Brush their hair and cut their claws when needed.
- Take them to a **veterinary doctor** when they are sick.
- Make sure that your pets are given the correct **vaccinations** at the correct time.

Spotlight

A **veterinary doctor** is a doctor who is an expert in treating the diseases of animals. The doctor can also be called a **vet** (shortened form of veterinary). If you have a pet, find a vet near your home. Write down the phone number of the vet or the veterinary clinic in your notebook.

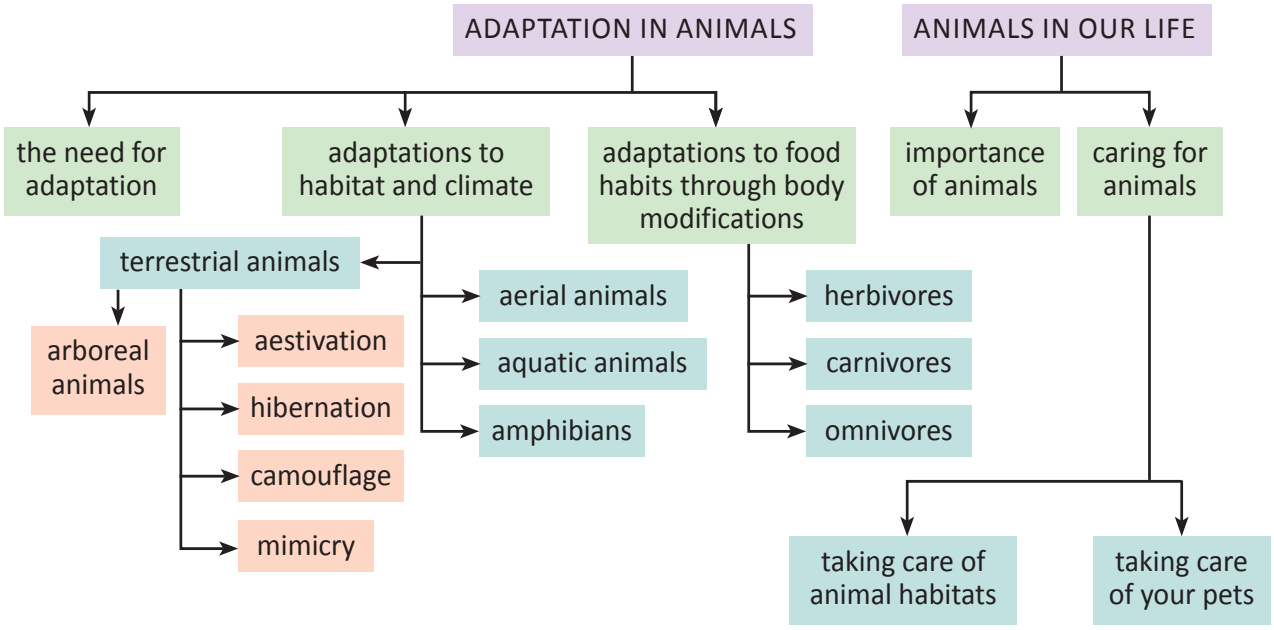
Stop and check

Say if the statements are true or false.

1. Animals can be divided into three kinds based on the kind of food they eat.
2. A giraffe has a long neck to reach the leaves on trees and tall plants.
3. A parrot has a sharp, curved beak to tear flesh.
4. Bears eat only plants.

In a nutshell

CONCEPT MAP



SUMMARY

- The place where an animal or plant normally lives is called its habitat.
- Animals that live on land are called terrestrial animals.
- Animals that can fly are called aerial animals.
- Animals that live in the water are called aquatic animals.
- Amphibians are a group of animals that live both on land and in water.
- Animals can be divided into herbivores, carnivores and omnivores based on the food they eat.
- Animals have adaptations that are suited to their habitats and the food they eat.
- Animals are an important part of the environment.
- You should take steps to protect the animals found around you.
- You should take good care of your pets.

KEYWORDS

aestivation the long sleep of an animal during the hot season

behaviour the way a person acts

hibernation the long sleep of a living thing during the cold season

seed dispersal the act of spreading seeds over a large area by wind, water or animals

vaccination protecting a person or animal from a disease by giving a medicine in advance

webbed feet feet that have the toes connected by thin skin

CHECKPOINT

A. Choose the correct option.

1. Which of the following is **not** an adaptation that is observed in terrestrial animals?
   a) Many of them have four legs to move from place to place.
   b) Some of them that live in deserts sleep during the day and are active at night.
   c) Some of them have thick fur on their bodies.
   d) Many of them breathe through gills.

2. How does a camel's hump help it to survive in the desert?
   a) It helps the camel to balance its body while walking.
   b) It protects the camel during a sandstorm.
   c) It stores fat which can be used to get energy when food is not available.
   d) It stores water so that the camel need not drink water for a long time.

3. Which of the following is **not** matched correctly?
   a) Polar bears and their thick coat of fur
   b) Turtles and their fins
   c) Monkeys and their long tail
   d) Frogs and their powerful hind legs

4. Which of the following is true about frogs?
   a) They have gills to help them breathe in water.
   b) They have air holes in the skin that can trap air.
   c) Their skin helps them breathe in water.
   d) They have lungs that help them breathe in water.

B. Pick the odd one out.

1. chameleon, ladybird beetle, polar bear, stick insect
2. fish, frog, dolphin, shark
3. frog, salamander, toad, crow
4. crow, tiger, lion, wolf
5. bear, fish, squirrel, deer

C. Form similar pairs of words.

1. *summer sleep* and *aestivation* / *winter sleep* and _____
2. _____ and *seasonal movement of animals* / *camouflage* and *protective colouring*
3. *light and hollow bones* and _____ / *strong limbs and tail* and *arboreal*
4. *herbivore* and *plant-eating animals* / _____ and *flesh-eating animals*

D. Short-answer questions

1. Define the terms:
   i. terrestrial animals ii. arboreal animals iii. amphibians
2. Why do some terrestrial animals have powerful legs?
3. What are nocturnal animals?
4. Why do aerial animals and aquatic animals have streamlined bodies?
5. Give two adaptations seen in herbivorous birds.

E. Long-answer questions

1. List three features of a camel that helps it to survive in a desert.
2. Differentiate between camouflage and mimicry.
3. Birds are built to fly. Justify this statement.
4. List three adaptations that are seen in carnivorous animals.
5. Give three steps that you can follow to protect the animals around you.
6. How can you take care of your pets?

Think and Answer

An owl is a nocturnal bird. What features will a nocturnal carnivorous bird need to hunt its prey at night?

Picture Study

Look at the picture and answer the questions.

1. What do you see in the picture?
2. What has the animal used to hide from its predator—camouflage or mimicry?
3. How will this help this animal?

Life Skills and Values

1. Our lives do not stay the same for long. They keep changing constantly. Be open to adapting to the changes that you see happening around you. Being adaptable helps you in many ways.
2. Dipti saw a couple of boys throwing stones at a stray dog in front of her house. She ran out to stop the boys and explained to them that all living things need to be treated with kindness. What values did Dipti show?

Hands-on

1. Choose a habitat and illustrate it on a sheet of chart paper. Show the kinds of animals and plants found there. Display your chart on the board and describe it to the class. Explain the adaptations that the animals shown have.
2. Choose an animal. Find out everything you can about it—where it lives, how it is adapted to its environment, what it eats. Then, make a poster that says 'I love the _____.'

Subject Integration

(Languages, Health and Physical Education and Social Studies)

1. Check the Internet to find out some unique adaptations that are found in the animal world. Note them down in your notebook.
2. Find out a special landform, like mountains, desert and so on, that is seen in your state. Name two animals that live in that habitat. What are their adaptations?

Scientist in Focus

Biruté Mary Galdikas

Biruté Galdikas had decided by the age of six that she wanted to be an explorer. In 1971, she arrived in Borneo (in Indonesia) to study orangutans in their natural habitat. Four years later, she wrote an article on orangutans in National Geographic Magazine that brought attention to the orangutans. She studied the orangutans and worked to preserve their natural habitat. With 40 years of study, Galdikas's work is the longest study of any wild mammal in the world. Galdikas and her team have set up the Orangutan Foundation International to conserve orangutans and their habitat.

Internet Links

https://www.cntraveler.com/galleries/2013-02-24/photos-great-animal-migrations/1
http://mentalfloss.com/article/57204/20-amazing-animal-adaptations-living-desert

9 Light

Learning outcomes

By the end of this theme, you will be able to:

- identify sources of light
- distinguish between natural and artificial sources of light with examples of each
- differentiate between luminous and non-luminous objects
- describe the properties of light
- differentiate between transparent, translucent and opaque objects with examples of each
- explain how shadows are formed

Get going

Here is a busy street that is lit at night by street lights. Do you think you would be able to walk down the street if all the lights were switched off?

What would you use to light your path as you walk?

INTRODUCTION

We use our eyes to see. Can you see the objects around you in a dark room? We can see the objects only if there is enough light.

Light is a form of energy that helps us to see things around us.

Activity

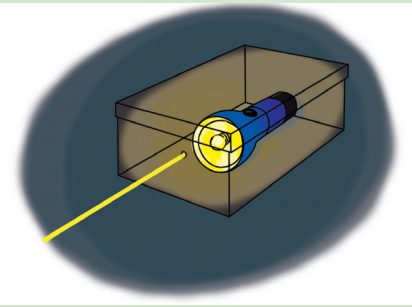
Aim: To study sources of light using a light box

Materials required: a shoebox, black paint, a torch, a small mirror, a lit *diya*, a piece of wood

Method

1. Paint the inner walls of the shoebox with black paint. Make a small hole in one wall. You now have a light box.
2. Keep the light box in a darkened room. One by one, place these items in the box: a torch, a small mirror, a lighted diya, and a piece of wood. Does light shine out of the hole in every case?

Observations and conclusions: Only the torch and the lit *diya* give out light. These are sources of light.



SOURCES OF LIGHT

During the day, light from the Sun helps us to see things around us. At night, or when we are in a place where there is not enough light, we use light from bulbs, tube lights and so on to see.

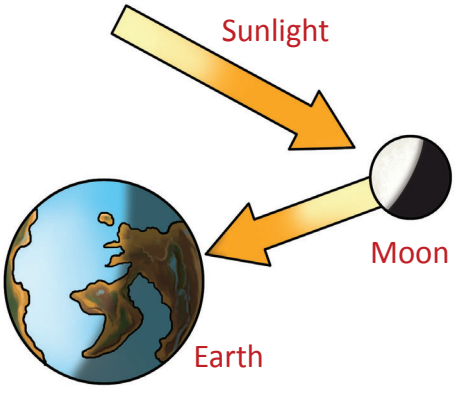
Objects that give out light are ***sources of light****.* They are either natural or artificial.

Natural sources of light *Natural objects that give out light are natural sources of light.*

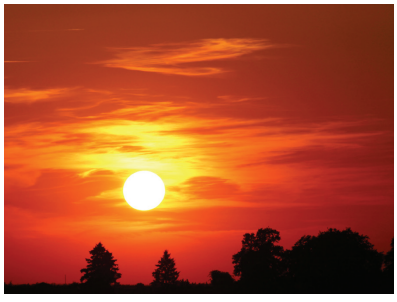
The Sun is the main source of light on Earth. The Moon does not give out light of its own. It reflects[1] the light of the Sun. Stars are made of gases and give out light.

Certain jellyfish, insects such as glow-worms and fireflies and other living things can produce light too!

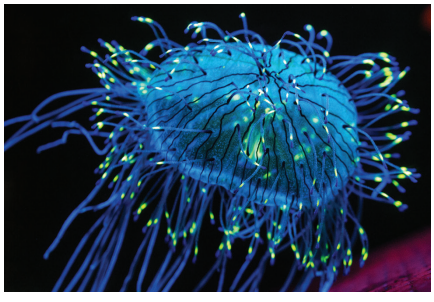
Artificial sources of light *Human-made objects that give out light are artificial sources of light.* Examples are electric bulbs, tube lights, candles, torches, earthen lamps or *diyas* and so on. We use artificial sources of light when there is no light from a natural source.



The Moon reflects the light of the Sun.



The Sun



A jellyfish that produces light

[1]**reflect** throw back or bounce off a surface

LUMINOUS AND NON-LUMINOUS OBJECTS

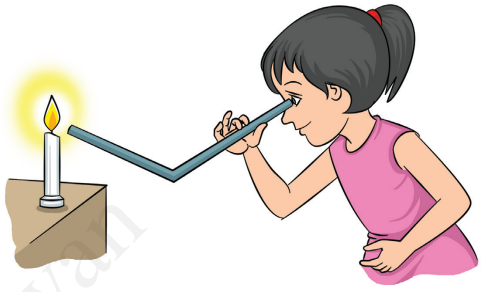
Objects that emit[2] *light of their own are called* ***luminous objects***. They are sources of light. Examples are the Sun, a bulb, a candle and a torch.

Objects that do not emit light of their own are known as ***non-luminous objects***. A book, a table, a teacup and the Moon are examples.

PROPERTIES OF LIGHT

Light has the following properties.

- **Light travels only in straight lines.** We can see the flame of a candle when we look at it through a straight straw. However, if we bend the straw, we cannot see the flame because light from the flame does not bend as it travels through the straw.



We cannot see the candle flame through a bent straw.

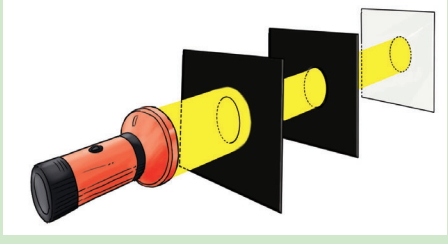
Activity

Aim: To observe how light travels in a straight line

Materials required: a torch, one sheet of white cardboard, two sheets of black cardboard

Method

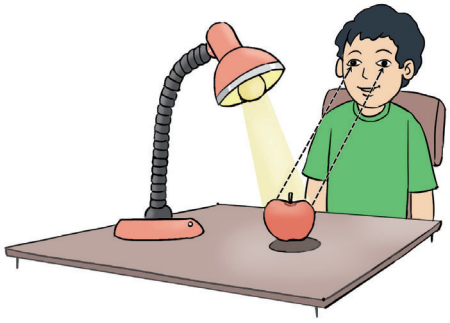
1. Make a small hole in each of the two black sheets of cardboard. The white sheet will be used as a screen.
2. Arrange the sheets upright in a line with the white sheet at one end. The holes should be in the same straight line.
3. Darken the room. Shine the light of the torch through the hole of the first sheet. A patch of light forms on the screen.
4. Move the second black sheet to one side. Will you still see a patch of light on the screen?



Observations and conclusions: You will see a patch of light on the screen only if the holes of the cardboard sheets are aligned in the same straight line. This is because light travels only in straight lines.

[2]**emit** give out

- **Light travels at high speed.** Light covers a distance of about 300,000 kilometres in one second. Light can also travel through empty space beyond the Earth's atmosphere. This is how light from the Sun and stars can reach the Earth.
- **Light from a source is given out in all directions.**
- **Light is reflected.** Some or all of the light that falls on a surface may bounce off it. *This bouncing of light off a surface is called* ***reflection of light***. We see an object when light that is reflected from it reaches our eyes.

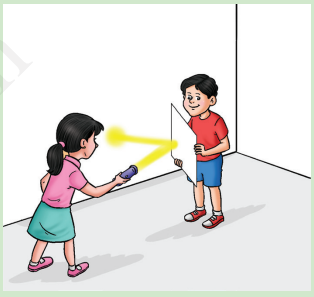


We can see an object when light is reflected from it.

Activity

Ask your friend to hold a mirror and stand near a wall. Darken the room and shine a torch onto the mirror. What do you see?

The light bounces off the mirror and forms a bright patch on the wall. This is because of reflection.



Eco corner

Mirrors can be used to make a room look brighter. Some light fittings have small mirrors that reflect the light of the electric bulb. This helps reduce the electricity needed for lighting.

Properties of Light: Advanced Topics

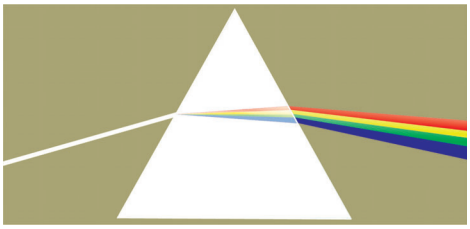
- **Light is refracted.** Light appears to bend when it passes from one medium[3] into another, such as from air into water or glass. *This change in the direction of light when passing from one medium into another is called the* ***refraction of light***.

  When one end of a pencil is placed in a glass of water, it appears bent. Light gets refracted when it passes from water to air. So, the part of the pencil that is under water appears bent.

A pencil dipped in water appears bent.

[3]**medium** (here) a substance or material through which light passes , such as air, water or glass

- **Light splits into different colours when it passes through a prism.** This is because of refraction. White light splits into violet, indigo, blue, green, yellow, orange and red (or 'VIBGYOR').



Splitting of white light passing through a prism

A rainbow is formed in the sky when sunlight passes through raindrops and splits into many colours. Each raindrop acts as a prism.

Stop and check

Say if the statements are true or false.

1. A candle is a luminous object.
2. Light gets refracted when it bounces off the surface of a mirror.
3. When passed through a prism, white light splits into different colours.

TRANSPARENT, TRANSLUCENT AND OPAQUE MATERIALS

Based on how much light they allow to pass through them, materials are grouped into three types.

Transparent materials *Materials through which most of the light passes are called transparent materials.* We can easily see through these materials.

View through a transparent glass window

Examples are clear glass, water, cellophane (clear plastic sheet) and clean air.

Translucent materials *Materials through which only a part of the light passes are called translucent materials.* We cannot see clearly through these materials.

View through a frosted glass window (translucent)

Examples are coloured glass, frosted glass, wax paper (tracing paper), butter paper and smoke.

A brick wall is opaque.

Opaque materials *Materials through which no light passes are called opaque materials.* We cannot see through opaque materials. Examples are metals, wood, rubber, cardboard and stone.

Activity

Hold a sheet of white paper up against the light. Can you see through it? Is the paper transparent, translucent or opaque?

Apply a drop of cooking oil to the centre of the sheet. Can you see through the place where the oil has been applied? Is that part of the paper transparent, translucent or opaque now?

HOW SHADOWS ARE FORMED

Shadow of a horse

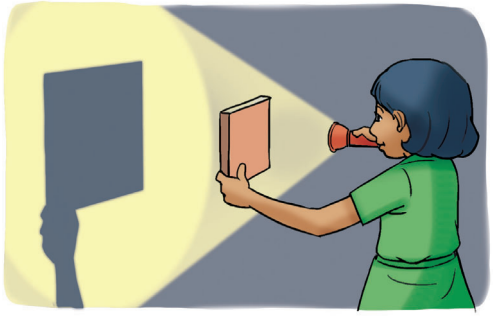
*A **shadow** is the dark patch formed on a surface when the path of light is blocked by an object.*

The following are needed for a shadow to form:

- a source of light, such as the Sun or a torch
- a surface, such as a screen, a wall or the ground
- an object to block the path of light

Below are some important features of shadows.

- A shadow will form only when the object is between the source of light and the screen.
- A shadow always forms on the side opposite the source of light.
- A shadow is generally grey or black in colour.
- The size and shape of a shadow change based on the positions of the object and the source of light.
- Opaque objects usually form the darkest shadows as they block light completely. As translucent objects allow some light to pass through them, the shadows that they form are not as dark.



Formation of a shadow

Activity

Aim: To observe the features of a shadow

Materials required: a light box with a torch switched on inside it, a wooden block, a sheet of coloured cellophane

Method

1. Place the wooden block halfway between the light box and the wall. Move the block slightly to one side. Does the position of the shadow on the wall change?
2. Move the block closer or to away from the light box. Does the size of the shadow change?
3. Paste the coloured cellophane over the hole of the light box. Does the colour of the shadow change?

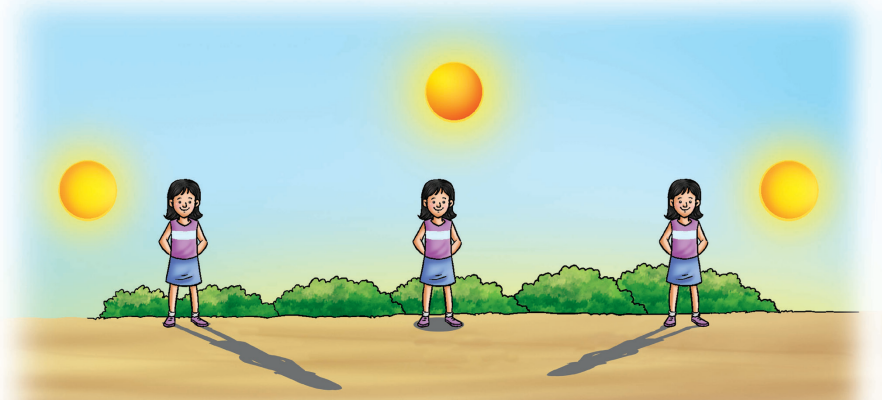
Observations and conclusions: You will find that the position of the shadow on the wall changes when the block is moved. The shadow also becomes larger when the block is moved closer to the light box, and smaller when it is moved away from the light box. When coloured cellophane is pasted over the hole of the light box, there is no change in the colour of the shadow. It remains dark.

Shadows formed by the Sun

The shape and length of a shadow change depending on where the Sun is in the sky.

The shadow formed by the Sun is longest in the morning and in the late afternoon. At this time of day, the Sun is low in the sky.

The shadow formed by the Sun is shortest at noon or midday. At this time of day, the Sun is high in the sky and is directly overhead.



In the morning At midday In the late afternoon

Changes in the length of a shadow

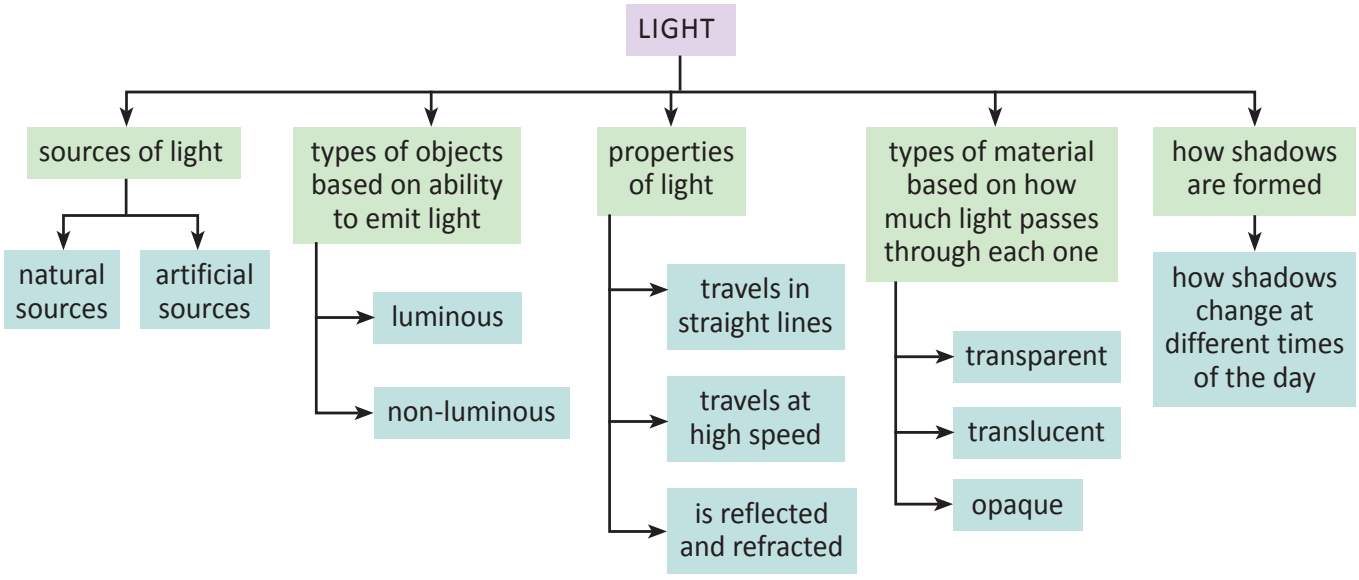
Go further...

A sundial is a kind of clock that uses shadows to show what time it is. The surface of a sundial has markings to show the hours in the day. A rod or a similar object is fixed in the centre of the sundial. As the Sun moves across the sky, the shadow of the rod moves across the dial. This shows us what time it is. The sundial was used mostly in ancient times.

Sundial

In a nutshell

CONCEPT MAP



SUMMARY

- Light is a form of energy that helps us to see things around us.
- Sources of light may be either natural sources, such as the Sun, or artificial sources, such as candles and electric bulbs.
- Objects such as the Sun and candles emit light of their own and are luminous. They are sources of light. Objects such as a book and the Moon do not emit light of their own and are non-luminous.
- Light has several properties: it travels only in straight lines; it travels a distance of around 300,000 kilometres in one second through air; it is given out in all directions from a source; it is reflected and refracted, and it splits into different colours when it passes through a prism.
- Objects are classified as transparent, translucent or opaque depending on the amount of light that passes through them.
- A shadow is formed on a surface when the path of light is blocked by an object.
- The shape and length of a shadow change through the day according to the position of the Sun in the sky.

KEYWORDS

luminous emitting light of its own

non-luminous not emitting light of its own

opaque not allowing light to pass through

prism a thick, triangular piece of glass

shadow a dark patch formed on a surface when the path of light is blocked by an object

source of light an object that gives out light

translucent allowing some light to pass through

transparent allowing most of the light to pass through

CHECKPOINT

A. Choose the correct option.

1. Which of these are natural sources of light?
   a) candle, bulb b) the Sun, stars c) stars, tube lights d) torches, *diyas*
2. When light bounces off a mirror, it is _____ from the mirror.
   a) split b) luminous c) reflected d) refracted
3. Which of these is translucent?
   a) frosted glass b) cellophane c) metal pan d) wooden chair
4. A shadow will form only when the object is _____ the lamp and the screen.
   a) between b) in front of both c) next to both d) under both
5. At what time will your shadow on the ground be the shortest?
   a) 7 o'clock in the morning b) 9 o'clock in the morning
   c) 4 o'clock in the afternoon d) 12 o'clock (midday)

B. Say if the statements are true or false. Correct the false statements.

1. An electric bulb is a luminous object that is an artificial source of light.
2. We can see objects around us because light gets refracted off their surfaces.
3. Raindrops act like prisms and split sunlight into colours to form the rainbow.
4. Clear glass is transparent but frosted glass is opaque.
5. A shadow is formed on the same side as the source of light.

C. Define the terms.

1. Source of light 2. Luminous object 3. Refraction of light
4. Transparent material 5. Shadow

D. Give differences between the following.

1. Natural and artificial sources of light
2. Translucent and opaque materials

E. Short-answer questions

1. Give two examples each of natural sources of light and artificial sources of light.
2. The Moon is non-luminous. Why are we still able to see it at night?
3. What is reflection of light? How does it help us to see an object?
4. Why does a spoon dipped in a glass of water appear to be bent?
5. Name the main colours that we can see when white light passes through a prism.
6. What are the three things needed to form a shadow?

F. Long-answer questions

1. How would you show that light travels in a straight line?
2. Explain how a rainbow is formed in the sky.
3. List three important features of shadows.
4. Describe how the length of a shadow changes during the day.

Think and Answer

1. Study the table. Different materials are grouped based on how much light can pass through each of them. Which one of the following materials **cannot** be placed in Group C?

Group A	Group B	Group C
Glass	Butter paper	Mirror
Clear plastic	Frosted glass	Cardboard

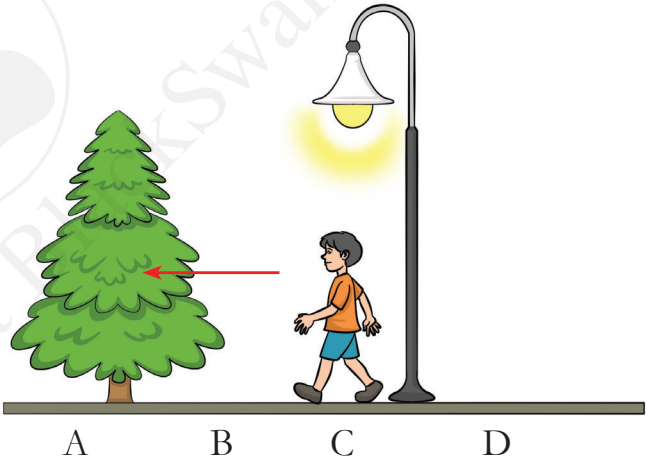
aluminium foil, cellophane, drawing board, brown wrapping paper

2. A mirror appears to shine when bright light from a torch falls on it. Is the mirror a luminous object?
3. Why does a block of coloured glass form a shadow that is not as dark as the shadow formed by a metal block?

Picture Study

Ajay was walking on a path in a park in the evening. As he walked past a lamp post, he noticed that his shadow started to change.

1. At which point on the path will Ajay cast the longest shadow—A, B, C or D?
2. If Ajay stops just before reaching the tree and faces it, will his shadow be in front of him or behind him?

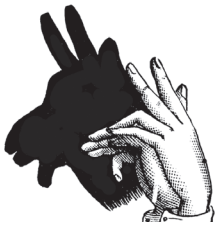


Life Skills and Values

1. It is important to have enough light in the room when you are reading, writing, drawing or using the computer. Too little light can make our eyes feel tired, and too much light can also hurt our eyes.
   Use a table lamp while reading at your desk. While writing, you can move the lamp to make sure that the shadow of your head or arm does not fall on the page. While using the computer, make sure that there is light on the keyboard. There should not be any reflection of light on the screen.

2. Veer does not clean his spectacles regularly. Sid told him that dirt reduces the transparency of the spectacle lenses and makes it difficult for us to see through them. He gave Veer a special liquid that his mother uses to clean her spectacles. What values do you learn from Sid?

Hands-on



Stage a shadow puppet play. Make shadow puppets by cutting outlines of the Sun, trees, birds, animals and houses from cardboard and pasting them on ice-cream sticks. You can also make shadow puppets using just your hands! Use a bright lamp or torch as a source of light, a white bedsheet or wall as a screen and act out a song, poem or simple play. Invite your friends and family to watch!

Subject Integration

(Social Studies)

Did you know that the Earth, the Moon, planets in the solar system and other objects in space also cast shadows? The Moon goes around the Earth, and the Earth goes around the Sun. From time to time, the three are in a straight line. Eclipses are caused when the Earth and the Moon block the light of the Sun and cast shadows. A solar eclipse takes place when the Moon comes in between the Sun and the Earth, casting a shadow on the Earth. A lunar eclipse takes place when the Earth comes in between the Sun and the Moon, casting a shadow on the Moon.

Internet Links

https://www.youtube.com/watch?v=fYsAK24le6U
http://www.sciencekids.co.nz/gamesactivities/lightshadows.html

Heritage Corner

Jantar Mantar, Jaipur

The world's largest sundial is at the Jantar Mantar in Jaipur, Rajasthan. It is made entirely of stone. The sundial is 27 metres tall. Its dial has markings that can measure every two seconds. This makes it the most accurate sundial in the world.

The sundial is one of the many instruments in the Jantar Mantar complex at Jaipur. This complex was built in the early 18th century, and is a UNESCO World Heritage site.

Inspired SCIENCE

For the CISCE curriculum
CLASS 4

Orient BlackSwan

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

The Inspired Science series is mapped perfectly to the National Education Policy 2020.

21st Century Skills

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

The NEP parameters	Features	Page nos.
The 4Cs		
Critical Thinking	Think and Answer	39
Creativity	Life skills and Values (1)	51
Collaboration	Hands-on (2)	19
Communication	Hands-on (1)	74
Social and Emotional Learning	Hands-on (3)	11
	Life skills and Values (2)	120
Multiple Intelligences	Subject Integration	5
	Hands-on (2 and 3)	74

Experiential/ Constructivist Approach

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

The NEP parameters	Features	Page nos.
Experiential/Constructivist Approach	Activities	35–36
	Activities	68–69
	Activities	113, 116–117

Integrated Approach

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

The NEP parameters	Features	Page nos.
Subject Integration	Subject Integration (Language)	29
	Subject Integration (Maths)	99
Art Integration	Hands-on	29
	Get Going	75
Health and Wellness	Subject Integration (2)	11
	Life Skills and Values (1)	94
Values	Life Skills and Values (2)	40
	Life Skills and Values (1)	104
Life Skills	Subject Integration	19
	Activity	67
	Life Skills and Values (1)	110

Sustainable Development Goals

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

The NEP parameters	Features	Page nos.
Sustainable Development Goals	Eco Corner	16
	Eco Corner	88

India Knowledge

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

The NEP parameters	Features	Page nos.
Know more about India	Heritage Corner	41
	Heritage Corner	95

Digital Integration

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

ICT/Digital resources

Orient BlackSwan Smart App - Interactive Tasks and Games for Practice and Revision

Teachers' Smart Book - Flipbook, Animations, Videos, Presentations, Picture Galleries, Interactive Tasks, Embedded Questions, Lesson Plans, Students' Book Answer Key, Worksheets with Answer Key, Question Paper Generator

Teacher Empowerment

Teachers' Resource Books - Lesson Plans, Students' Book Answer Key, Question Bank with Answer Key, Worksheets with Answer Key, Test Papers

Teachers' Portals - Chapter e-Book, Presentations, Picture Galleries, Animations, Students' Book Answer Key, Worksheets with Answer Key, Lesson Plans, Question Bank with Answer Key

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