Orient BlackSwan

Inspired SCIENCE

For the CISCE curriculum

NEP Compliant inside

5

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

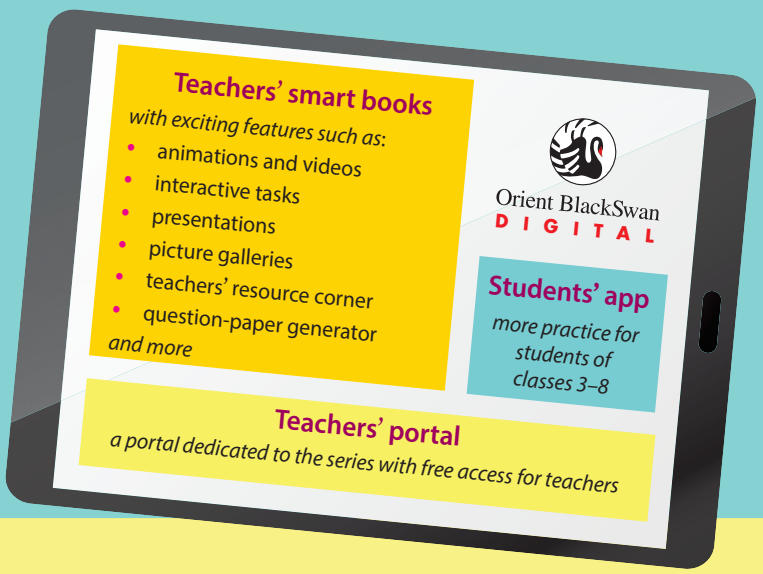
Summary
lists the main points of the lesson briefly

Keywords
lists important words and their definitions

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

Teachers' resource packs

- 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

CONTENTS

9 Work and Energy

Learning outcomes

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

- define work
- cite examples from daily life where work is done or not done
- explain that energy is needed to do work
- define energy and differentiate it from work
- state the different forms of energy with examples
- describe the different sources of energy

Get going

Collect 10 thick books and place them one on top of the other on your table. Lift this pile up on to your head.

Then, try and place this pile of books on the top shelf of the cupboard in your classroom. Was it more difficult? Why?

INTRODUCTION

Your mother is reading her office file and says that she is working. But do you know that, according to science, she is not doing work?

You feel tired after reading for a test. But do you know that you have not done any work?

So, what exactly is **work**?

WORK

When you lifted the pile of books, you applied an upward force that moved the pile up. You did some work. When you tried to place the books in the cupboard, you found it difficult because you had to apply a greater force to lift the books through a greater distance. You had to do more work to complete this task.

Is the person doing any work?

Work is done when a **force** acts on an object and moves it some distance in the direction in which the force acts. *The distance moved by an object in the direction in which a force acts is called* ***displacement***.

The conditions for work to be done are as follows.

- a force is applied to an object
- the object is displaced in the direction of the force applied

Spotlight

Force is a push or a pull which acts on an object. A pull is a force that moves something towards you while a push is one that moves something away from you. A force can make an object move, stop its movement, change its direction of movement or change its shape.

Examples of Work Done

Work is done in the following examples because both conditions are met.

- writing
- pushing a shopping cart
- playing badminton
- mixing vegetables while cooking
- moving the coins on a carrom board with a striker

A person doing work

Examples where Work is Not Done

Work is not done in the following examples because one or both conditions are not met.

- sleeping, reading or thinking
- carrying a school bag but standing still
- pushing a door the wrong way
- pushing a heavy cupboard which does not move

Activity

Aim: To decide if work has been done while pulling a door

Method: Pull a door towards yourself.

Observations and conclusions: If the door opens towards you, it has moved some distance. So work has been done. If the door does not open and remains in the same place, then no work has been done.

Activity

Aim: To decide if work has been done while pushing a table

Materials required: table, chalk

Method: Mark the position of the legs of the table on the floor with a piece of chalk. Now push the table with as much force as you can.

Observations and conclusions: See if the legs of the table have moved away from the earlier position. If you were able to move the table, then you have done work. If the table has not moved, then you have not done work.

Stop and check

Answer the following questions.

1. When is work said to be done?
2. Give three examples of work being done.
3. Give three examples of work not being done.

ENERGY

You may have seen tennis players eat a banana between games or long-distance runners have a drink containing glucose. Why do you think they have a banana or some glucose? It is because these foods give them instant **energy**. So what is energy? Why do we need energy?

Energy *is the ability or capacity to do work.* We need energy to do all our work—to ride a bicycle, push a cart, play football, or do any kind of activity. When we ride a bicycle over a long distance, do we not get tired after a while? If we stop, relax and eat something, we feel refreshed and ready to continue.

Activity

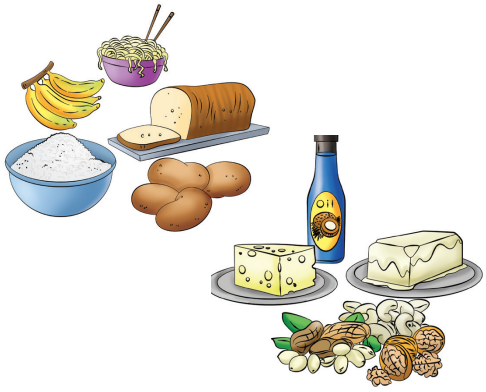
Aim: To understand which foods give more energy

Method: Go to the grocery store with an adult and look carefully at the labels on packed food items. The labels tell you the amount of energy each food item contains. Note down the information in your notebook and present it in class.

Energy-giving Foods

Where do we get energy from? We get energy from the food we eat. Carbohydrates and fats are good sources of energy. Our body breaks down the food we eat to get energy. Cereals (grains) contain carbohydrates. Butter, cheese, eggs, meat and nuts are rich in fats. These foods give us more energy than other foods like *dals*, fresh fruits or vegetables. However banana (a fruit) and potato (a vegetable) are high in carbohydrates, and are good sources of energy.

Machines also need energy to do work. Where do they get energy from? They get energy from **fuel** or electricity.



Sources of high energy

Why is Energy Needed for Work?

When we are very hungry, we are not able to do work. But after eating, we find that we are able to work. Food gives us the energy needed to do work. Energy is transferred from the food to our body. Our body needs this energy to do work.

The Difference between Work and Energy

Take the example of a girl playing football. When she kicks the football, she uses the energy she has to move the ball. Her kicking the football and moving it in the direction of the force applied is the work done. Therefore, energy is used when work is done.

Forms of Energy

Energy exists in many forms, some of which are as follows.

Activity

Aim: To understand that different activities need different amounts of energy

Method: Walk from one end of the school playground to the other. Then run across the playground as fast as you can. In which case did you breathe faster and feel your heart beat faster? This is because we need more energy to do exercise than when we are resting.

Arrange the following activities starting from the activity that needs the most energy to the activity that needs the least energy—playing football, cleaning your bicycle, watering plants, playing snakes and ladders, watching TV.

Go further...

An interesting fact about energy is that it can neither be created nor destroyed. It can only be converted from one form to another.

Candlelight

Power lines carrying electricity

Logs of wood giving out heat energy

Light energy

Light energy helps us see things around us. We get light energy from the Sun, fire, electric bulbs, tube lights, candles and so on.

Electrical energy

Electricity is a form of energy used for heating and lighting. We use it to run machines at home, and in offices and factories. It is produced in power stations by burning fuels like coal and petroleum, or from running water, wind or other sources.

Activity

Aim: To show that electricity is a form of energy

Materials required: toy car with batteries

Method: Switch on the toy car. You will notice that it moves forward.

Conclusions: The electricity stored in the batteries makes the toy car move forward. Therefore, electricity is a form of energy.

Heat energy

We get **heat energy** by burning fuels such as wood, coal and petrol. Heat energy is used to cook food, run vehicles, keep us warm in winter, generate electricity and so on. Some sources of heat energy are the Sun, burning wood and heaters.

Activity

Aim: To show that heat is a form of energy

Materials required: stove, stainless steel vessel, water

Method: Pour some water into the vessel. Ask an adult to light the burner and place the vessel containing water on the burner.

Observations and conclusions: You will notice the water start to boil after some time. The heat given out by the burning gas causes the water to boil. Thus, heat energy is a form of energy.

Sound energy

Sound is a form of energy that is produced when an object vibrates. We are able to talk because our vocal cords (specific parts in our voice box) vibrate to produce sounds. Some sources of sound energy are musical instruments like drums and guitars, the radio, loudspeakers and so on.

Sound energy

Mechanical energy

The energy that an object has because of its position or movement is called ***mechanical energy***. There are two forms of mechanical energy.

The energy that an object has because of its position is called ***potential energy***. When an object is at rest in a position, it has stored energy and the ability to do work once it starts moving. Examples of objects that have potential energy are water stored in a dam or a stretched bow.

Potential energy

The energy that an object has because of its movement is called ***kinetic energy***. Examples of objects that have kinetic energy are a flowing river or a moving car.

Kinetic energy

Magnetic energy

The energy that objects called magnets have, with which they can attract (pull) and/or repel (push away) some objects, is called **magnetic energy**. A fridge magnet is an example. Magnetic energy is used to sort, lift or hold substances and to keep doors closed.

Magnetic energy

Chemical energy

The food we eat, coal and petroleum all contain **chemical energy**. Burning of these substances releases the chemical energy inside them.

Stop and check

Fill in the blanks.

1. A tube light is a source of _____ energy.
2. You need _____ energy to run a washing machine.
3. A guitar is a source of _____ energy.
4. A gas burner gives out _____ energy.

Sources of Energy

We obtain energy from various sources. The sources can be either renewable or non-renewable.

Go further...

Did you know that the Cochin International airport is fully powered by solar energy? It is the first airport in the world to do so.

Renewable sources

Some sources of energy will either never run out or be renewed naturally within a short period of time. These are called **renewable** sources of energy. Some forms of renewable energy are explained below. They cause less pollution than burning fuels do.

Hydropower dam

Solar energy *Energy obtained from sunlight is called solar energy.* We get heat and light from sunlight. It supports life on Earth since photosynthesis happens only in the presence of sunlight.

Water energy (hydropower) *Energy from flowing or falling water is called hydropower*. The potential and kinetic energy in stored and moving water are used to generate electricity.

The Indian flag fluttering in the wind

Wind energy When wind blows, it causes a flag to flutter and fly. Is the wind doing work? Yes! Wind is a form of energy. The kinetic energy in wind can be used to move the blades of windmills to generate electricity and also to do work.

Non-renewable sources

Some sources of energy take millions of years to form and cannot be renewed once they are used up.

They are called **non-renewable** sources of energy. Fuels like coal, petroleum and natural gas are examples of non-renewable sources of energy.

A power plant using coal

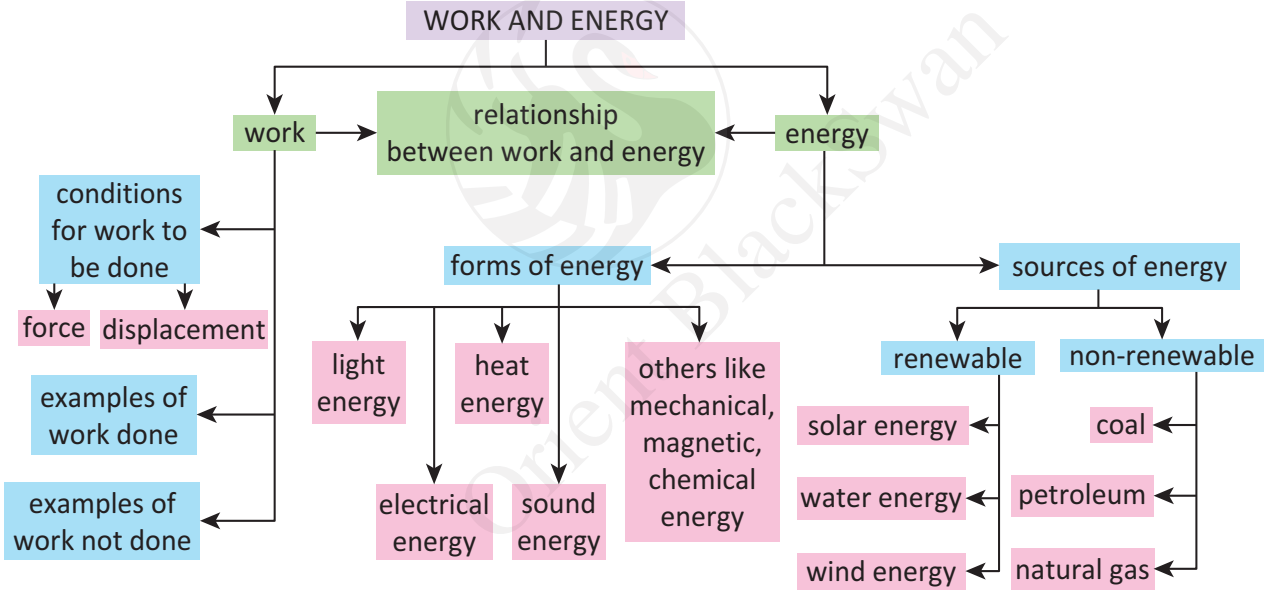
Importance of saving energy

Fuels like coal, petroleum and natural gas will run out soon. Scientists are looking at alternative sources of energy like ocean waves, tides, heat from inside the Earth and so on. However, some of these are not only expensive but also difficult to generate electricity from. For all these reasons, it is important to save energy in our daily lives.

A power plant in Iceland using heat from inside the Earth

In a nutshell

CONCEPT MAP



SUMMARY

- Work is done when a force acts on an object and moves it in the same direction as the force.
- Energy is the capacity to do work.
- Energy is used to do work and therefore you need energy to do work.
- You get energy from the food you eat. Carbohydrates and fats are good sources of energy.
- There are various forms of energy like light, heat, electrical and sound energy, and others like mechanical, magnetic, chemical and so on.
- Depending on the availability, energy sources can be classified as renewable or non-renewable.
- Scientists are looking for alternative sources.

KEYWORDS

kinetic energy the energy that an object has because of its movement
non-renewable cannot be replaced or regenerated
potential energy the energy that an object has because of its position
renewable can be replaced or regenerated

CHECKPOINT

A. Choose the correct option.

1. Work is said to be done when you are _____ .
   a) standing b) thinking c) writing d) sleeping
2. The capacity to do work is called _____ .
   a) force b) energy c) machine d) regeneration
3. _____ is a good source of energy.
   a) Butter b) An apple c) A cucumber d) *Dal*
4. A guitar produces _____ .
   a) heat energy b) electrical energy c) light energy d) sound energy
5. Hydropower is energy we get from _____ .
   a) the Sun b) burning coal c) moving water d) burning wood

B. Fill in the blanks.

1. The distance moved by an object in the direction in which a force acts is called _____ .
2. For work to be done, a _____ has to be applied on an object first.
3. _____ energy helps us to see.
4. _____ energy and _____ energy are types of mechanical energy.
5. _____ energy sources are regenerated in a short time.

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

1. Work is done when a boy pushes against a wall.
2. A body needs to have energy to do work.
3. Solar energy is the energy found in oceans and seas.
4. Wind energy can be used to generate electricity.
5. Natural gas is an example of a renewable source of energy.

D. Define the terms.

1. work 2. energy 3. hydropower

E. Short-answer questions

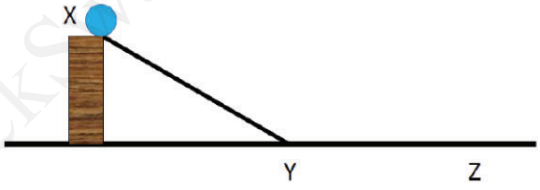
1. Give two examples for work not being done in spite of a force being applied.
2. How is energy different from work?
3. List the different forms of energy.
4. What is meant by a non-renewable source of energy?

F. Long-answer questions

1. What are the conditions to be satisfied for work to be done?
2. Explain how work and energy are related.
3. List two uses each of electrical energy and heat energy.
4. What are renewable sources of energy? Explain any one of them.
5. Mention three ways in which energy is important in your daily life.

Think and Answer

1. A woman carrying a basket of vegetables on her head is walking along a road in the plains. Is work being done on the basket? Justify your answer. (*Hint*: The woman is not pushing or pulling the basket. The only force acting on the basket is gravity, which acts in a downward direction.)
2. Anita released a marble at point X, as shown in the diagram. The marble rolled down the slope and came to a stop at point Z. At which points did it have potential energy, and at which point did it have kinetic energy?



Picture Study

The pictures show two persons engaged in some activity. Are they doing work? Why do you think so?

1. 

2. 

Life Skills and Values

1. Save as much fuel as you possibly can by walking, cycling, using the school bus or joining a carpool.
2. John saw an old man carrying a heavy bag and trying to cross the road. He took the bag from the old man and helped him cross the road. What values did John show?

Hands-on

1. List all the activities that you usually do in a day. Write in which of them work is done and in which of them, work is not done. Share your list with the class.
2. Work with your partner in class. Discuss and plan three ways in which you will save energy.

Subject Integration

(Social Studies)

Work in groups of three. Research and find three sites where solar farms, wind farms and hydropower dams can be found in India. Mark these on a map of India. (An area of land where many solar panels or windmills are set up to generate electricity is called a solar farm or a wind farm respectively.)

Scientist in Focus

Anna Mani

Anna Mani (1918–2001) was an Indian scientist who designed instruments to measure solar and wind energy. In 1957, she set up a network of sites to measure solar energy. She wrote many books, some of which are used by scientists for reference. She became the Deputy Director General of the Indian Meteorological Department.

Internet Links

https://www.youtube.com/watch?v=PD7a1EWjsTc
https://www.teachengineering.org/lessons/view/cub_energy2_lesson01

Heritage Corner

Indian Classical Music

Indian music has two styles—the *Hindustani* and the *Carnatic*. The Hindustani is the North Indian style of music. Musicians use instruments such as the *sitar*, *shehnai* and *tabla*. The Carnatic is the South Indian style of music. Musicians use instruments sush as the *veena*, *mridangam* and *nadaswaram*. The kinds of sounds produced by the singers and the instruments are unique and fascinating.

10 Light and Shadows

Learning outcomes

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

- classify objects as luminous or non-luminous
- categorise materials as transparent, translucent and opaque
- demonstrate that light travels in straight lines
- explain how shadows are formed
- list the conditions necessary for the formation of shadows
- explain rotation and revolution of the Earth
- show how day and night are caused
- explain eclipses

Get going

Blindfold a friend and lead them to one corner of a playground. Place some pots and chairs randomly in the space. Now request the blindfolded person to go past the pots and chairs and crossover to the opposite side of the playground. You can tap each pot or chair once to warn your friend. On completion of the task, ask your friend about his/her experience.

INTRODUCTION

It would certainly not have been easy for your friend, or for anyone else, to make their way across the playground, blindfolded. This simple activity helps us realise how important light is in our life and how much we take it for granted.

A natural source of light

An artificial source of light

A luminous object

A non-luminous object

SOURCES OF LIGHT

Light is a form of energy that stimulates our sense of sight. It enables us to see everything around us. When light falls on objects they become visible to us.

Any object that gives out light is called a ***source of light***. It can be either natural or artificial. *Sources of light which emit light of their own in nature are called* ***natural sources of light***. Examples are the Sun and the stars. *Sources of light which emit light but have been created by humans are called* ***artificial sources of light***. Tube lights and lamps are examples.

Objects that emit or give out their own light are said to be ***luminous***. The stars and a lighted candle are examples. *Objects that do not emit or give out their own light are* ***non-luminous***. Stones and plants are examples.

Stop and check

1. Write **N** against the natural sources of light and **A** against the artificial sources of light.
   - i. stars
   - ii. lamp
   - iii. bulb
   - iv. burning log of wood
2. Write **L** against luminous objects and **NL** against non-luminous objects.
   - i. candle
   - ii. stone
   - iii. fruit
   - iv. Sun

TRANSPARENT, TRANSLUCENT AND OPAQUE OBJECTS

Depending on whether an object allows light to pass through it or not, an object can be classified as transparent, translucent or opaque.

Objects

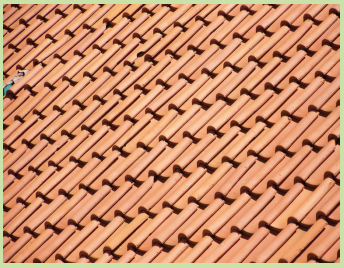
Transparent

- Light falling on transparent objects passes through.
- Hence we can see through these objects clearly.
- Examples are air, water, clear plastic sheet, glass.

Translucent

- Only part of the light falling on translucent objects passes through.
- Hence we can see but not clearly through these objects.
- Examples are butter paper, a thin handkerchief, a thin sheet of paper, frosted glass.

Opaque



- Light falling on opaque objects does not pass through.
- Hence we cannot see through these objects.
- Examples are books, chairs, soil, trees, walls.

Activity

Aim: To classify various objects as transparent, translucent or opaque

Materials required: Objects of your choice like bag, tracing paper, clear glass, book, coloured glass, ruler, plate, a torch and so on

Method: Switch on the torch. Place one of the objects in front of the torch. Observe if you can see the light from the other side. Make a note of it. Repeat for each object.

Observations and conclusions: If you can see the light clearly through the object, the object is transparent. If the light is blurred, the object is translucent. If the light is not seen, the object is opaque.

Stop and check

Classify the following objects as transparent, translucent or opaque.

1. TV remote
2. air
3. stainless steel water bottle
4. glass table
5. jelly
6. frosted glass vase

Sunlight streaming in straight lines

LIGHT TRAVELS IN STRAIGHT LINES

Have you noticed sunlight streaming through the clouds, trees or gaps in doors? You can see thin straight lines of light.

A very narrow and thin line of light is called a ***ray****.*
A collection of rays is called a ***beam****.*

You will notice that rays travel in straight lines. *The property by which light travels in straight lines is called* ***rectilinear propagation of light****.*

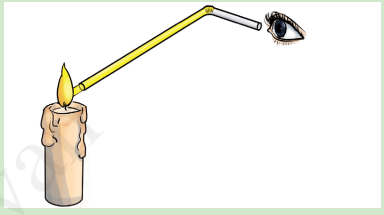
Activity

Aim: To show that light travels in straight lines

Materials required: hollow plastic tube that can be bent, lit candle

Method: View the lit candle through the plastic tube. Can you see the flame? Then bend the tube and view the candle flame. Can you see the flame now?

Observations and conclusions: The flame is visible when the tube is straight but not when the tube is bent. This shows that light travels in a straight line.



looking through a bent tube

Shadows of trees

SHADOWS

Observe the shadow of one of the trees in the image.

Where do you think the source of light is? What is the source of light here? What is the colour of the shadow? Why do you think it is this colour? Where is the shadow cast? Discuss the answers in class.

A ***shadow*** is formed when an object blocks the path of light.

Do the activity on the next page to understand the conditions under which shadows are formed and their characteristics.

Go further...

A sundial is a clock that helps to tell local time with the help of the Sun.

Activity

Aim: To study shadows

Materials required: torch, dark room

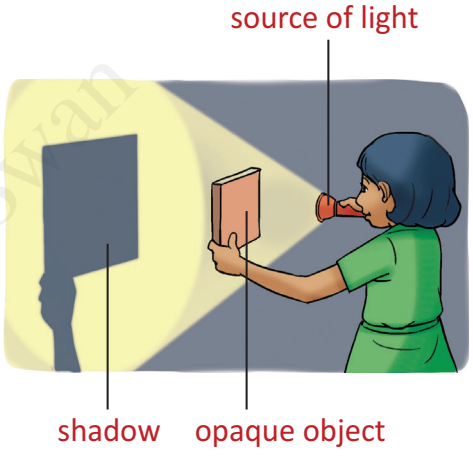
Method: Switch on a torch and place it in a dark room facing the wall.

1. Place your hand between the torch and the wall. What do you see on the wall?
2. Make different shapes with your hands. Observe the shape of the shadows.
3. Hold a brightly coloured toy between the torch and the wall. What is the colour of the shadow?
4. Is anything drawn on the toy visible in the shadow?
5. Bring the torch closer to the toy, and then move it away. You will observe that the size of the shadow changes.
6. Hold a glass plate between the torch and the wall. Is a shadow formed?
7. Switch off the torch. Can you see any shadow now?
8. Repeat this in an open area without any screen. Are shadows formed now?

Conditions for the Formation of Shadows

To form a shadow, we need:

- a source of light
- an object blocking the path of light
- a screen for the shadow to be cast on



Formation of a shadow

Characteristics of Shadows

- A shadow is formed on the side opposite to the source of light.
- Only the outline of the object is seen; not details.
- The colour of the shadow is always dark whatever the colour of the object may be.
- The size of the shadow depends on the
  - size of the object and light source
  - distance between object and light source
  - distance between object and screen
- Opaque objects form darker shadows. Translucent objects form faint and unclear shadows. Transparent objects do not form shadows since they do not block light.

The shadow is dark though the flower is yellow.

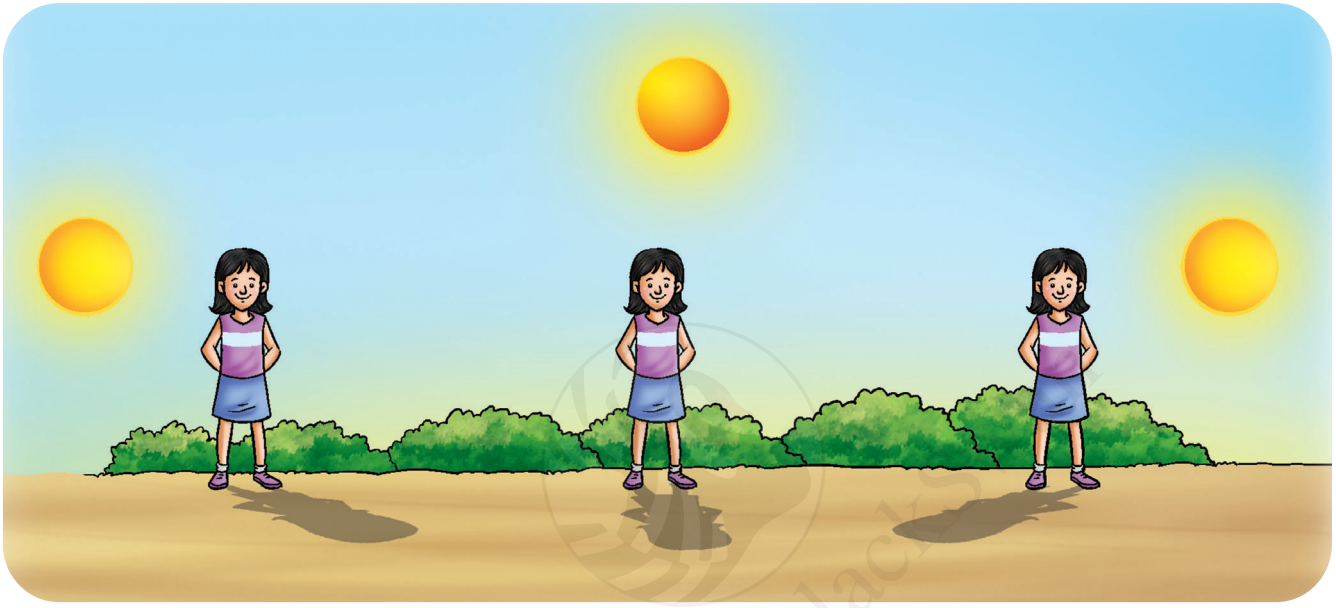
Go further...

It is dangerous to look at the Sun directly. Sunlight is very strong and can permanently damage your eyes. It can also cause loss of sight. So you should not view the Sun with your naked eyes or with sunglasses.

Shadows formed at different times

Shadows in the sun are sometimes long and sometimes short. This depends on the position of the Sun in the sky.

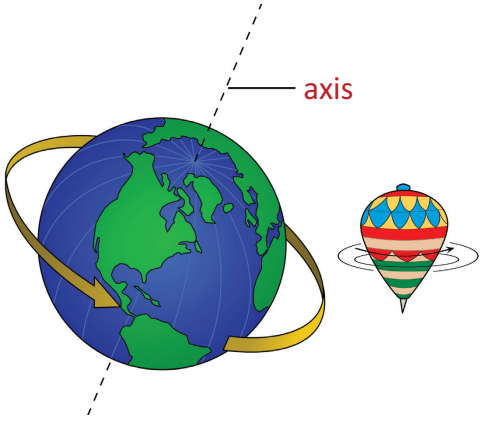
- In the morning and evening, the Sun is lower in the sky and hence shadows cast are longer.
- At noon, the Sun is directly overhead and hence the shadows cast are shorter.



Morning Afternoon Evening

THE MOVEMENTS OF THE EARTH

You have seen the Sun rise in the east in the morning and set in the west in the evening. Do you know what causes this? It is due to the movement of the Earth.



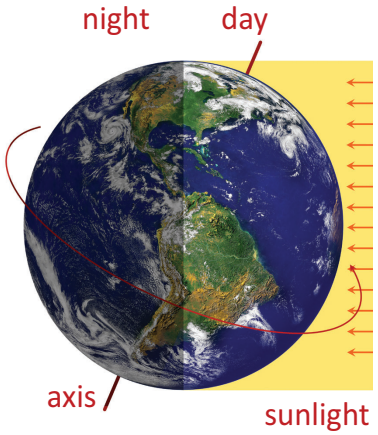
Earth's rotation is like the spinning of a top.

Rotation

Observe a spinning top. It appears to spin around a line passing through its centre. The Earth spins in a similar way, around an imaginary line passing through its centre. This line is called the **axis** of rotation. *The spinning movement of the Earth is called* ***rotation***.

Day and night

The Earth completes one rotation in 24 hours. As the Earth rotates, different parts face the Sun. The part of the Earth facing the Sun has day. At the same time, the part of the Earth facing away from the Sun has night. As the Earth rotates, the part having day moves and faces away from the Sun. It then has night. Hence, day and night follow each other.



Formation of day and night

Activity

Aim: To demonstrate day and night

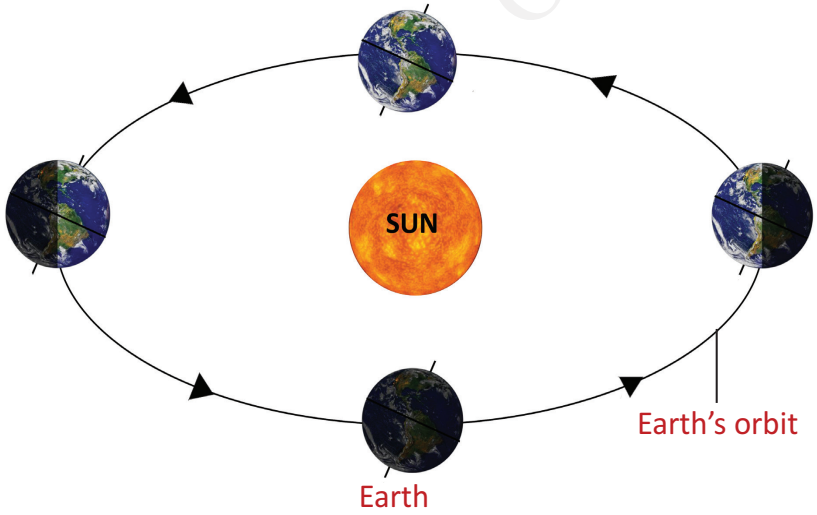
Materials required: globe, torch, some thick books

Method: In a dark room, place the globe on a table and the torch on the stack of books kept opposite the globe. Switch on the torch (denoting the Sun) and spin the globe from left to right slowly. Observe that only a part of the globe faces the torch at any point and thus has day. The other part facing away from the light is dark and has night. Keep spinning the globe till the half that was lit moves into darkness.

Conclusion: Day and night are caused by the rotation of the Earth.

Revolution

While spinning around its axis, the Earth also moves around the Sun in a fixed path. *The movement of the*



Earth's revolution

Activity

Aim: To demonstrate Earth's rotation and revolution

Method: Make two children play the role of the Sun and the Earth in class. Let the first child playing the Sun stand in the centre of a circle. The second child playing the Earth should turn around himself/herself slowly. At the same time he/she must move around first child slowly. He/She will thus be rotating and revolving like the Earth.

Go further...

The shadow of the Moon zooms across the Earth's surface at about 2500 kilometres per hour.

Earth around the Sun is called ***revolution****. The fixed path on which the Earth revolves is called its* ***orbit****.* The Earth revolves around the Sun once in 365 days.

Stop and check

Define the terms.

1. ray
2. beam
3. shadow
4. rotation

ECLIPSES

Like all other objects, the Earth and the Moon cast their shadows in space when sunlight falls on them. When their shadow falls on another heavenly object, it causes an **eclipse**.

Activity

Aim: To demonstrate a solar and lunar eclipse

Materials required: torch, cricket ball, basketball (denoting the Sun, the Moon and the Earth)

Method: In a dark room, place the torch, cricket ball and basketball (in the same order) in a straight line. Switch on the torch and watch the shadow of the cricket ball fall on the basketball. This is how a solar eclipse occurs.

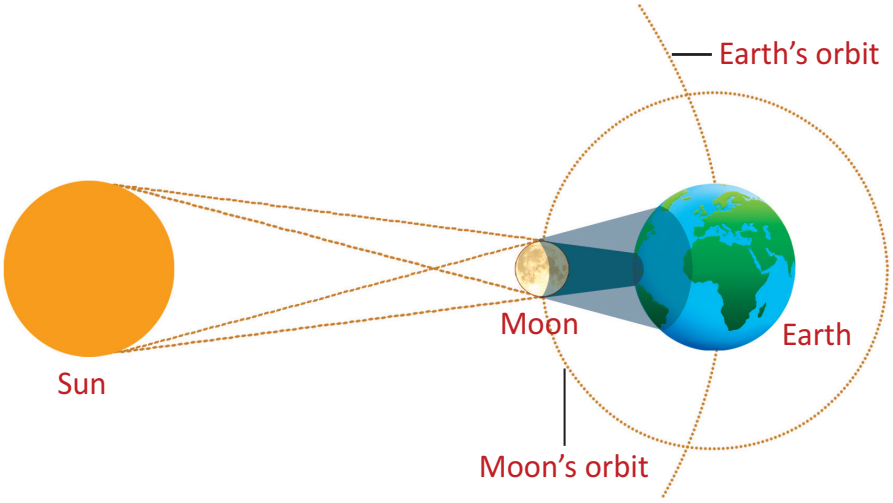
Now, place the torch, basketball and cricket ball (in the same order) in a straight line. Repeat the activity. It will show how a lunar eclipse occurs.

The Solar Eclipse

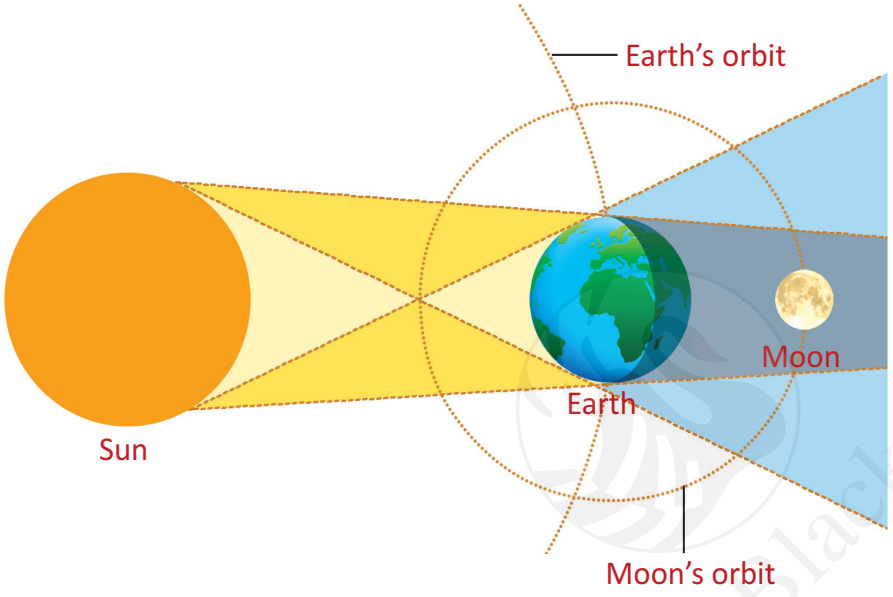
As the Moon revolves around the Earth, sometimes it comes between the Earth and the Sun. The Moon blocks the Sun and casts its shadow on the Earth. This is called a **solar eclipse**. If the Sun is completely blocked by the Moon when seen from the Earth, we have a **total solar eclipse**. If it is only partially blocked, we have a **partial solar eclipse**.

The Lunar Eclipse

Due to the Earth's revolution, sometimes the Earth comes between the Sun and the Moon. Now, the shadow of the Earth falls on the Moon. This is called a **lunar eclipse**. If the shadow of the Earth covers the Moon completely and the Moon cannot be seen from the Earth, it is a **total lunar eclipse**. When it covers the Moon only partially, we have a **partial lunar eclipse**.



Solar eclipse



Lunar eclipse

Activity

In groups of three, choose one person each to play the part of the Sun, the Earth and the Moon. Act out solar and lunar eclipses with your own dialogues.

In a nutshell

CONCEPT MAP

- LIGHT AND SHADOWS
  - types of objects
    - whether they give out light
      - luminous
        - natural sources
        - artificial sources
      - non-luminous
    - whether they let light through
      - transparent
      - translucent
      - opaque
  - shadows
    - conditions for formation
    - characteristics of shadows
  - movements of the Earth
    - rotation
      - causes day and night
    - revolution
  - eclipses

SUMMARY

- Any object that gives out light is called a source of light. Light sources can be natural or artificial. Objects are also classified as luminous or non-luminous.
- Transparent materials allow light to pass through them completely, translucent materials allow light to pass through only partially while opaque materials do not allow light to pass through them.
- The property by which light travels in straight lines is called rectilinear propagation of light.
- When the path of light is blocked by an opaque or translucent object, a shadow is formed.
- A source of light, an opaque or translucent object and a screen are needed for a shadow to form.
- Rotation and revolution are movements of the Earth. Rotation causes day and night.
- A solar eclipse occurs when the Moon is between the Sun and the Earth.
- A lunar eclipse occurs when the Earth is between the Sun and the Moon.

KEYWORDS

axis of rotation the imaginary line around which the Earth spins

beam a collection of rays

eclipse an event where the shadow of a heavenly body falls on another

orbit the fixed path on which the Earth revolves

ray a very narrow and thin line of light

revolution the movement of the Earth around the Sun

rotation the spinning movement of the Earth around its axis

source of light an object which gives out light

CHECKPOINT

A. Choose the correct option.

1. Which of these is opaque?
   a) Earth b) Moon c) mirror d) all of these
2. A collection of rays is called a _____ .
   a) beam b) bundle c) group d) collection
3. Shadows are formed because _____ .
   a) light travels in straight lines b) an opaque object blocks the path of light
   c) both of these d) none of these
4. The rotation of the Earth on its axis causes _____ .
   a) seasons b) day and night c) only day d) none of these
5. Which of these is true in case of a lunar eclipse?
   a) The Moon casts its shadow on the Earth. b) The Sun casts its shadow on the Earth.
   c) The Earth casts its shadow on the Sun. d) The Earth casts its shadow on the Moon.

B. Fill in the blanks.

1. We can see through things which are _____ .
2. _____ objects do not let any light pass through them.
3. Shadows are formed on a _____ .
4. The axis of the Earth is an _____ _____ .
5. The rotation of the Earth takes _____ _____ .

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

1. We cannot see any details of an object in its shadow.
2. Shadows are longest at sunrise and shortest at sunset.
3. The Sun seems to rise in the west and set in the east.
4. The movement of the Earth on its axis is called rotation.
5. In a solar eclipse, the Earth, Sun and Moon are in a straight line in this order.

D. Define the terms.

1. ray
2. beam
3. axis
4. orbit

E. Short-answer questions.

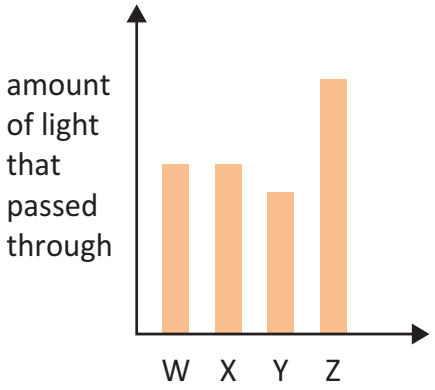
1. Distinguish between luminous and non-luminous objects. Give two examples of each.
2. What is rectilinear propagation of light?
3. Why does a sheet of plain glass not form a shadow?
4. How does a lunar eclipse occur?

F. Long-answer questions.

1. Differentiate between transparent, translucent and opaque objects.
2. What are the conditions necessary for a shadow to be formed?
3. Differentiate between rotation and revolution of the Earth.
4. Explain how day and night are caused, with the help of neat labelled diagrams.
5. Explain how a solar eclipse occurs with a neat diagram.

Think and Answer

1. Chennai and New York are on the opposite sides of the globe. If it is morning in Chennai, will it be morning or night in New York?
2. Meena finds out how much light passes through four sheets—W, X, Y and Z—made of four different materials. The results are shown in the bar graph. Which sheet (W, X, Y or Z) will form the lightest shadow?



Picture Study

Identify whether the objects are luminous or non-luminous, and natural or artificial.
Tick the correct options.

1. 

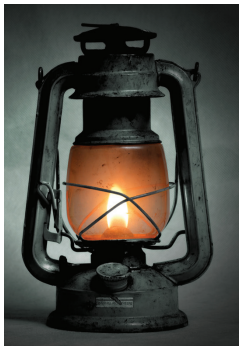
2. 

Image 1: luminous / non-luminous
natural / artificial
Image 2: luminous / non-luminous
natural / artificial

Life Skills and Values

Bindu was interested in observing a solar eclipse that was to occur. Tito gave her special eclipse glasses to observe the eclipse. Why did he do this? What values did he show?

Hands-on

1. Observe your shadow. Go out in the sunlight in the morning around 8 a.m. Ask a friend to mark the end of your shadow. Make a mark near your legs where the shadow begins. Now with a ruler, measure the length of your shadow. Repeat this activity at 12 noon as well as at 4 p.m. Present the information in class and give reasons for the change in length of your shadow.
2. Shadow puppetry is a form of storytelling. Flat puppets are held by strings between a light source and a screen. In groups of six, learn more about this art and present a shadow puppet show.

Scientist in Focus

C V Raman

Sir C V Raman was the first Indian to win a Nobel Prize in Physics in 1930. He did experiments on light and how it passes through transparent objects. He was thus able to explain the blue colour of seawater and the sky. His discovery is commonly known as the **Raman effect**.

Internet Links

https://www.youtube.com/watch?v=cDed5eXmngE
https://www.youtube.com/watch?v=xgJdXpN9il4

Inspired SCIENCE

For the CISCE curriculum
CLASS 5

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	88
Collaboration	Subject Integration	100
Communication	Hands-on (2)	35
Communication	Get Going	124
Social and Emotional Learning	Life Skills and Values	10
	Life Skills and Values	35
Multiple Intelligences	Activity	49
	Hands-on	35

Experiential/ Constructivist Approach

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

The NEP parameters	Features	Page nos.
Experiential/Constructivist Approach	Activity	12
	Activity	28
	Activity	94

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 (Social Studies)	80
	Subject Integration (Physical Education)	134
Art Integration	Subject Integration	127
	Hands-on	35
Health and Wellness	Go Further	17
	Activity	7
Values	Life Skills and Values	89
	Life Skills and Values	100
Life Skills	Life Skills and Values (1)	35
	Life Skills and Values (1)	123

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	Hands-on (2)	80
	Hands-on (2)	100

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	24
	Heritage Corner	100
	Scientist in Focus	100

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

Follow us at
OrientBlackSwanSchools

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