SCIENCE CENTRE
PEMBROKE MALTA

INTEGRA

INTEGRA

Learning scenarios promoting
Science Language & Integrated Learning

These learning scenarios were produced as part of the project INTEGRA, part of European Schoolnet's Scientix STE(A)M partnership on Education Resilience in Europe

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About 'INTEGRA'

INTEGRA is a project of the Science Centre, that employed an integrated learning approach to facilitate integration of migrant learners into mainstream education. This short project was run between the 15th February and the 31st May 2023, and was conducted in collaboration with the Maria Regina College (MRC) Naxxar Induction Hub. INTEGRA received funding from the '**Education Resilience in Europe**' initiative, coordinated by European Schoolnet (EUN) and Cisco Foundation.

The project had the ultimate aim of supporting migrant learners' second language development, without losing focus on other attainment targets related to STEM skills and knowledge. To reach this objective, the project embarked on providing all educators at the MRC Naxxar Induction Hub with a training programme in 'Content and Language Integrated Learning' (CLIL). More specifically this consisted in two full-day seminars titled: 'Planning a CLIL lesson: benefits and challenges' and 'The CLIL Approach in Practice'.

Also, as part of this project, teachers from the MRC Naxxar Induction Hub were given the opportunity to develop Learning Scenarios as exemplars of CLIL lessons covering both Science and English learning outcomes. These Learning Scenarios are included in this booklet and can also be accessed online. Teaching aids and equipment required to deliver these lessons are also being supplied to the MRC Naxxar Induction Hub through funds from this project.

Ms Amanda Lupi Spencer and Ms Amanda Mizzi, teachers at the MRC Naxxar Induction Hub contributed to this project as Learning Scenario developers, while Ms Cressida Abela and Ms Judith Smith provided any assistance required with respect to English and Science respectively.

About 'Education Resilience in Europe'

Integrating new children at different times of the school year into a new classroom, from different backgrounds and with, in many cases, emotional baggage, can be very challenging.

Through the **Education Resilience in Europe** initiative, Scientix supports Ministries of Education, schools, teachers, and other stakeholders working on providing solutions to facilitate the integration of children into new educational environments. This initiative is supported by the STE(A)M Partnerships of Scientix, with funding from the European Union's H2020 research and innovation programme – project Scientix 4, coordinated by European Schoolnet (EUN) and Cisco Foundation.

The STE(A)M Partnerships programme of Scientix (the community for science education in Europe) promotes the collaboration between several organisations to develop research and testing initiatives for new approaches for creative and innovative science, technology, engineering, and maths (STEM) teaching and learning opportunities connected to existing national practices. These new approaches are tested locally, nationally, or internationally.

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Learning Scenario 1: **Getting to Know Scientists**

TOPIC	GROUP	TIME
Scientists at Work	Year 7	40 minutes

Materials and Resources

Interactive TV, YouTube videos, whiteboard, handout, branches of science poster, random science apparatus, Kahoot quiz

Learning Outcomes

1. I can give examples of the relevance of science and technology in everyday life.
2. I can name some scientists, including contemporary and local ones, and describe their work.

Teacher's Objective and Learning Intention

Science

- To understand the basics of science and how it branches out
- To identify the relevance of science and how it splits into different branches
- To learn about scientists and their work.

English

- To learn how to use the 5 Ws and 1 H to help structure a descriptive presentation/ write up: What, When, Where, Who Why and How.

Success Criteria

ALL students must be able to:

- Identify and appreciate that science is all round us and recognise the names of a few scientists and their discoveries (including local ones).

MOST students should be able to:

- Recognise the names of a few scientists and their discoveries.

SOME students could be able to:

- Show and tell in a presentation: If I were a young scientist, I would like to discover/ invent... students are to use the w and h questions to help them formulate their presentation.

Tasks and Questions

- Introduction (5 minutes)

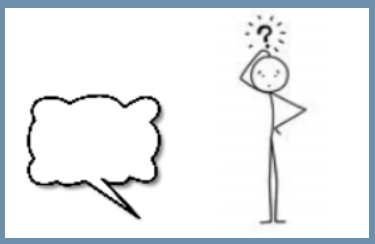
- Teacher can walk into class 'dressed up' as a scientist. Ask students what/who do you think I am? The issue of whether students associated being a scientist with males or females can be discussed. This is to address gender stereotypes, where scientists are generally pictured as men.

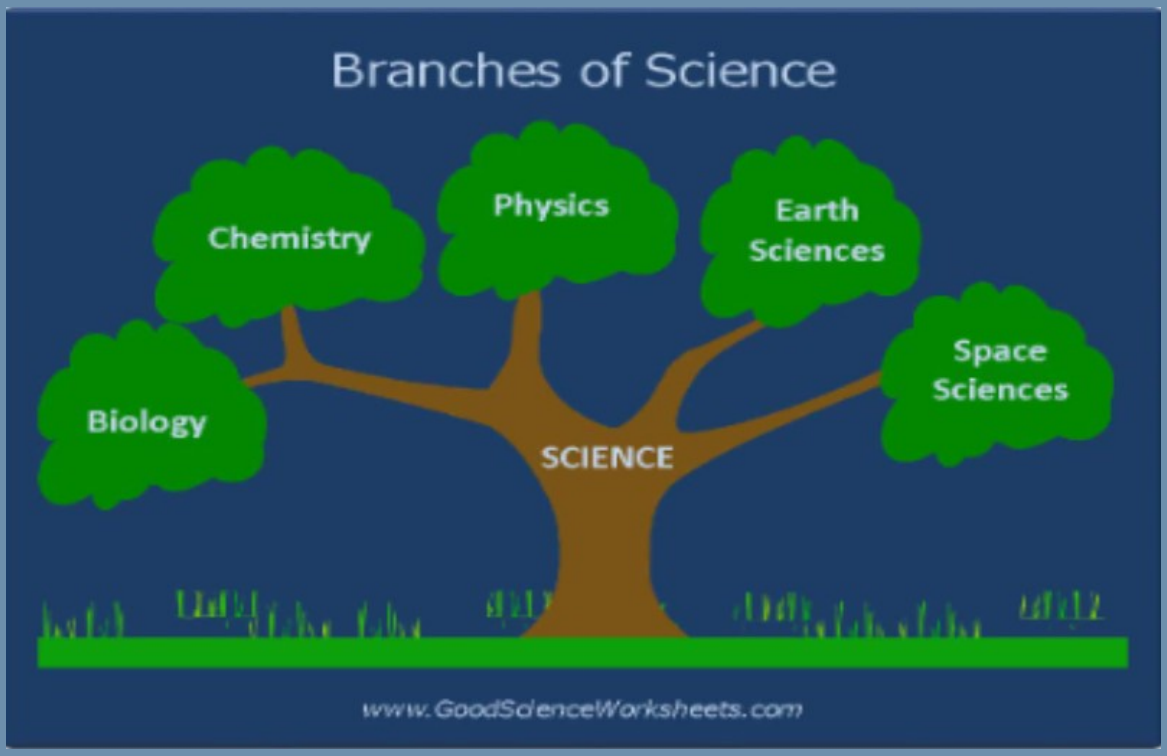
- The lesson will continue by writing a question on the whiteboard. **"What is science".** Then to ask if there is anything wrong with what is written. (It does not have a question mark at the end.) While a statement or a command has a full stop, a question has a question mark at the end. Most questions contain one of these words.

- Write a list on the side of the whiteboard: What? Where? When? Who? Why? and How? Explain to students that they will be using a lot of these words throughout this lesson (because science is all about questions).

- Task 1 – Discussion/Speaking (10 min)

- Now back to the question, "**What** is science?" . Give each student a sticky note to jot down his/her (more elaborate) idea. Once done, hang a poster such as the one below or similar (or draw one) and discuss briefly. Let students come up to the board to explain what they wrote and stick their sticky note under which category their idea of science fits in. Emphasise the questions, WHAT did you chose to write about? HOW did you come up with this idea?





This table is a reference for the teacher.

Physical Sciences	Life Sciences	Earth Sciences
Physics	**Anatomy**	**Astronomy**
Mechanics	**Botany**	Meteorology
Electromagnetics	**Biology**	**Geology**
Thermodynamics	**Zoology**	Atmospheric Sciences
Kinetics	**Neurobiology**	Glaciology
Chemistry	**Marine Biology**	Climatology
Inorganic Chemistry	Embryology	Structural Geology
Electrochemistry	**Ecology**	
Analytical Chemistry	**Paleontology**	
Earth Sciences*	Genetics	
	Cell Biology	
	Ethology	

Ask those who did not come up with any ideas to look around themselves: What do you see in the room that reminds you of science? How does it remind you of science? Which science branch do you think it falls under?

- **Task 2 - Listening (10 min)**

- Teacher to ask: Do you know WHY I am asking so many questions? Questions are the bases of all science. How? Human beings are always very curious about the world we live in and are always asking questions.

- Questions like.... 'Why do we get sick?' 'What are the stars made of?' 'How does it rain?' 'How do we know that dinosaurs were real?' 'When will we find a cure for cancer?' This process of asking questions is 'Science'. Individuals/persons involved in this process are called _____. Science is the answer we get when we ask questions.

See the video. (Attached)

- **Task 3 - Reading (10 min)**

Throughout the years, many famous scientists have made very interesting discoveries and have come up with inventions that have made big impacts on our lives.

- Can you name any famous scientists?

- Can you name any female scientists?

- Can you name any of their inventions/discoveries?

The below is a 2-minute video on scientists and their discoveries/inventions:

(15) Great scientist and there invention || Top 21 inventors and Their Invention - YouTube

After the video give the handout to the students to match and keep as notes.

- Conclusion - Writing skills (5 min)

- Assessment for Learning HW. Writing: Imagine you were a young scientist, what would you like to discover/invent?

Assessment

- Explain to students how to write a report in 6 sentences/paragraph. Use the words we learnt to help you prepare your writing.

Example:

What would I like to invent?

I would like to invent ...

When would I like to invent it?

Why? Who would benefit from it?

Fun Times

Kahoot quiz.

- This will not be done to assess knowledge of students, but rather to give students the information in a fun way.

- The Kahoot quiz will be given to students for homework, or it could be done in a separate follow up lesson, after the students are asked to research some famous scientists to win a class Kahoot competition.

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I am a French Physicist and chemist who made ground breaking discoveries in radioactivity and was the first woman to win a Nobel Prize (1903).

MY NAME IS _____

I studied Maths and Physics and formulated the laws of motion and universal gravitation.

I AM

_____

I always asked myself many questions, especially what is space made of and black holes. I studied physics and quantum mechanics and the origins of the universe.

I AM _____

I am a Maltese physician, scientist, and educator who made significant contributions to public health and medical education in Malta.

MY NAME IS

_____

I am a physicist who developed the theory of relativity and made massive contributions to our understanding of the nature of time, space, and energy.

I AM _____

I am the father of your favourite toy - the telephone. I invented it in 1876 as I wanted people to communicate with each other over long distances.

MY NAME IS

_____

I am a medical doctor who concentrated my studies to cure cancer especially in children. I am Maltese.

I AM _____

I am a naturalist who proposed the theory of evolution by natural selection, which explains the diversity of life on Earth.

I AM _____

I am an inventor and electrical engineer who made big contributions to the development of electrical power and wireless communication. They named an famous electric car after me.

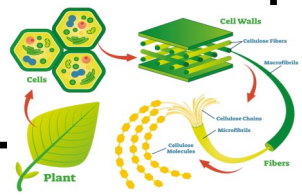
MY NAME IS _____

I am proud to say that I am a cosmonaut and in 1963, I was the first woman to travel to space. I came from the Soviet Union. My historic flight paved the way for other women to become astronauts and explore space.

I AM _____

I am a Maltese Female Scientist . I am a professor and a dentist. I also carry out research on materials used to fix your teeth. These are called biomaterials and are also used in the construction industry.

MY NAME IS _____



Isaac Newton Josette Camilleri Valentina Tereshiko Albert Einstein Marie Curie Nikola Tesla Alexander Bell Sir Temi Zammit Victor Calvagna Charles Darwin Stephen Hawkins

Learning Scenario 2: **Flora, Fauna and Habitats**

TOPIC	GROUP	TIME
Living Things and the Environment	Year 7	40 minutes

Materials and Resources

Interactive TV, YouTube videos, whiteboard, PowerPoint, Handouts, Sun hat, Sunglasses, Camouflage scarf or jacket, Mosquito cream, Warm jacket, Fishing rod, Knife, Packet of fruit seeds, Swimsuit, Gloves and a beanie, Flippers and goggles, 5 posters (wetland, desert, coastal, aquatic, arctic), Packet of plastic animals and plants, Big world map, Animal classification charts, Play Zoo (Book)

Learning Outcomes

1. I can group living things based on similarities and differences in structural features.
2. I can describe the function of some animal and plant adaptations.
3. I can identify and describe some local habitats.
4. I can identify some locally occurring animals and plants.

Teacher's Objective and Learning Intention

Science

- Acknowledge that living things can be grouped according to features and habitats.
- Understand why animals and plants adapt over the years, and what evolution means.
- List local flora and fauna and habitats.

English

- Increase adjective vocab and learn how to use these adjectives in creative writing.

Success Criteria

ALL students must be able to:

- List the basic functions of living things and group them according to their features.

MOST students should be able to:

- Understand the process of evolution and why living things adapt to their environment.
- List a few local animals and plants and describe their habitat.

SOME students could be able to:

- Memorise some new adjectives and use them correctly when given a written descriptive task.

Tasks and Questions

- **Introduction (10 minutes)**

- Teacher can enter the classroom wearing sunglasses and perhaps a hat! Teacher is then to hang the 5 habitat posters along the wall and stand under the artic poster. Am I dressed well for this habitat? Why not?

- Phrase the sentence to emphasize the adjectives, ''So you are saying that my BIG straw hat and YELLOW sunglasses are not good for this habitat?''

- Tell students that today will be using many descriptive words in our conversation.

- Ask students to sort the clothing items according to which habitat they think they belong to.

- Next, give the students the plastic animals and plants to sort them according to habitat.

- Observe, and then ask some questions about why for example can't a BIG BLUE fish live in the HOT desert, why can't a BRAVE, MAJESTIC lion live in the FREEZING artic, or a HUGE, WHITE polar bear live in the LUSH jungle.

- Explain that different animals and plants have evolved to adapt to their surroundings.

- **Task 1 – Listening/ Reading(15 min)**

- Show the students the following video. Explain that you are going to see 3 types of animal adaptations, and you will ask them about them later, so it might be a good idea for them to jot down some notes.

(69) Animal Adaptations - Adaptation and Survival - Animal Adaptations for Kids - Learning Junction - YouTube

- From the video we have seen that there are 3 types of adaptations, can you mention them?

- Give students 'Handout 1: The Three Types of Adaptations'

- **Task 2 – Writing / Speaking (10 min)**

- Are all animals the same? But are there similar animals? Do you consider a dog to be similar to fish? Or more like a wolf? Is a wolf similar to a tree?

- Broadly speaking living things can mainly be grouped into plants and animals. Write on white board the classifications.

- Brainstorm types of plants, and group them on the board. Circle similar ones and where available later label the group according to similar characteristics such as flowering, non-flowering plants, and so on.

- Same with animals that can be sub-grouped into vertebrates and invertebrates following brainstorming. Students can be encouraged to mention animals that can be found in their country but not in Malta.

- Teacher's notes:

Vertebrates [ANIMALS WHICH HAVE A BACK BONE]

—- Mammals: Humans, dogs, cats, elephants. (explain briefly what mammals are)

—- Birds: Eagles, owls, sparrows, penguins.

—- Reptiles: Snakes, turtles, lizards, crocodiles.

—- Amphibians: Frogs, toads, salamanders.

—- Fish: Goldfish, sharks, clownfish, trout.

Invertebrates: [ANIMALS WHICH DO NOT HAVE A BACKBONE]

—- Insects: Butterflies, ants, bees, beetles.

—- Arachnids: Spiders, scorpions, ticks.

—- Molluscs: Snails, octopuses, squids.

—- Crustaceans: Crabs, lobsters, shrimp.

—- Annelids: Earthworms, leeches.

- Can be supported with this 1-minute video: (57) Classification of Animals - YouTube

- If time permits the plastic animals and plants can be once again classified according to sub-groups mentioned during the lesson.

- **Conclusion - Listening (5 min)**

- Malta: Local habitats, and the flora and fauna found there. In Malta we too have particular habitats, can you mention a few? Go through the relevant presentation with the students.

- Send the presentation to the students to review again at home, and give them Handout 2 for them to fill in for HW.

Assessment

Assessment for Learning HW – writing

Send the presentation to student to review again at home, and give them Handout 2 for them to fill in for HW.

Fun Times

Activity 1 : Organise an outing to Simar Nature Reserve to observe nature, or to an association that works with Birdlife.

Activity 2 : Play with the book '' Play Zoo'', classify animals by habitat and answer the animal questions at the back of the animal cut outs .

The Maltese Islands

Different types of Habitats

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Coastal Areas

Malta has a diverse coastline, including sandy beaches, rocky shores, and cliffs. These habitats support a variety of marine and coastal species, including seabirds, marine mammals, and marine vegetation.

Examples of locality: all around Malta
Local Flora: seaweed, moss
Fauna: fish, starfish, jellyfish, turtles, seagulls

Maquis and Garigue

These are types of Mediterranean scrublands consisting of low, dense shrubs, aromatic plants, and small trees. They are found in the rural areas of Malta and provide habitat for various bird species, reptiles, and insects.

Examples of Location : Girgenti, Comino and Dingli

Examples of Flora : Mediterranean Thyme, Maltese orchid, carob tree, grass

Examples of Fauna : earthworms, butterflies, lizards, scorpions, snakes, and the Maltese Shrew

Woodlands

Although limited in extent, Malta has some woodlands consisting of indigenous tree species like Aleppo pine (*Pinus halepensis*), carob (*Ceratonia siliqua*), and olive trees (*Olea europaea*). These woodlands provide habitat for birds, insects, and small mammals.

Examples of locality: Buskett and Mizieb
Local Flora: mosses, trees, flowers, shrubs
Fauna: earthworms, birds, chameleons, snakes, snails and butterflies

Rock pools

Though scarce, Malta has a few freshwater habitats, including small reservoirs, ponds, and springs. These provide refuge for amphibians, aquatic insects, and some bird species.

Examples of locality: Fawwra
Local Flora: pond weeds
Fauna: crabs and frogs

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Cliffs and Caves

Malta's limestone cliffs and caves offer important nesting and roosting sites for seabirds, including shearwaters and gulls. Some caves also contain unique species adapted to the dark and sheltered conditions

Examples of Location: Dingli, Comino
Examples of Flora: seaweed, moss,
Examples of Fauna: fish, bats, crabs, insects.

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Farmland and Agricultural Areas

Farmlands and agricultural areas are man-made habitats but play a significant role in supporting wildlife in Malta. These areas host a range of bird species, reptiles, insects, and small mammals.

Examples of Location: around the less urban parts of Malta
Examples of Flora: fruit trees, fig trees, wheat
Examples of Fauna: mice, cats, birds

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Animal Adaptations

These three types of adaptations demonstrate how living things adjust to their surroundings and improve their chances of survival. It's important to note that adaptations can occur over long periods of time through the process of evolution or can be inherited from parents.

Structural/ physical Adaptations: These are physical features or body parts that help living things survive in their environment. For example, a polar bear's **thick (bushy/slim)** fur and **fat (big/small)** layer of blubber help it stay warm in **cold (freezing/warm)** Arctic regions.

Behavioural Adaptations: These are actions or behaviours that living things perform to increase their chances of survival. For instance, **beautiful (amazing/ugly)** birds migrating to **warmer (hotter/better)** areas during the **cold** winter to find **good (quality/ quantity)** food and avoid **harsh (perfect/bad)** conditions is a behavioural adaptation.

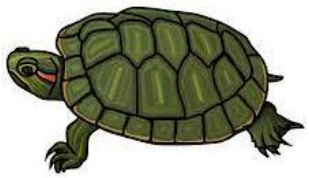
Functional Adaptations: These adaptations involve internal body processes or functions that help organisms survive. One example is a camel's ability to store water in its hump, allowing it to survive in **dry (unfertile/ fruitful)** desert environments for **extended (short/long)** periods.

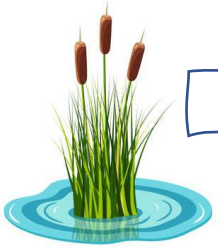
Change the words in bold with another suitable adjective

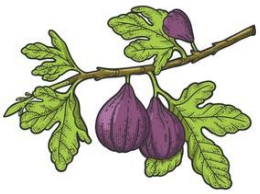
Different Types of Habitat

Exercise 1

Look at the pictures. Write down "flora" or "fauna" next to the pictures.







Exercise 2: Read the information on slides 2, 3 & 4 and decide if these statements are True (T) or False (F).

a. The Maltese coastline is only made up of sandy beaches. ____
b. A lot of species such as seabirds live on Malta's coast. _____
c. Reptiles can be found in Malta's countryside. ____
d. The carob and olive trees are typical trees found in Malta. ____
e. Chameleons can be found around Malta's coast. ____

Exercise 3: Read the information on slides 5,6 & 7. Match the phrase in column A to column B to complete the sentence.

	A	B
1	Malta does not have a lot of	for wildlife in Malta.
2	Seabirds like to nest in	freshwater habitats.
3	Farmland is very important	that is found in Malta's farmland areas.
4	Wheat is an example of flora	Malta's cliffs and caves.

Learning Scenario 3: **Matter and Change of State**

TOPIC	GROUP	TIME
Understanding Matter	Year 7	40 minutes

Materials and Resources

Beads (three different colours, YouTube Video: Changing States of Matter, Interactive Whiteboard, Diagram 'Changes States of Matter', Handout 'Record sheet', Pot of water, Ice cubes, Heat source, Thermometer, Timer, Tongs, Handout 'The Particle Model', HW Handout 'Reading Comprehension – The Particle Model', Game 'The Particle Model' https://learningapps.org/display?v=pf18h8wx223

Learning Outcomes

1. I can link properties of solids, liquids and gases to examples of their everyday use.
2. I can identify the different forms in which water can be found.
3. I can use and explain terms melting, freezing, evaporating, condensing and boiling.
4. I can use the particle model to explain the properties of solids, liquids and gases.

Teacher's Objective and Learning Intention

Science

- To understand the properties of matter in terms of the particle model.
- To apply the particle model to explain behavior of solids, liquids and gases.
- To conduct a hands-on experiment to observe changes in matter and explain them using the particle model.

English

- To learn opposites in English.

Success Criteria

ALL students must be able to:

- Identify the states of matter (solid, liquid and gas).

MOST students should be able to:

- Understand the particle model and the properties of matter.

SOME students could be able to:

- Understand the change in particles of a substance when a change in temperature occurs.

Tasks and Questions

Introduction (5 minutes)

- The lesson should begin by asking students if they know what matter is and what its different states are. Write their responses on the whiteboard. Explain that matter is anything that takes up space and has mass and that it can exist in three states: solid, liquid, and gas.

- Discuss the three states of matter and ask students to give real life examples.

Task 1 - Content Presentation / Listening to instructions (5 minutes)

- Introduction of the particle model and explanation of how it helps us understand the properties of matter. This can be done by creating a particle model using basic beads. This will help students understand how particles behave in different states of matter. Instruct the students to:

- Choose one colour of beads to represent each state of matter: solid, liquid, and gas.

- Pour a small amount of beads onto the table and arrange them in a pattern to represent the solid state. The beads should be arranged tightly together and in a regular pattern.

- Take a different colour of beads and pour them onto the table in a random pattern to represent the liquid state. The beads should be close together, but not as tightly packed as the solid beads.

- Take a third colour of beads and sprinkle them onto the table to represent the gas state. These beads should be very spread out and not in any particular pattern.

- Use your fingers to move the beads around and simulate the movement of particles in each state of matter. For solids, show how the particles vibrate in place. For liquids, show how the particles can move around each other. For gases, show how the particles move quickly and independently of each other.

Task 2 - Listening and speaking (5 minutes)

- Before watching a video, students will be advised to take notes while they are listening.

- Watch the following video: Changing States of Matter - YouTube

- After watching the video ask students what the process is called when:

—- a solid substance such as ice is heated, and then turned into liquid? (Answer: MELTING)

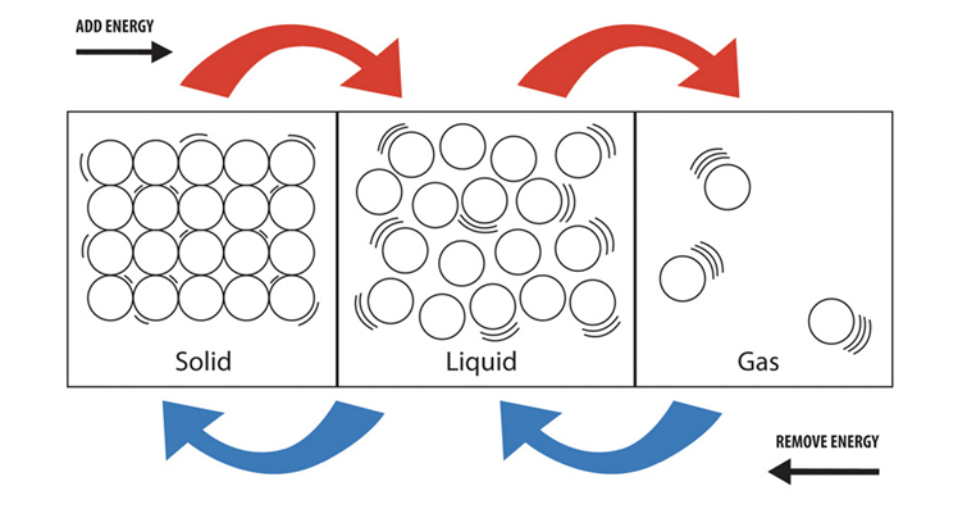
—- a liquid substance such as water is heated, and turned into gas? (Answer: EVAPORATION)

—- a gas such as water vapor is cooled, and form a liquid? (Answer: CONDENSATION)

—- a liquid substance such as water is cooled, and there is a change of state from liquid to solid? (Answer: FREEZING)

- Answers can be written on the whiteboard.

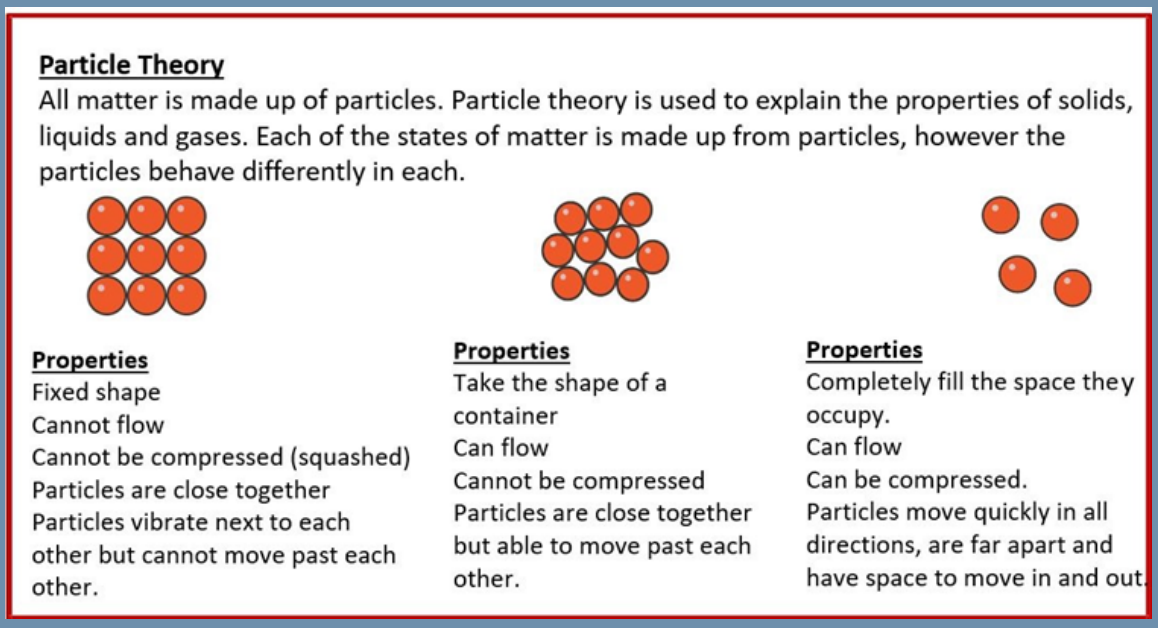
- The diagram below can be shown on interactive whiteboard and explain to students the changing of states of matters and illustrate how the particles in solids, liquids and gases are arranged and how they move, reinforcing on the keywords: **Melting**, **Evaporation**, **Condensation**, **Freezing**.



Task 3 - Presenting Observations / Speaking (10 minutes)

- Involve students by dividing them into 3 groups to role play the movement of particles by pretending to be solid, liquid or gas. For example, students can stand still and close together to represent a solid, move slowly to represent a liquid, and vibrate randomly to represent a gas. Students are then asked to describe the behaviour of particles in each state of matter.

- Give the handout 'The Particle Model' to students for note taking and to follow during the discussion through the lesson. The following diagram can be presented on the IWB and discuss it together with students.



Task 4 - Experiment / Listening and Writing (10 minutes)

- The change of state of water experiment.

- Materials: container with ice cubes, pot of water, stove or hot plate, thermometer, timer, tongs.

- Procedure:

- Divide students into groups and hand a record sheet for each group.

- Ask students to observe the container of ice cubes and describe what they see. Encourage them to use descriptive language to talk about the properties of the ice, such as its colour, shape, and texture.

- Explain to students that the ice is in a solid state, and that we can change its state by adding heat. Explain that heat is increasing temperature while the opposite, cool, means decreasing the temperature.

- On the whiteboard write the opposite words; heat – cool; increase – decrease; solid – liquid.

- Fill the pot with water and place it on a heat source. Add another opposite hot – cold on the board.

- Ask students to predict what will happen to the ice when it is placed in the pot of water on the stove. Answers should lead to the word 'melt'. Add the opposites melt – freeze on the board.

- When the water reaches boiling point (100°C), use tongs to transfer the ice cubes into the pot of boiling water.

- Encourage students to observe and describe what happens to the ice cubes as they are heated. They may notice that the ice starts to melt and turn into water.

- With students participation, use the thermometer to measure the temperature of the water and ask students to record the temperature.

- Continue heating the water and measuring the temperature at regular intervals (e.g. every minute) until the water reaches boiling point (100°C).

- Ask students to describe what they observe as the water boils. They may notice that steam starts to rise from the surface of the water.

- Discuss with students the different states of water they observed during the experiment (solid ice, liquid water and steam) and the changes that occurred as heat was added or removed.

- Throughout the experiment, use language that is appropriate for the students' level of English proficiency, and encourage them to use language to describe what they see and understand.

- Opposites being taught during the lesson:

    heat – cool (refer to the hot plate) / increase – decrease (refer to the temperature) / hot – cold (refer to substances that get hot when warmed by hot plate) / warm – cold / solid – liquid (example from ice to water) / melt – freeze (refer to example of different forms of water) / low – high (refer to temperature as an example) / soft – hard (refer to solids and liquids)

Conclusion (5 minutes)

- Summarize the main points of the lesson and review the particle model.
- Assign homework.

Assessment for learning HW - Reading:

Handout 'Reading Comprehension – The Particle Model.'

Assessment

Observe student participation and engagement during the experiment and class discussion.

Review student handouts to check for accurate explanations of the properties of matter using the particle model.

Grade students on their homework.

Fun Times

If there is enough time, students can play the game 'The Particle Model'. This game can also be given as HW to reinforce the understanding of the Particle Model:

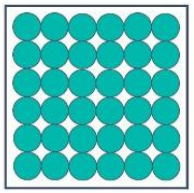
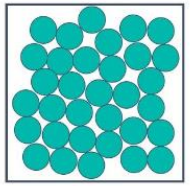
https://learningapps.org/display?v=pf18h8wx223

Lesson: Understanding Matter - Chemical Science

The Particle Model.

	Properties						
States of Matter	Can be weighed	Occupies space	Movement of particles	Fixed shape	Fixed volume	Can be compressed	Material properties
 Solid	✓	✓	Particles are closely-packed in a regular pattern. They vibrate on the spot.	✓	✓	✗	Keeps its shape unless a force is applied to it. Remains the same volume.
 Liquid	✓	✓	Particles are close together, but random. They can move past each other.	✗	✓	✗	Takes the shape of the container it is in. Remains the same volume.
 Gas	✓	✓	Particles are spread out and can move about quickly in all directions.	✗	✗	✓	Does not keep its shape. Can spread out to fill the space it is in.

The Particle Model.

	Properties						
States of Matter	**Can be weighed**	**Occupies space**	**Movement of particles**	**Fixed shape**	**Fixed volume**	**Can be compressed**	**Material properties**
 Solid	✓	✓	Particles are closely-packed in a regular pattern. They vibrate on the spot.	✓	✓	✗	Keeps its shape unless a force is applied to it. Remains the same volume.
 Liquid	✓	✓	Particles are close together, but random. They can move past each other.	✗	✓	✗	Takes the shape of the container it is in. Remains the same volume.
 Gas	✓	✓	Particles are spread out and can move about quickly in all directions.	✗	✗	✓	Does not keep its shape. Can spread out to fill the space it is in.

Lesson: Understanding Matter - Chemical Science

Name:_____

Class:_____

Reading Comprehension.

The Particle Model.

Matter is anything that has mass and takes up space. It is the physical substance that makes up the universe, including everything we can see, touch, and feel. Matter can exist in various forms, including solids, liquids and gases, depending on its temperature and pressure.

The Particle Model of Matter helps us think about how matter behaves. It also helps us explain why different matter has different properties.

In a solid, the particles are packed close enough together that they can hardly move. In a liquid, particles are close together with some space, while in gases, particles are far apart with a lot of space to move into. When you heat up particles, they move faster.

Circle the correct answer.

1. Solid, liquid and gas are three types of…..

   models matters planets

2. Orange juice is a type of…..

   solid liquid gas

3. Steam is a type of…..

   solid liquid gas

4. Particles have no space in a…..

   solid liquid gas

5. The higher the temperature, the higher the…..

   gas space speed

Lesson: Understanding Matter - Chemical Science

Answer **TRUE** or **FALSE**.

1. Milk is a type of liquid. (TRUE) / FALSE
2. In a gas, particles have no space to move into. TRUE / FALSE
3. Particles of solids do not have spaces between them. TRUE / FALSE
4. Air is a type of liquid. TRUE / FALSE
5. Matter has mass and takes up space. TRUE / FALSE
6. The opposite of melting is freezing. TRUE / FALSE

Answer the following questions.

- Name 3 types of solids.
  1. _____
  2. _____
  3. _____

- Name 3 types of liquids.
  1. _____
  2. _____
  3. _____

- Describe the particles in a solid.

  _____

  _____

- Describe what happens to the particles when chocolate is melted.

  _____

  _____

  _____

Lesson Plan: Understanding Matter - Chemical Science

Experiment Change of State of Water.

Handout – Record Sheet

Group no. _____

Substance	
Properties of substance (e.g. colour, shape, texture)	
Observations when temperature is 100°C	
Observations when temperature is _____	
Observations when temperature is _____	
Observations when temperature is _____	
Observations when temperature is _____	
Observations when temperature is _____	

Learning Scenario 4: **Energy in Food**

TOPIC	GROUP	TIME
What is Energy?	Year 7	40 minutes

Materials and Resources

mini-whiteboard, foods (pasta, bread, marshmallows, crisps, cheese, bacon, dry broad beans, etc.), water, balance, experiment worksheet (see attached), measuring cylinders, boiling tubes, tongs, beakers, thermometers, mounting needles, Bunsen burners, retort stands, clamps, stop-watches, safety goggles, lab coats, fire resistant mats, worksheet: Match the word with the pictures

Learning Outcomes

1. I can identify food as a source of energy.
2. I can select foods with the most/least energy content.
3. I can carry out and describe a fair test to investigate food for its energy content.

Teacher's Objective and Learning Intention

Science

- Students will understand the concept of energy and its relationship to food.
- Students will be able to identify foods with high and low energy content.
- Students will be able to investigate the energy content of food samples.

English

- By the end of this lesson, students will be able to expand their vocabulary related to food.

Success Criteria

ALL students must be able to:

- Understand the relationship between food and energy.

MOST students should be able to:

- Conduct a fair test.

SOME students could be able to:

- Interpret results from the fair test.

Tasks and Questions

- Introduction (5 minutes):

- The lesson shall begin by asking students 'What is energy?' A few minutes to be allowed for each student to think of and write an answer on a mini-whiteboard or a notebook.

- Class discussion and explanation of what energy is; *the ability to do work or cause change*. Ask students for, and provide examples of energy in action, such as a car moving, a light bulb glowing, or a plant growing.

- Next, students are asked if they know where we get energy from. Allow a few minutes for responses (students can use mini-whiteboard again).

- Class discussion and explanation that we get energy from the food we eat. The food we eat provides our bodies with the energy we need to move, think, and grow. Only if students mention air or oxygen, take the opportunity to discuss with the class.

- Task 1 – Writing (10 minutes)

- A selection of foods is distributed to each student. The teacher will introduce new vocabulary related to food items. The list of food shall be written on the board so that students can refer to it during the lesson. Students are asked to work in pairs to sort the foods into two groups: those with high energy content and those with low energy content. Each pair shall write down their reasoning for their categorisation.

- Task 2 – Speaking (5 minutes)

- After a few minutes, the class shall be brought back together, and a few pairs will be asked to share their reasoning for their categorisation. Other students shall be encouraged to share their views and say whether they do agree or disagree and discuss their own reasoning.

- Task 3 – Reading and Understanding/Listening (10 minutes)

- Introduction of the idea of carrying out a fair test to investigate the energy content of different foods. The teacher will discuss that a fair test is one where all variables are controlled except for the one being tested, and that this ensures that the results are reliable.

- Teacher to distribute the worksheet with instructions for the test. Students shall be divided into 4 or 5 groups to conduct the test, using one sample of food provided. Teacher shall read instructions and walk around the classroom to answer any questions and ensure that the test is being conducted fairly.

- Task 4 – Speaking (5 minutes):

- After the test is complete, each group of students will share the results with the other groups and compare them with their results. Each group will discuss the reasoning for their findings.

- Conclusion (5 minutes)

- Teacher to summarize the key concepts covered in the lesson: the relationship between energy and food, how to identify foods with high and low energy content, and how to conduct a fair test when investigating the energy content of different foods.

- Assessment for learning HW: Students will be asked to reflect on what they learned during the lesson. They shall write down at least one thing they learned and one question they still have.

- Reflections to be collected in the next lesson to assess student learning and plan future lessons.

- Worksheet to enhance their food vocabulary: Match the words with the pictures.

Assessment

Students' understanding of the concept of energy and its relationship with food, their ability to identify foods with high and low energy content, and their ability to conduct a fair test to investigate the energy content of different foods will be assessed through class participation, written reflections, and the results of the investigation.

Fun Times

See the below word search. This can be done at home or school depending on the time available.

Lesson 4 – Energy and Food

Match the word to the pictures.

~~apple~~	popcorn	cake	onion	cheese
cucumber	tomato	cereal	pasta	bread
rice	yoghurt	banana	strawberry	chips
milk	orange	fish	meat	chocolate

			
apple			
			
			
			
			

LABORATORY REPORT

Investigate the energy content of food

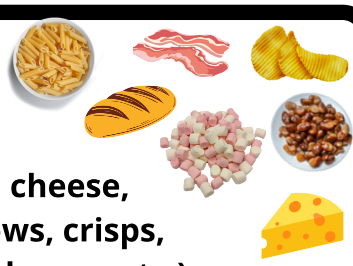
Purpose

To determine which food item contains the most energy by measuring the temperature change in water after the food is burned.

Procedure

1 - Wear a lab coat and safety goggles.
2 - Place the fire resistant mat on the working surface.
3 - Measure water in a measuring cylinder and add the water to a boiling tube clamped in a retort stand.
4 - Record the initial temperature of the water.
5 - Weigh samples of food and record their mass. Place them in small beakers.
6 - Take a food sample and place it on a mounted needle.
6 - Ignite the food sample using a bunsen burner.
7 - Hold the burning food sample under the boiling tube of water until completely burned – it may be necessary to relight the food sample. (One can record time.)
8 - Record the final temperature of the water and mass of food sample.
9 - Record results in a table.
10 - Calculate the change in temperature caused by the burning food sample.

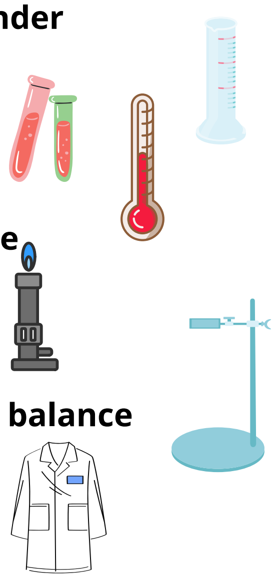
Materials

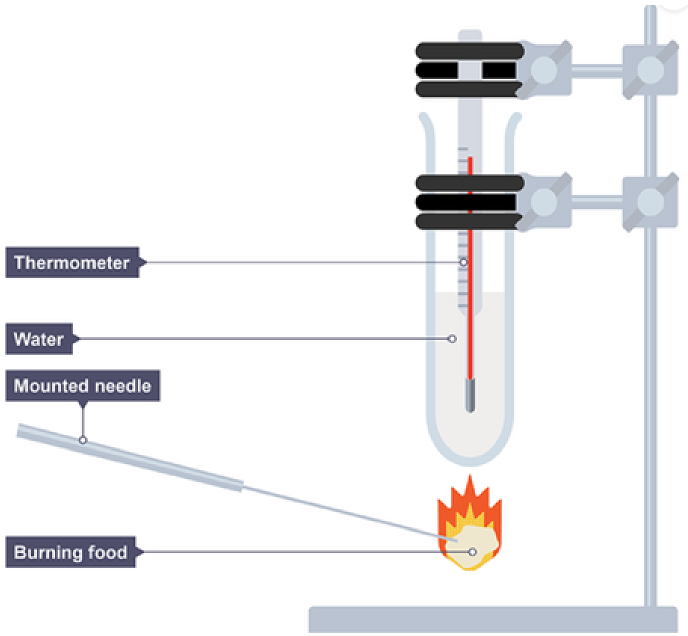


- Water
- Food samples

(e.g. pasta, bread, cheese, mini-marshmallows, crisps, bacon, dry broad beans, etc.)

- Measuring cylinder
- Boiling tubes
- Tongs
- Small beakers
- Thermometer
- Mounted needle
- Bunsen burner
- Retort stand
- Clamp
- A scale / digital balance
- A timer
- Safety goggles
- A lab coat
- Fire resistant mat





Result

A large increase in temperature indicates the food contains a lot of energy.

KEEP IN MIND

To ensure a fair test:

- Use the **same amount of water** for each food sample to ensure a consistent heat transfer.
- Measure the initial and final temperature of the water carefully **using the same thermometer.**
- Hold the food sample at the **same distance** and for the **same amount of time** for each trial to ensure consistent heating.

RECORD YOUR WORK

Food Sample	Initial weight of food	Initial temperature of water	Weight of food at the end	Ending temperature of water	Difference in temperature

What is your conclusion about this experiment?

Energy in Food

t g t k n m p m n e x e a j d n i e t y j f d n b
z o v q u m v r c v c f u k e n s f r r p e p y w
n y m l v b b l v f y f c q k e l r z j a a z p x
g h b a k c t z k s w n o k e y e a v w s b y c i
c u r c t b a n a n a j l h s b a m a t o w m r y
u l e j a o z m v e q g c p w m b u a o a a z t r
c i a h p k e l s r b q x a d c j y m y n b j q r
u q d a i s e c c u h r r l i v w l c a c x v x q
m g u z v v k q b t y t m x t m r z a c y z g a j
b s a n p h j j o a s w n y i o n x o e c h i p s
e f e t d h s o v r g h l z q s g k u i r g o a i
r f p i a e p g b e s t a o n o m z y p u e y r m
f x y l r y k s d p m v p m m p a z h x q b c a z
k h a a w o o u d m s x s d c r x d e c i r s z x
a n x j n q l i p e x g o q h h i p p k v a b g s
y k j i p v a a u t s z n s w w p f o o p y x e c
l b o c v k a r c z f t r a j f q j s n v o j z q
o n q z c m q k n k n f c d p a l s h u t u e a r
k r u d y n u h t g u a r k e y n h t h j b s v x
z x a g y r o n d d n s o d r h r l m n d e z j r
h i g n o i g l h o t r c h o c o l a t e l x v j
g d r p g i u x s i o x p z y g c f u k g p d i w
e x v i u e h p u h p f q x a s p b k u c p l c k
a k f m r c f r j v t w a i a p o y m l m a z j x
s j u d t h f o b i y g r e n e p k d x z i v w o

apple
banana
bread
cake
calories
cereal
cheese
chips
chocolate
cucumber
energy
food
fruits
oats
onion
orange
pasta
popcorn
rice
strawberry
temperature
tomato
yogurt

Find the word in the puzzle.

Words can go in any direction.
Words can share letters as they cross over each other.

23 of 23 words placed.

Learning Scenario 5: **Electrical Components**

TOPIC	GROUP	TIME
Electricity	Year 7	80 minutes

Materials and Resources

YouTube videos, batteries, 2 flash cards INSULATORS and CONDUCTORS, bulbs, switches, wires with crocodile clips, various objects for conductivity testing: metal spoon, copper wire, aluminium foil, paperclip, nail, coin, straw, key, pencil (graphite), rubber eraser, plastic straw, wooden stick or pencil, cotton cloth, glass bottle, ceramic mug, Styrofoam cup

Learning Outcomes

1. I can use electrical components to construct basic electrical circuits.
2. I can name basic electrical components and use symbols to represent electrical circuits. These include wire, battery, bulb and a switch.
3. I can distinguish between electrical conductors and insulators.
4. I can design and perform an experiment to identify conductors and insulators.
5. I can describe uses of conductors and insulators and relate their use to issues of safety.
6. I can link conductors and insulators with examples of everyday use.
7. I can identify applications of conductors and insulators in everyday use.

Teacher's Objective and Learning Intention

Science

- Recall names of basic electric components and use them in a basic circuit.
- Understand the difference between electric conductors and insulators and know how to identify them.
- Know practical uses of conductors and insulators and applications in everyday life.

English

- Introduction to prepositions.

Success Criteria

ALL students must be able to:

- Follow instructions which include prepositions and later use prepositions correctly in their communications.

MOST students should be able to:

- List the basic components needed to build an electric circuit.
- Describe how to build it in their own words (using prepositions)

SOME students could be able to:

- Understand the difference between conductors and insulators and know their application in everyday use

Tasks and Questions

- **Introduction (10 minutes)**

- Teacher can put on the goggles and lab coat. Starts the lesson holding a box. Teacher is to keep silent and confused, hoping students engage in the role play and ask what happened.

- Teacher explains that the box is a time travel machine she/he invented, but unfortunately it is not switching on. Ask the students if they know why. The conclusion would be that it does not have a power supply.

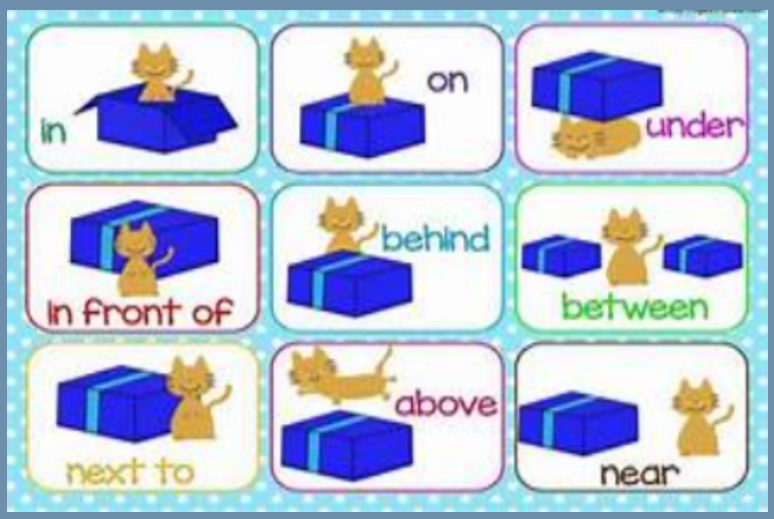
- Teacher to ask the students, addressing them as young scientists, if they could help by building an electric circuit to get power.

- Explain that when one is creating/inventing something as a team, it is important to be able to communicate well within the team and to give clear instructions. Therefore, we will be using the following words to help us in our quest.

- **Task 1 – Speaking (20 mins / 10 min on prepositions, 10 min on the light bulb activity)**

- Go to the white board and write the following prepositions:

in – on – under – in front – behind – next – between



- Explain them briefly and tell the students we will be using a lot of these words today, and that they are called prepositions.

- Draw or hang a poster similar to this on the whiteboard.

- Bring out a light bulb from your box. Ask do you know what this is? What is it used for? How does it work? Shake it and say, but it is not lighting up? What can I do?

- I must create something to make it light up. What might I need? Let students come up with ideas. If they don't, start taking out things from the box, let students name the items. Depending on the class level, the items may be labelled.

- Ask what the students think the basic components to light the bulb are — battery, bulb, wire, and switch. These are the components of a basic electrical circuit.

- **Task 2 – Demonstrate (15 min)**

- Gather students around the table and ask them to try and build an electrical circuit from scratch. Use and emphasise every time one of the prepositions you wrote earlier on the board, is used by you or the students.

- Turn on the switch, to show the bulb lighting up! That's some science for you! Just imagine how cool it must have been when people started seeing a bulb lighting up for the first time back when it was invented!

- **Task 3 - Reading (20 min)**

- As students go to their desks to complete the task, the teacher pretends to be in a very pensive mood, scratching her head and looking at the things on the table confused.

- Explain to students that you still cannot understand what you were doing incorrectly, and why you did not manage to create electricity without the help of the class.

- Show what you were trying to do ... replace the component with an insulator object from the table. Repeat the process with another insulator or two and ask the students why they think it is not lighting up. Then place a conductive material, and the bulb will light up pretending to be very surprised. Ask if any of the students know why. Ask whether any student can explain the concept of conductors and insulators.

- Conductors are materials that allow electricity to easily pass through them. They are like "electricity-friendly" materials. Ask students for examples of conductors they are familiar with (copper, aluminium, silver). When we use these materials in circuits, electricity can move through them easily, like water flowing through a pipe.

- On the other hand, insulators are materials that don't let electricity flow easily. They are like "electricity blockers." Ask students for examples of insulators they are familiar with (rubber, plastic, and wood). When we use insulators in circuits, they stop the flow of electricity, like a closed door stopping someone from entering a room.

- Take out 2 flash cards with the words INSULATORS and CONDUCTORS and place them on either side of the table. Now ask students to divide the objects on the table accordingly.

- Give students Handout 1 to do at home.

- **Conclusion – talking (15 min)**

- Understanding conductors and insulators helps us know how to protect ourselves from electric shocks.

- Show students handout 2 on the interactive board and discuss ways how one can avoid an electrical shock. (Never touch exposed wires or electrical outlets. / Keep water away from electrical devices. / Use dry hands when plugging or unplugging cords. / Avoid overloading outlets with too many devices. / Don't use electrical devices near water or in damp areas. / Always ask an adult for help with electrical repairs or if you have any concerns.)

Assessment

- Assessment for learning HW – Project

- Draw and label a poster explaining how one can avoid an electrical shock. In the diagram, clearly show and illustrate the roles of conductor and insulators.

Fun Times

- Robotics or Electronics Workshop: Arrange a workshop where students can learn about robotics or electronics. They can apply their knowledge to build simple robots or electronic devices that involve circuitry and apply their knowledge of circuits in a hands-on and creative way.

- Alternatively, you can hold a workshop following these links:

Scribble robot: https://www.youtube.com/watch?v=IVrfcTPSzyo&t=4s

Copper tape cards: https://www.youtube.com/watch?v=7hb-9eUpfbQ&t=5s

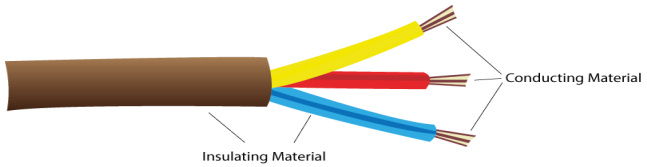
The second option can be used to create a card for Mother's day/ Valentines / Christmas / Birthday etc., depending on time of year. Careful to be culture-sensitive and inclusive.

Conductors:

Definition: Conductors are materials that allow electricity to flow through them easily.

Examples of Conductors:

- Aluminium is a good conductor because electricity can flow (in/through) it.
- Copper is a conductor commonly used in electrical wiring (in/next) buildings.
- Water, though not a solid, can conduct electricity when it comes (near/under) an electrical sources.



Insulators:

Definition: Insulators are materials that do not allow electricity to flow through them easily.

Examples of Insulators:

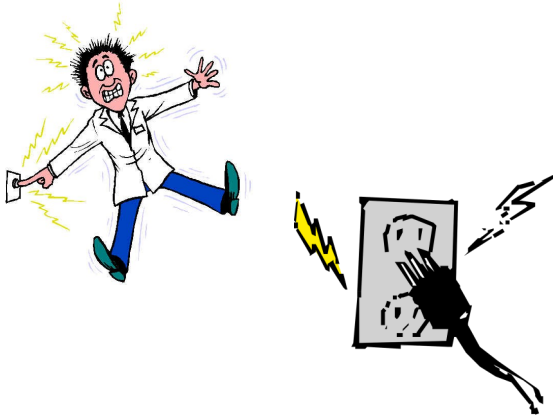
- Plastic is an insulator, so it is used (in/on) electrical cords to prevent electric shocks.
- Rubber gloves provide insulation when working (near/in front of) live electrical equipment.
- Air is an insulator that is all (near/around) us and provides a protective barrier as it is a poor conductor of electricity.

How to Avoid Electric Shocks and Stay Safe

Stay safe from electric shocks and remember these guidelines:

1. Never put yourself (under/behind/in) danger by touching exposed wires or electrical outlets.
2. Keep water away from electrical devices.
3. Make sure your hands are dry when plugging or unplugging cords.
4. Avoid plugging (under/in/on) too many devices to one outlet.
5. Don't use electrical devices (next to/under) water sources or in damp areas.
6. Always be (under/in) the company of an adult when dealing with electrical devices.

Remember, following these guidelines and understanding the difference between conductors and insulators will help you stay safe when using electricity.



INTEGRA
science & language integrated learning

How to Avoid Electric Shocks

and Stay Safe

Learning Scenario 6: **Cells and Microscopes**

TOPIC	GROUP	TIME
Cells and Reproduction	Year 7	80 minutes

Materials and Resources

Interactive whiteboard, magnifying glasses, microscopes (one per group), prepared slides of plant cells, ready-made animal and plant cells, glass slide, lens paper (to clean the microscope slide), cover slips (to hold the specimen), needle, scalpel, forceps, scissors, onions, glycerine, methylene blue, slide box (to store the prepared slides after use), lego car, calculators (optional), record sheet, magnifying glass (2 pages), record sheet – microscope (2 pages), reading comprehension – cell observation (2 pages), worksheet on sentence structure, YouTube video - Intro To Cells: Animals & Plants | Cells | Biology | FuseSchool - YouTube, Online puzzle https://puzzel.org/en/jigsaw/play?p=-NVkaEKN5JYb0IQ0IdK2

Learning Outcomes

1. I can use magnifying glasses to observe small things.
2. I can perform simple calculations regarding magnification.

Teacher's Objective and Learning Intention

Science

- By the end of the lesson, students will be able to observe and describe the basic structures of a cell using magnifying glasses and microscopes, and calculate magnification.

English

- Students will enhance their knowledge in proper sentence structure and understanding different parts of speech.

Success Criteria

ALL students must be able to:

- know how to use a magnifying glass and a microscope.

MOST students should be able to:

- do the magnification calculation.

SOME students could be able to:

- know the 3 basic structures that cells have in common.

Tasks and Questions

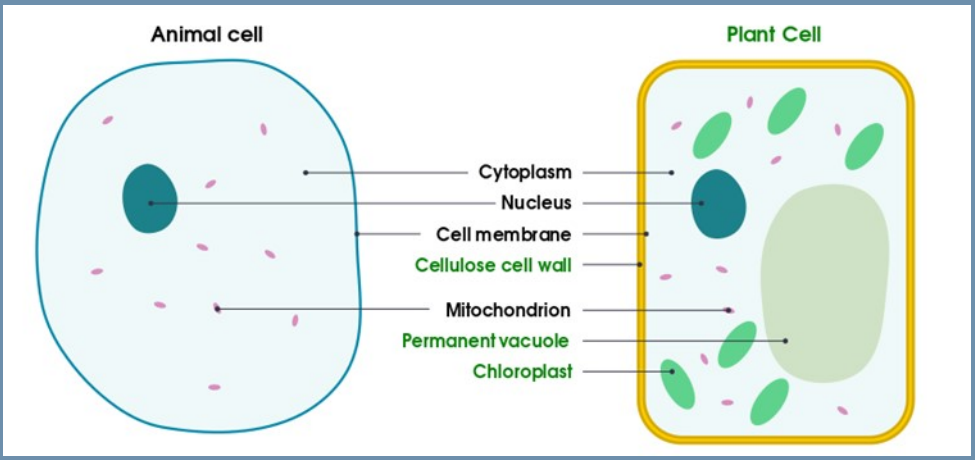
Introduction (5 minutes)

- Begin the lesson by asking students if they have ever used a magnifying glass before. Encourage them to share their experiences and discuss why magnifying glasses are useful.

- Explain that today, they will be using magnifying glasses and microscopes to observe and explore cells, which are the building blocks of all living organisms.

Task 1 – Speaking (15 minutes)

- Display the following diagram of cells on the interactive white board. Ask students if they know what it is. Answers should be listed on the whiteboard.



- Next, inquire with the students whether they are familiar with the concept of a cell and its significance in living organisms.

- Explain in simple terms what a cell is by using the following example:
Tell students to close their eyes and picture a brick wall. Ask them 'What is the basic building block of that wall?'. (Answer: a single brick.) Like a brick wall, your body is composed of basic building blocks, and the building blocks of your body are cells. Bricks are generally rectangular, while cells can have many shapes — round, square, spindle-shaped and even star-like! Bricks generally stay put, while many types of cells will happily migrate from one place to another.

- To help students understand better the concept of cells forming tissues and organs in our body, you can visually demonstrate the relationship between Lego pieces, cells and the structures of the Lego car as organs.

- Start with a complete Lego car and explain that just like our body is made up of cells, the Lego car is made up of individual Lego pieces.

- Emphasize that each Lego piece represents a single cell in our body. Cells are the building blocks of life, just as Lego pieces are the building blocks of the car.

- Introduce the idea that just as our body has different organs, the Lego car has different structures like wheels, doors, and windows.

- Begin by removing one Lego piece from the car, representing a single cell. Explain that this cell is like a basic unit, similar to how a single Lego piece is the basic unit of the car.

- Gradually remove more Lego pieces, representing multiple cells. Explain that cells can come together and form tissues, just as multiple Lego pieces can come together to form structures like the car's wheels or doors. Windows and doors of the car are like the organs.

- Use the example of the wheels on the car to represent organs in our body. Explain that the wheels help the car move, just like organs have specific functions to keep our body functioning properly.

- Finally, emphasize that our body is made up of trillions of cells, each with its own specific role, and they work together to form organs and keep our body functioning just like how different Lego pieces come together to form a complete car.

- Mention that cells work together to form body systems, which help our bodies function properly. *(Depending on the level of the class choose adequate examples from: Bone cells, for instance, contribute to the construction of bones, offering essential support. Cells belonging to the immune system actively combat invading bacteria. Blood cells, alongside the bloodstream, transport nutrients and oxygen throughout the body, simultaneously eliminating carbon dioxide.)* Each of these distinct cell types assumes a crucial part in facilitating the growth, development and regular upkeep of the body.

- Class shall be divided in 4 groups, 2 groups working on 'Activity 1: Cell Observation with Magnifying Glasses', while the other 2 groups will be working on 'Activity 2: Cell Observation with Microscopes'. Same slides shall be prepared for both activities, namely onion epidermal cells and ready-made slides of plant and animal cells. When ready, groups can swap activity.

- **Task 2 - Activity 1: Cell Observation with Magnifying Glasses / Writing and Speaking (15 minutes)**

- Distribute magnifying glasses and prepared slides of plant and animal cells to each student or group.

- Instruct students to use magnifying glasses to observe the cells on their slides.

- Circulate around the classroom to provide assistance and ask guiding questions to promote critical thinking and observation skills.

  What shapes and sizes do you see in the cells?

  Can you describe how they look and how they are arranged?

  How are the structures in different cells similar or different from each other?

  Why are some structures easier to see in some cells than in others?

- Students are encouraged to fill up the record sheet.

- **Task 3 - Activity 2: Cell Observation with Microscopes / Writing and Speaking (15 minutes)**

- Distribute microscopes and prepared slides of plant and animal cells for each group.

- Instruct students to carefully place a slide on the microscope stage and adjust the focus to observe the cells.

- Encourage students to compare their observations from the magnifying glass activity with what they see under the microscope, noting any additional details or structures that become visible.

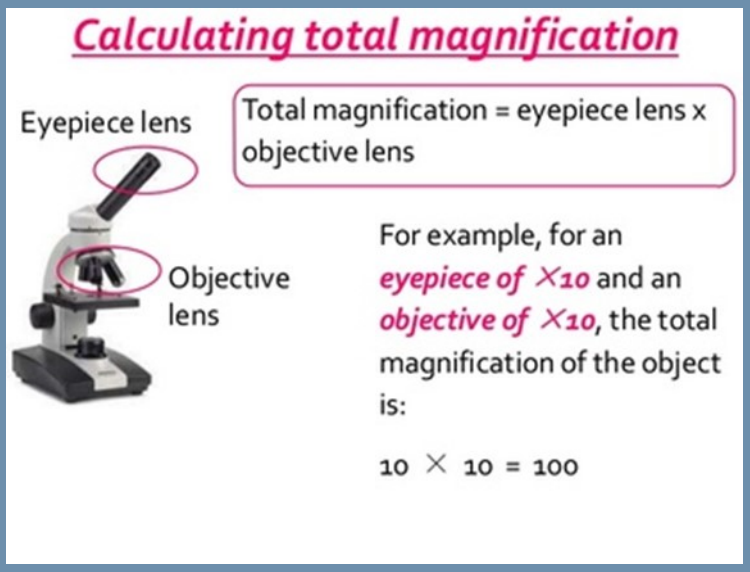
- Circulate around the classroom to provide assistance and ask the same guiding questions (see Task 2) to promote critical thinking and observation skills.

Task 4 - Magnification Calculation (5 minutes)

- Explain to students that scientists often use magnification to study cells and other small objects.

- Provide a simple example of magnification calculation using a magnifying glass (e.g., if the magnifying glass has a magnification power of 5x and an object is 2 cm in size, the magnified size would be 10 cm).

- Similarly, the magnification process for microscopes. If for example the eyepiece magnification is 10x and the objective lens in use has a magnification of 4x, the total magnification is: 10×4=40.



- Instruct students to work out the magnification power of the observed cells in the same record sheet.

Task 5 – Reading (10 minutes)

- Gather the students back together and ask them to read their observations and findings about the cell structures and share them with the other groups. Focus on the similarities that students from different groups have mentioned.

- Emphasize that cells are the building blocks of life and understanding their structure helps us understand how our bodies function.

Task 6 – Sentence structure and parts of speech – reading (10 minutes)

- Highlight the fact that during the reading process, some individuals may have unintentionally neglected the appropriate sentence structure, leading to potential misunderstanding during conversations.

- Explain to students that proper sentence structure and understanding the different parts of speech are important for effective communication in both science and language.

- Provide students with a list of sentences related to cells and body systems, with grammar errors intentionally included. For example:

  a. “The cell, it have many parts called organelles.”

  b. “The nucleus is controls the cell activities.”

  c. “I can observed the cells under the microscope.”

  d. “Plants and animals are make of the building blocks we call cells.”

- Instruct students to identify and correct the grammar errors in each sentence, paying attention to sentence structure, subject-verb agreement and appropriate use of articles and prepositions.

- Conclusion – listening (5 minutes)

- Instruct students that there are some features that different cells have in common and that these are going to be mentioned in the next video. Encourage students to take note of them.

- Play the video: Intro To Cells: Animals & Plants | Cells | Biology | FuseSchool - YouTube

- Ask students if they have taken note of the 3 main features of the cells.

- Mention that all cells, have 3 common structures: cell membrane, cytoplasm and nucleus (state that there a few exceptions e.g. red blood cells have no nucleus).

- Highlight that students have already observed these cells during the activity.

- Assessment for learning HW: Reading Comprehension – Cell Observation. Students are requested to read the passage and answer the questions that follow the text.

- Worksheet on correct sentence structure.

Assessment

- Observe students as they use magnifying glasses and microscopes to observe cells, noting their ability to identify and describe cell structures accurately. Assess their engagement, attention to detail, and ability to make connections between observations and concepts discussed.

Fun Times

- Why not solve a puzzle to get to know the common cells that have animal and plant cells. https://puzzel.org/en/jigsaw/play?p=-NVkaEKN5JYb0IQ0IdK2

Name: _____

Class:_____

Reading Comprehension

Cell observation

A cell is the smallest unit of life. It's like a tiny building block that makes up all living things, including plants, animals, and even humans. Just like how a brick is a basic unit that can be used to build a house, cells are the basic units that make up living organisms.

When we want to look at really small things like cells, magnifying glasses are not powerful enough. Instead, we use special tools called microscopes. Microscopes can make small objects, like cells, appear much bigger so we can see them more clearly.

Microscopes have lenses that magnify the image of the cells, making them look larger than they actually are. This helps scientists study cells and learn more about their structure and how they work. By using different lenses and settings on the microscope, we can zoom in and see cells in greater detail.

Exercise 1: Choose the correct answer.

1. What is the basic unit of life?
   a) Tissue
   b) Organ
   c) Cell
   d) Organism

2. What tool is commonly used to magnify cells for observation?

   a) Telescope

   b) Microscope

   c) Binoculars

   d) Magnifying glass

3. Under a microscope, cells look much ….

   a) smaller.

   b) bigger.

   c) nicer.

   d) more colourful.

4. Seeing a magnified cell,

   a) Allows for better understanding of the cell's structure and function.

   b) Requires the use of a microscope.

   c) Enhances the ability to study cellular processes.

   d) All of the above.

Exercise 2: True or False

1. A cell is the smallest unit of life. (True) or False
2. Magnifying glasses are used to magnify a cell. True or False
3. Magnifying glasses provide greater magnification compared to microscopes. True or False
4. Zooming in reveals cells better. True or False
5. Microscopes can enlarge cells for clear visibility. True or False
6. Cells compose all living beings and objects. True or False

Exercise 3:

Correct grammar errors by re-writing the correct sentence structure.

1. Magnification is a tool that **making** small cells easier to **seeing**.

   Magnification is a tool that **makes** small cells easier to **see**.

2. Cells **is** tiny units of life, and magnification **helping** us study them better.

   _____

   _____

3. Magnification makes cells **looking** bigger, so we can **seeing** them more clearly.

   _____

   _____

4. Magnification helps scientists **understanding** how cells **working**.

   _____

   _____

5. By **magnify** cells, we **learning** more about their shapes and jobs.

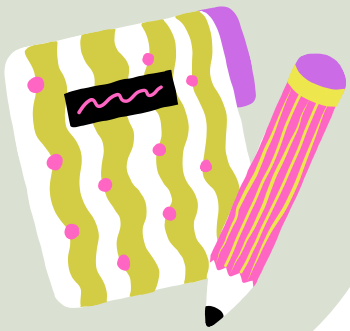
   _____

   _____

6. Through magnification, we **seeing** the amazing variety in cells.

   _____

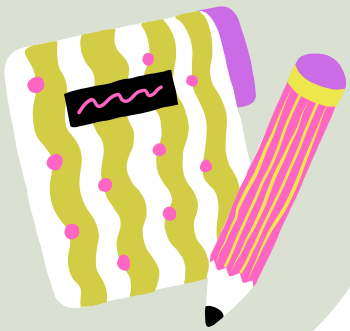
   _____



Record sheet: Group ___

Magnifying glass:

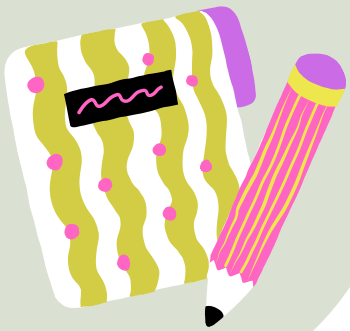
Observations ↓	Cell 1: _____ _____	Cell 2: _____ _____
Shapes		
Sizes		
Patterns (if any)		
Colours		
Additional details		



Record sheet: Group ___

TOTAL MAGNIFICATION - Magnifying Glass

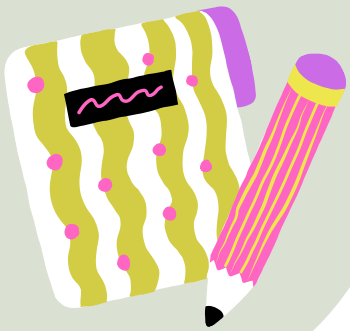
Observations ↓	**Cell 1:** _____ _____	**Cell 2:** _____ _____
Actual Size		
Magnification Power		
Magnification Calculation (show working)		
TOTAL MAGNIFICATION		



Record sheet: Group ___

Microscope

Observations ↓	Cell 1: _____ _____	Cell 2: _____ _____
Shapes		
Sizes		
Patterns (if any)		
Colours		
Additional details		



Record sheet: Group ___

TOTAL MAGNIFICATION - Microscope

Observations ↓	**Cell 1:** _____ _____	**Cell 2:** _____ _____
Eyepiece lens		
Objective lens		
Magnification Calculation (show working)		
TOTAL MAGNIFICATION		

Learning Scenario 7: **Keeping Healthy**

TOPIC	GROUP	TIME
Healthy Living	Year 8	40 minutes

Materials and Resources

interactive whiteboard, game 1: Healthy or Unhealthy? https://learningapps.org/19355393, handout on balanced diet (3 pages), nutrients poster, video: How to Create a Healthy Plate - YouTube, food diary worksheet (2 pages), game 2: Healthy of Unhealthy? https://learningapps.org/21273455

Learning Outcomes

1. I can describe what a balanced diet is.
2. I can apply my understanding of a balanced diet to suggest improvements to what I eat.
3. I can identify reasons why the diet changes with age, occupation and activity.

Teacher's Objective and Learning Intention

Science

- To enable learners to describe what a balanced diet is, apply their understanding of a balanced diet to suggest improvements to what they eat.
- Identify reasons why the diet changes with age, occupation, and activity.
- Describe the effect of smoking on health.

English

- Grammar structures for giving suggestions, expressing preferences, and making comparisons.

Success Criteria

ALL students must be able to:

- Define a balanced diet and its related food groups.

MOST students should be able to:

- Suggest improvements to what they eat.

SOME students could be able to:

- Identify how the nutritional needs differ with age, occupation and activity level.

Tasks and Questions

- Introduction (5 minutes)

- Ask learners what they had for breakfast and if they think it was a balanced meal.

- Break the ice at the beginning of the lesson by playing a game to choose if the food is healthy or unhealthy. https://learningapps.org/19355393. Students can play as a class using the IWB.

- Task 1 – Listening and Speaking (5 minutes)

- Explain what a balanced diet is, referring to the handout as a guide. Continue the lesson by showing the video How to Create a Healthy Plate - YouTube to students. Instruct students to pay attention to how many types of vegetables there are. Question should be written on the board. (Answer 2 types: starchy vegetables and non-starchy vegetables). From this video, students will get familiar with how to use the food plate to plan a balanced meal.

- After the video go back to the question and ask students if they know the answer and encourage them to give you examples.

- Task 2 – Speaking and Reading (10 minutes)

- Introduce the group names by writing them on the board in 5 separate columns: Vegetables and fruit, Proteins, Carbohydrates, Dairy Products and Fats. Discuss the importance of each food group in maintaining a healthy lifestyle. Ask students to give food examples from each food group. Students can come up front and write one food under the corresponding group.

- Explain to students that to maintain a healthy lifestyle is crucial for our overall well-being, and that a balanced diet plays a vital role in achieving this. Students can follow the following explanation by reading from the handout on balanced diet and they are encouraged to take extra notes. After reading the first page, students are encouraged to work a short exercise to improve their understanding of food-related texts by learning new food-related vocabulary. Then they are encouraged to keep on reading the second page and work out the second exercise.

  Fruit and Vegetables: These are rich in essential vitamins, minerals, and dietary fibre. They help boost our immune system, prevent chronic diseases, and maintain a healthy weight.

  Carbohydrates: Whole grains like brown rice, whole wheat bread, and oats are excel lent sources of fibre, B vitamins, and minerals. They provide energy, aid digestion, and help regulate blood sugar levels.

  Protein: Foods such as lean meats, poultry, fish, eggs, legumes (beans, lentils), and nuts are high in protein. Protein is essential for building and repairing tissues, sup porting muscle growth, and maintaining a healthy immune system.

  Dairy products: Milk, yoghurt, and cheese are rich in calcium, vitamin D, and protein. They promote bone health.

Fats and Oils: While fats are often associated with negative health effects, they are still essential for our body. Choose healthy fats like those found in avocados, nuts, seeds, and olive oil. These provide energy, aid nutrient absorption, and support brain function.

Sugars and Sweets: Foods high in added sugars should be consumed not so often. They offer empty calories and can contribute to weight gain, tooth decay, and chronic diseases like diabetes.

- Students should be reminded that to maintain a healthy lifestyle involves balancing these food groups in the right proportions.

- **Task 3 – Practice / Writing (10 minutes)**

- Hand out a food diary worksheet to each learner and ask them to fill it out with what they ate yesterday, including the quantity and type of food. Ask the learners to compare their food diaries with their classmates and discuss in pairs whether their diets were balanced or not. Then, ask the learners to suggest improvements to their classmates' diets based on what they learned about a balanced diet. Encourage them to use the language structures for giving suggestions and expressing preferences.

If I were in your place...

- I think you need to .....
- I really think you must .....
- I think you should .....
- How about?
- My suggestion is .....
- My advice is to .....
- You could (try) .....
- You probably need to .....
- You really should .....

- Finally, they should write 1 suggestion or recommendation they gave to their classmate.

- **Task 4 – Speaking (5 minutes)**

- The teacher should divide the class into 4 groups (3 to 4 students in each group) and encourage them to work together to discuss how diet changes with age, occupation and activity level. Each group will be assigned a different person:

Group 1: A growing child

Group 2: An office worker

Group 3: An athlete

Group 4: An old person

- Ask the students if the person in the picture would need anything more or less than the usual food plate section sizes and what food plan would they suggest to that individual. Students will identify how the nutritional needs differ. Each group needs to present the points that came out during their group discussion in class.

- **Conclusion (5 minutes)**

- Recap the main points of the lesson and encourage learners to reflect on how they can improve their eating habits.

- Assessment for learning HW. Task 1: Students need to work out the following handouts at home to reinforce their learning and understanding.

  Worksheet on Matching food with food groups

  Worksheet: Completing sentences by choosing the correct answer

  Worksheet on Healthy Meal

Assessment

- Observe learners as they work in pairs and provide feedback on their use of the language structures. Evaluate their ability to apply their understanding of a balanced diet.

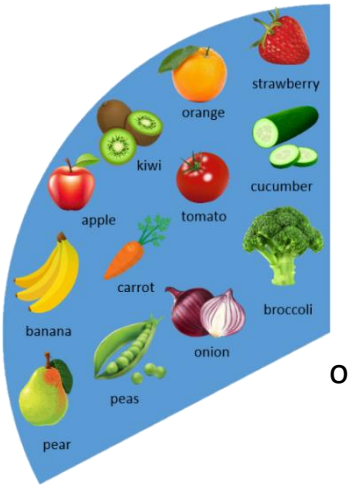
Fun Times

- A game where they look at the picture, listen to the sound and write healthy / unhealthy. https://learningapps.org/21273455

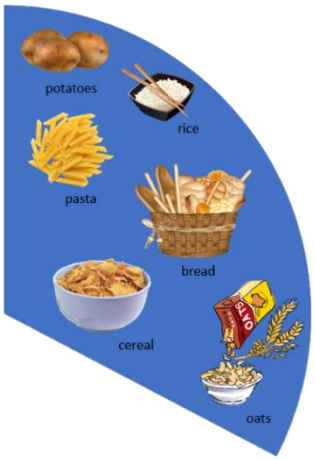
- This game can be as a conclusion to the lesson or given as homework to reinforce the understanding of healthy/unhealthy food. It can also be used as an introduction to the next lesson.

BALANCED DIET

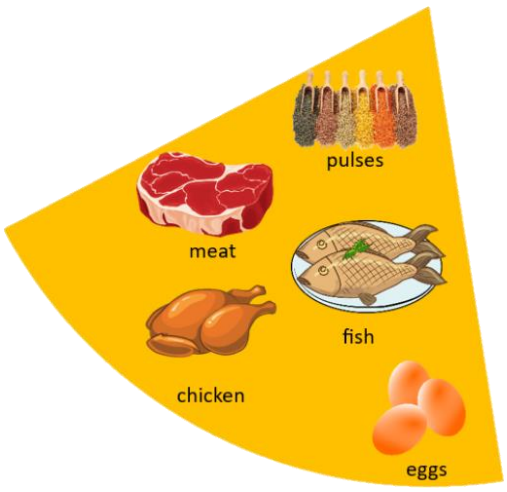
The food plate is a visual representation of a balanced meal that helps individuals plan their meals and make healthier food choices. It divides a standard dinner plate into four sections: fruits and vegetables, carbohydrates, and protein, with a side portion for dairy or a dairy alternative. Here's how you can use the food plate to plan a balanced meal:



1. Start with fruits and vegetables: The food plate should include two servings of fruits plus three servings of vegetables per day, for a total of five servings daily. Choose a variety of colourful fruits and vegetables. Include fresh, frozen, or canned options.



2. Add carbohydrates: Fill about a third of your plate with grains. Choose whole grains such as brown rice, whole wheat bread, quinoa, or oats, as they are rich in fibre, vitamins, and minerals.

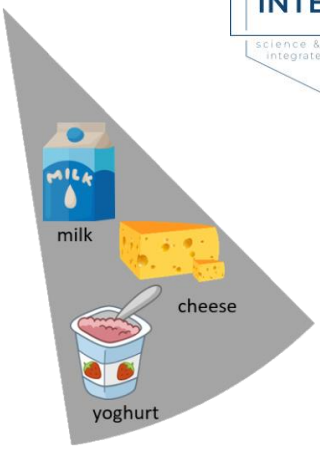


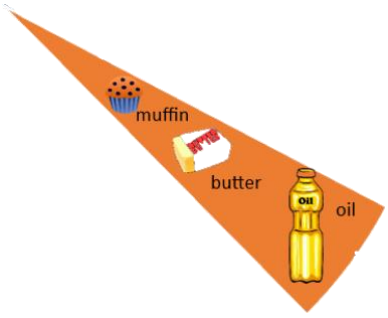
3. Include protein: These foods are sources of protein, vitamins and minerals, so it is important to eat some foods from this group. Options include lean meats (chicken, turkey, fish), legumes (beans, lentils), tofu, eggs, or low-fat dairy products.

Choose the correct answer:

- How many servings of fruit and vegetables should we eat every day?
    - 2
    - 3
    - 5
- Which of the following is a type of vegetable?
    - Cucumber
    - Strawberry
    - Apple
- Which group gives us fibre?
    - Fruit and vegetables
    - Carbohydrates
    - Protein
- _____ is rich in protein:
    - Kiwi
    - Rice
    - Fish

4. Include a side portion for dairy: Include a serving of low-fat milk, yoghurt, cheese, or a dairy alternative like almond milk or soy milk. Dairy provides calcium, vitamin D, and other essential nutrients.





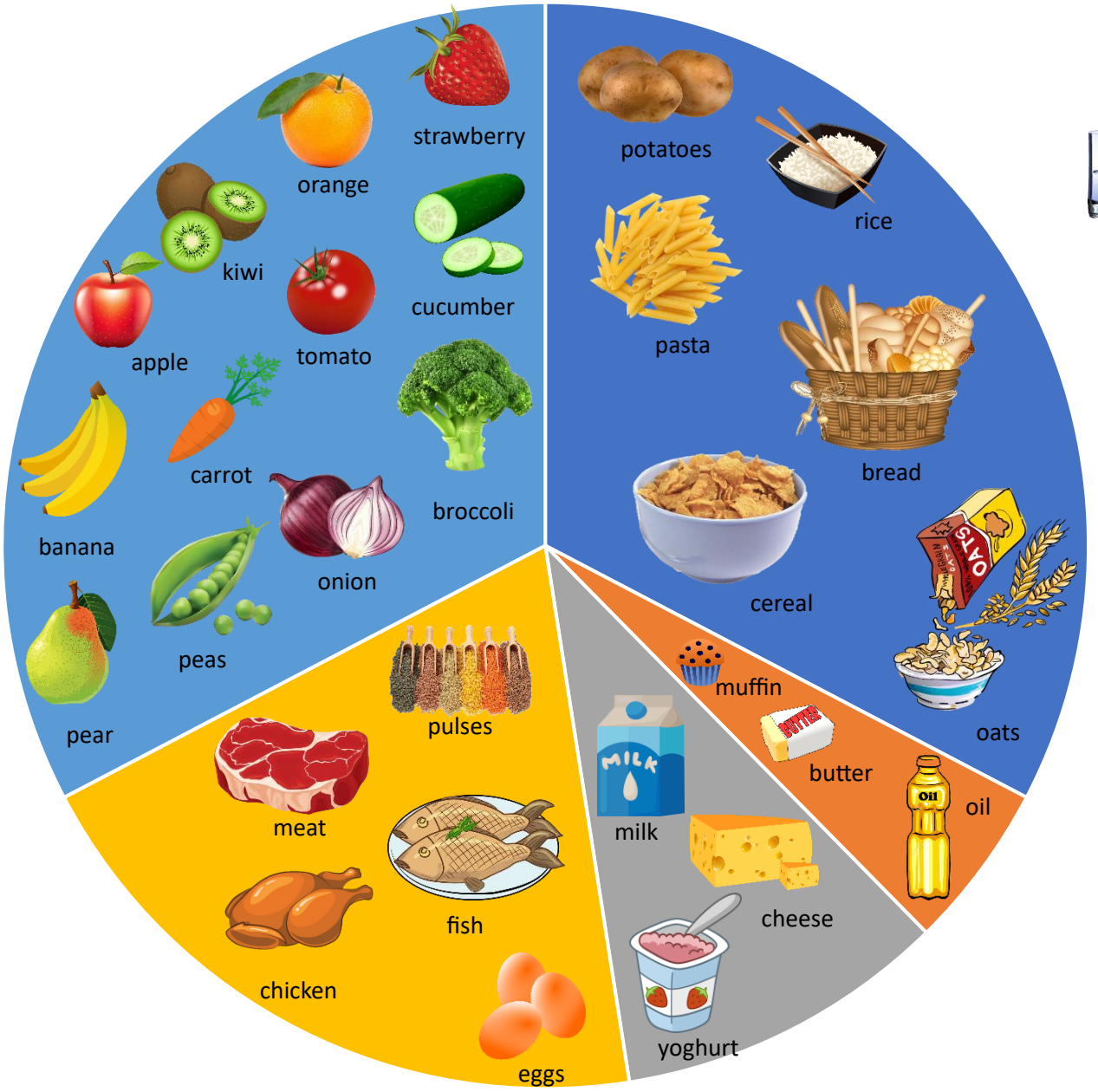
5. Balance with healthy fats and beverages: Although not specifically represented on the food plate, incorporate healthy fats in your meal. This can include avocados, nuts, seeds, and healthy oils like olive oil. Unsaturated fats are healthier fats that are usually from plant sources and in liquid form as oil, for example vegetable oil, rapeseed oil and olive oil. Swapping to unsaturated fats will help to reduce cholesterol in the blood, therefore it is important to get most of our fat from unsaturated oils.

Additionally, hydrate yourself with water or unsweetened beverages instead of sugary drinks.

Choose the correct answer:

- Which of the following item contains healthy fat?
    - Nuts
    - Cake
    - Butter
- How many portions of dairy should be included in the healthy plate?
    - 1
    - 2
    - 3
- Milk is a good source of …
    - Protein
    - Carbohydrates
    - Calcium
- We should drink a lot of sugary drinks.
    - True
    - False

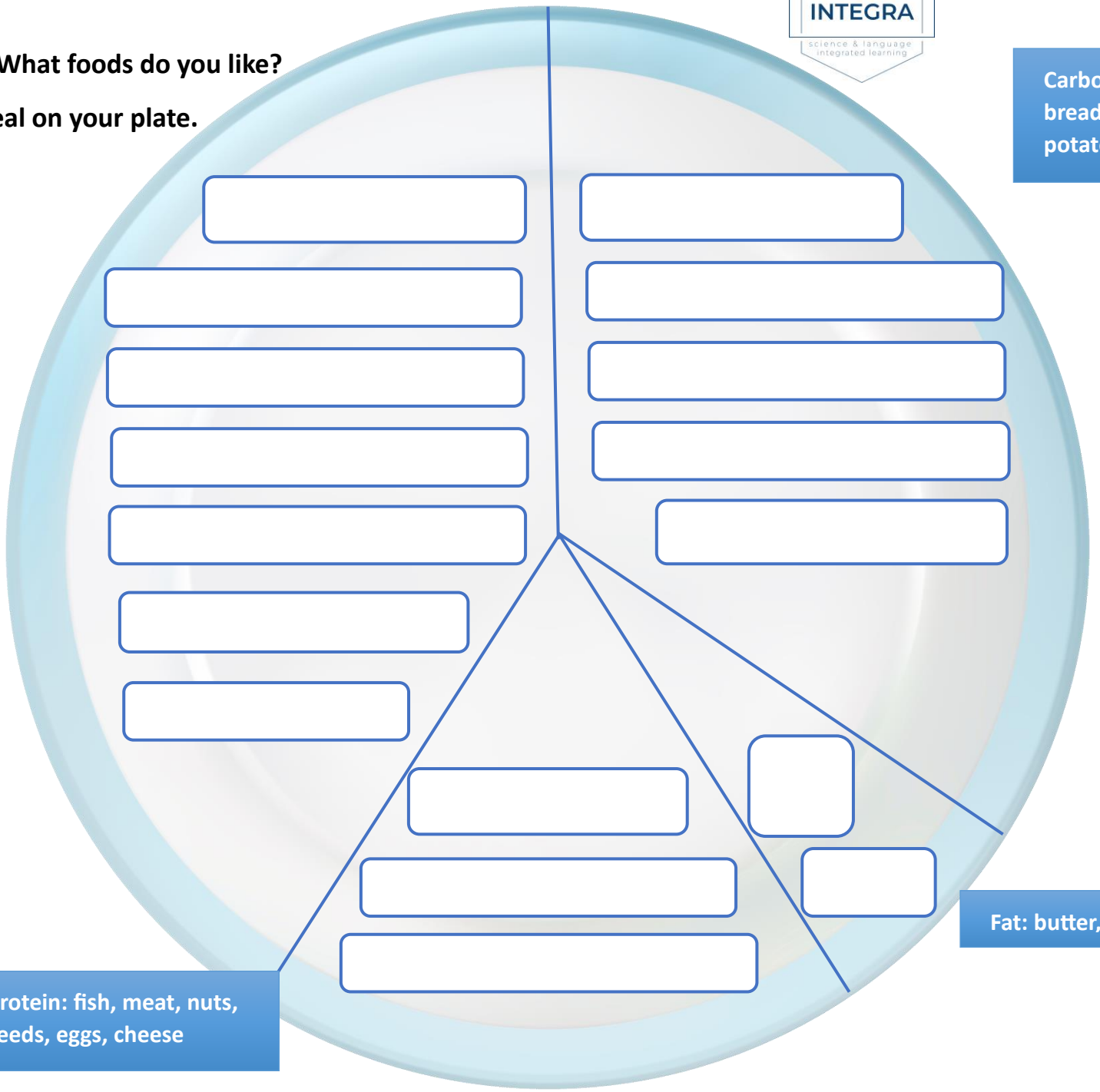
Food Plate


strawberry
orange
kiwi
cucumber
apple
tomato
carrot
broccoli
banana
onion
peas
pear
pulses
meat
fish
chicken
eggs
potatoes
rice
pasta
bread
cereal
oats
muffin
butter
oil
milk
cheese
yoghurt
Carbohydrates
Fats
Dairy products
Protein
Vegetables and fruits


Drink
More Water

Look at this plate. What foods do you like?

Write a healthy meal on your plate.



Carbohydrates: bread, cereal, potato, pasta

Fibre: Fruit and vegetables

Fat: butter, oil, fried food

Protein: fish, meat, nuts, seeds, eggs, cheese

Match the food with the corresponding group food.

Proteins

pasta

bread

rice

Carbohydrates

chicken

fish

eggs

Fruit and vegetables

butter

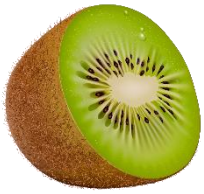
oil

Fats

tomato

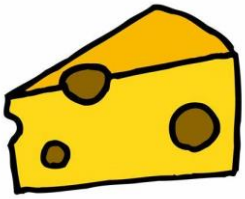
orange

kiwi



Dairy products

cheese

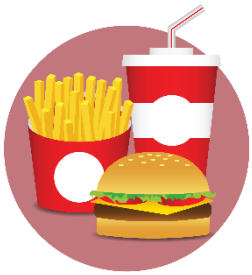


milk

yoghurt

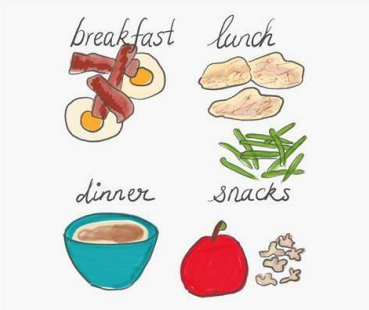
Complete the sentences by choosing the correct answer. Pictures will help you in understanding the sentence better.

1. Each person should eat a (balanced diet, sugar, bread) including a portion of each of the 5 food groups.



2. Avoid eating an excess of (apples, fat). Your body stores the fat it does not use. This is (good, bad) for your health.

3. Eat (two, three, five) times a day: breakfast, lunch, dinner and a piece of (chocolate, cake, bread) or a yoghurt between meals.



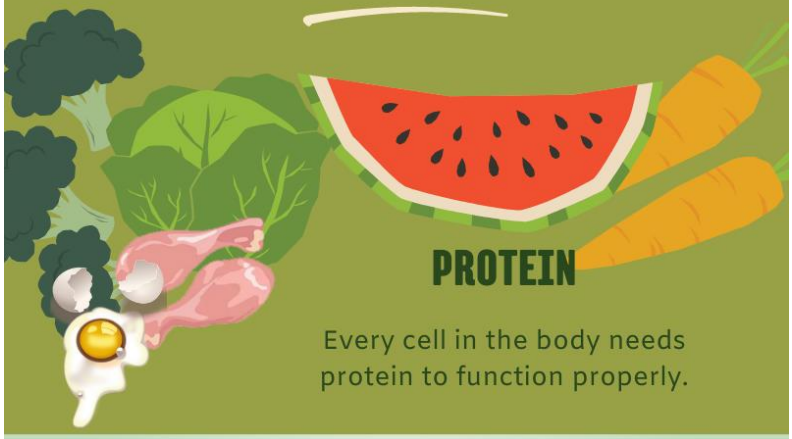
4. Eat the correct quantity of (hot dogs, food, ice cream) for your body. A lack of nutrients means we can get (taller, shorter, ill).

5. Always eat (unhealthy, a lot, breakfast). It is the most important meal of the day. It gives us the (rest, energy, thirst) we need until lunch.

6. (Proteins, Fats, Carbohydrates) help our muscles to keep stronger and give our (hair, nails, body) the nutrients we need for growth and repair.

7. (Proteins, Fats, Carbohydrates) give our body energy.

HEALTHY NUTRIENTS



PROTEIN

Every cell in the body needs protein to function properly.

CARBOHYDRATES

Your body's main source of energy provide energy for all the cells.

FATS

A person needs certain fats to help maintain optimal health.

VITAMINS

Vitamins play a crucial role in preventing illness and maintaining overall well-being.

MINERALS

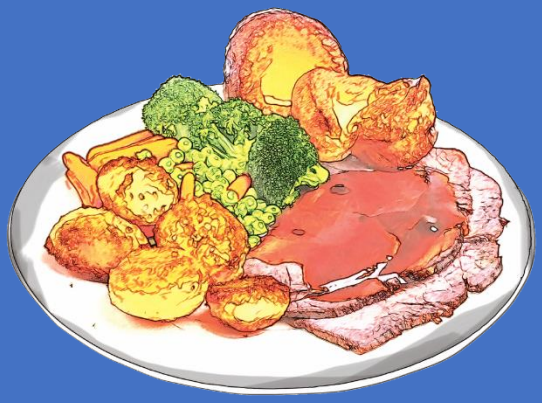
Minerals are essential for many body functions.

WATER

Water is absolutely crucial for every system in your body.

Food diary worksheet.

What did you eat for dinner yesterday?

Dinner	List the items of food you ate.
	

Now list the food you mentioned in the correct food group.

Fruit and Vegetables	Protein	Carbohydrates	Dairy Product	Fat

Exercises – Now have a look at your friend's food diary and discuss his/her meal. Give him/her advice and recommendations by using ANY of the below expressions.

- If I were in your place ……
- I think you need to ……..
- I really think you must …….
- I think you should ……..
- How about?
- My suggestion is ……
- My advice is to ……
- You could (try) …….
- You probably need to ……
- You really should …….

Write ONE suggestion or recommendation that you gave to your friend.

_____

_____

_____

_____

_____

Learning Scenario 8: **Air Components**

TOPIC	GROUP	TIME
Elements, Compounds and Mixtures	Year 8	80 minutes

Materials and Resources

chart and markers, YouTube video: The difference between elements, compounds and mixtures - simple explanation!, 2 sets of molecule model, notes on substances, candle, lighter, graduated cylinder, bowl of water, poster of 'Air Composition', 'Air Composition' exercise, poster of 'Properties of Oxygen', safety goggles, test-tubes, hydrogen peroxide (H_2O_2), manganese dioxide (MnO_2), wooden splints, bunsen burner, fire resistant mats, air quality monitor, worksheet: 'Compound, Elements of Mixtures?', learningapps game 'Composition of Air' - https://learningapps.org/20315500

Learning Outcomes

1. I can identify some common mixtures including air.
2. I can identify nitrogen, oxygen and carbon dioxide as the main components of air and give their approximate percentages.
3. I can describe some properties of oxygen and carry out a chemical test to identify it.

Teacher's Objective and Learning Intention

Science

- Students will be able to identify the differences between elements, compounds, and mixtures.
- Students will understand the properties of some common elements and carry out a chemical test to identify oxygen.

English

- By the end of this lesson, students will be able to effectively utilize scientific vocabulary to describe the properties of elements and demonstrate their knowledge by conducting a chemical test to identify oxygen. *(Vocabulary: element, compound, mixture, nitrogen, oxygen, carbon dioxide)*
- Students will be able to understand the difference between "more than" and "less than".

Success Criteria

ALL students must be able to:

- identify the difference between elements, compounds and mixtures.
- list the components of air composition.

MOST students should be able to:

- know the percentages of components of air composition.

SOME students could be able to:

- know how to identify oxygen.

Tasks and Questions

- Introduction (5 minutes)

- Begin by asking students what they know about elements, compounds, and mixtures. Write their responses on the chart paper. Use chart paper so it will be available for future lessons. Some students might never have heard the words due to language barrier. If there are lack of responses, carry on to the next task.

- Task 1: Listening and Speaking (20 minutes)

- Introduce the following video to the students and instruct students to take notes on elements, compounds and mixtures while watching: The difference between elements, compounds and mixtures - simple explanation!

- Brainstorming - after the video, ask again the students:

  What are elements?

  What are compounds?

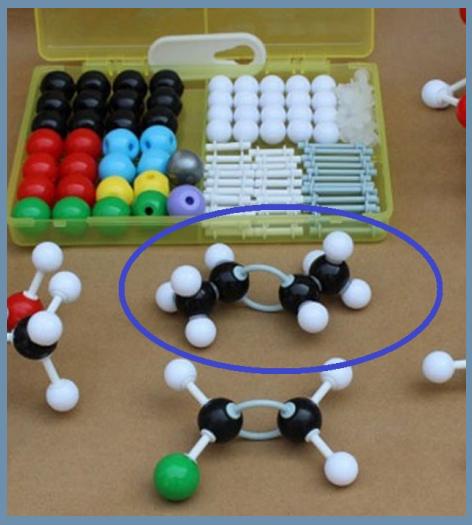
  What are mixtures?

  Can you mention some examples?

- Answers should be listed on the chart paper. Explain the definitions of elements, compounds, and mixtures, using examples from everyday life. Emphasize the differences between the three, particularly in terms of chemical composition and physical properties. To help them understand better, distribute the notes on substances:

1. First page is revision of states of matter.
2. Second page shows a diagram showing the chemical composition of element, compound and mixture.
3. Next page shows definitions of substances.
4. The following pages include some real examples to enhance vocabulary words.

- Divide the class into 2 groups and hand a molecule model to each group. Ask students to create a compound. Allow them to do research.



Task 2 – Calculating the % of oxygen – Understanding and Writing (20 minutes)

- Perform a simple experiment to calculate the percentage of oxygen in air.

- Materials needed: candle, matches/lighter, measuring cylinder, bowl of water.

- Procedure:

    Fill the bowl with water.

    Place the candle in the water and light it up.

    Once the candle flame is steady, invert the graduated cylinder and carefully place it over the candle, submerging the open end of the cylinder in the bowl of water, en suring that the cylinder remains airtight and the water doesn't enter inside.

- Observation and Explanation:

    Ask the class to propose an explanation to the phenomenon observed.

    (Observation: As you cover the candle with the inverted graduated cylinder and submerge the open end of the cylinder into the water, you will observe that the wa ter starts to rise inside the cylinder and stops when the flame is out. You can meas ure the rise in the water by reading the level from the graduated cylinder.

    Explanation: The water rises due to a decrease in air pressure inside the cylinder caused by the combustion process. This experiment shows that there is presence of oxygen in the air.)

- Encourage students to work out the percentage of oxygen in the air from the reading of the rising level of water.

- Take some results from the class and discuss that air is an example of a mixture and explain that it is made up of approximately 78% nitrogen, 21% oxygen, and 1% other gases (including carbon dioxide).

- Properties:

    Nitrogen is a colourless, odourless, and non-reactive gas. Nitrogen makes up ap proximately 78% of the Earth's atmosphere.

    Oxygen is a colourless, odourless, and highly reactive gas that supports combustion and is essential for many living organisms. Oxygen constitutes approximately 21% of the Earth's atmosphere.

    Carbon Dioxide is a colourless gas that is slightly heavier than air. It is produced through respiration, combustion, and various natural processes. Carbon dioxide makes up a very small portion of the Earth's atmosphere, approximately 0.03%.

- With the students, go through the posters ‘Air Composition’ and the ‘Properties of Oxygen’. Use the posters to recap and introduce and new points.

- Students are to carry out the exercise – ‘Air Composition exercise_more than less than’.

Task 3: Group Activity / Reading (15 minutes)

- Divide students into groups of 3-4 and have them use an air quality monitor to measure the percentage of oxygen in the air. Pay attention to the readings displayed on the monitor. They can be presented as numerical values or using colour-coded indicators (e.g., green for good, yellow for moderate, red for poor air quality). Different monitors may have different scales or thresholds for each parameter, so refer to the instruction manual to understand what the readings mean in terms of air quality.

- Ask students to read the instructions and together you can interpret the results.

- **Task 4: Chemical Test (15 minutes)**

- Demonstrate a chemical test to identify oxygen. Wear the safety goggles. *Place a small amount of manganese dioxide (MnO_2) in a test tube, add a few drops of hydrogen peroxide (H_2O_2). Light the splint and blow out the splint leaving a glowing end. Then hold the wooden splint over the opening of the tube. MnO_2 helps H_2O_2 remove extra oxygen, ending up with H_2O (water) and oxygen (O_2). The bubbles you see are a result of this reaction. This oxygen released will relight the splint.*

- **Conclusion (5 minutes)**

- Review the definitions of elements, compounds, and mixtures, as well as the properties and percentages of nitrogen, oxygen, and carbon dioxide in air. Ask students to explain how the chemical test demonstrated the presence of oxygen.

- Assessment for learning HW: Have students research and present on other common mixtures found in everyday life, such as soil or milk.

- Hand out the worksheet 'Compounds, Elements or Mixtures?'

Assessment

Observation and participation in group activity and chemical test, as well as accuracy and clarity in responses during conclusion discussion.

Fun Times

If there is enough time, students can play the game 'Composition of Air'. This game can also be given as HW to reinforce the understanding of Air Composition.

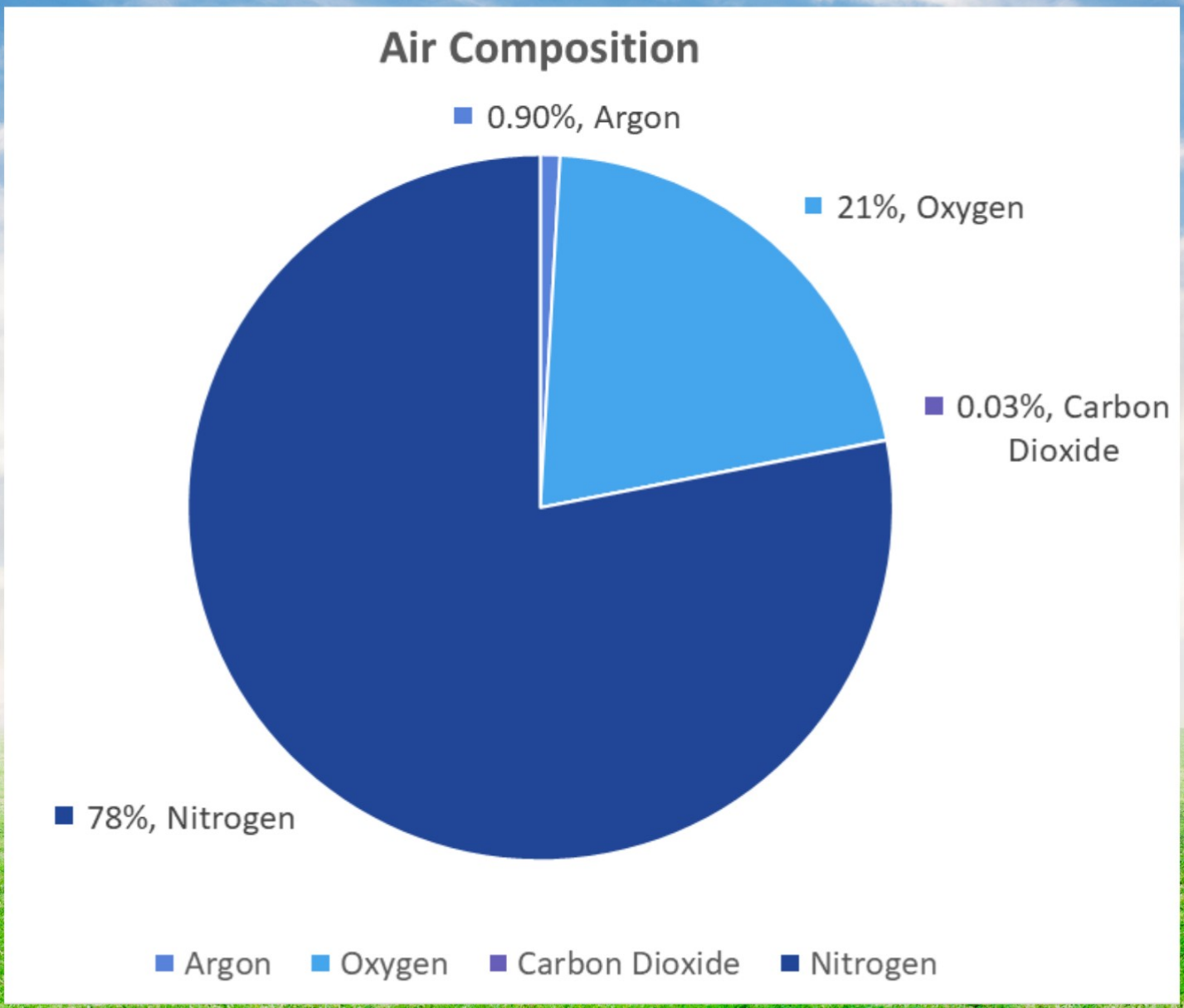
https://learningapps.org/20315500

Air Composition

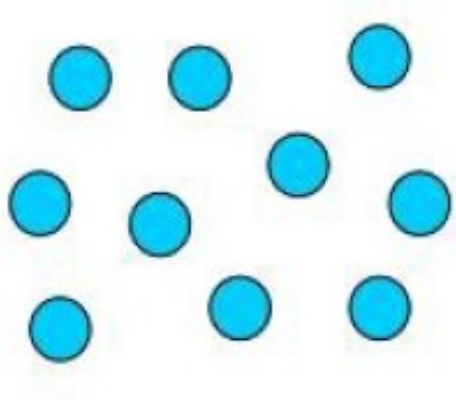
Write 'True' or 'False'

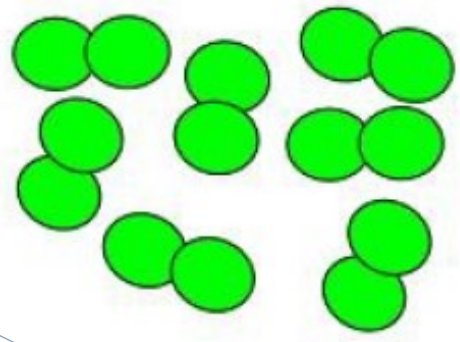
1. Air is a type of mixture. True
2. The percentage of oxygen in air is less than 20%. _____
3. Air has less than 70% of nitrogen. _____
4. The percentage of carbon dioxide in the air is less than 5%. _____
5. Air has more oxygen than nitrogen. _____
6. The percentage of nitrogen in the air is less than carbon dioxide. _____
7. The percentage argon is less than the percentage of carbon dioxide. _____
8. Air has less oxygen than argon. _____
9. The sum of argon and oxygen in the air is less than the nitrogen. _____
10. The percentage of argon is more than the percentage of nitrogen. _____

Air Composition

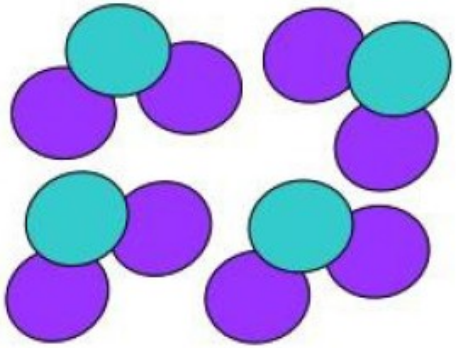


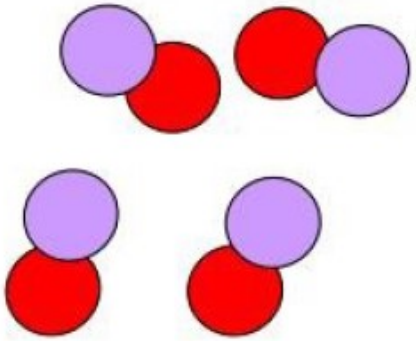
Element



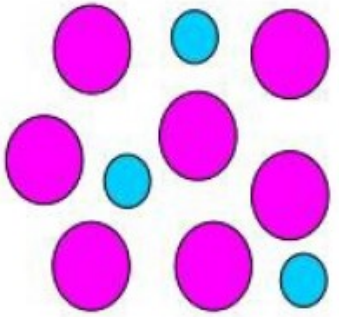


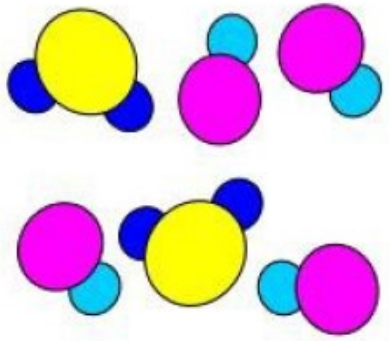
Compund





Mixture





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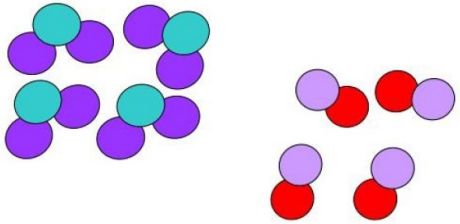
VOCABULARY

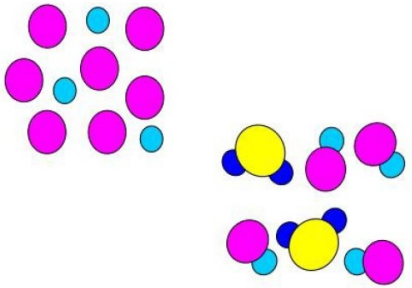
ELEMENT:

Has only 1 type of atom.

COMPOUND: ***a combination of 2 or more elements chemically combined.***



MIXTURE: ***a combination of 2 or more substances that are not chemically combined and have variable composition.***



Examples.

Elements

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Examples.

Compounds

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Examples.

Mixtures

Water and oil

Sand

Spaghetti with meatballs

Cereal and milk

Salad

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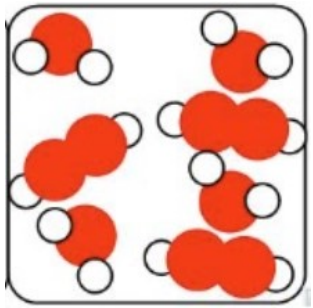
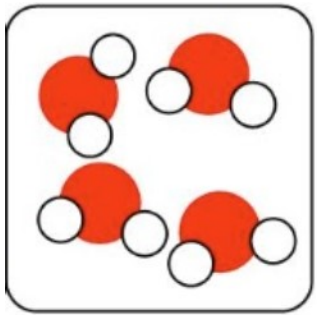
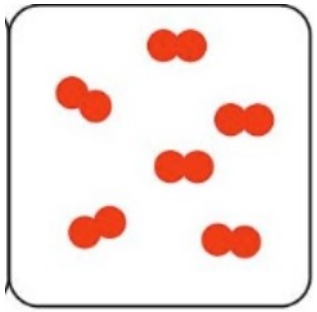
Compound, Element of Mixtures?

Link each substance with the correct diagram and description.

Substance	Diagram	Description
Compound		A substance made up of more than one type of atom, and is chemically joined together.
Mixtures		A substance made up of multiple atoms, but only one type of atom.
Element		Made of different substances, mixed together.

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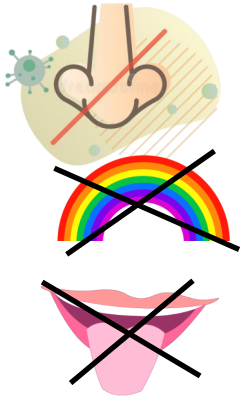
Properties of Oxygen

Where?

- ⇒ Atmosphere
- ⇒ Living Things

What?

- ⇒ Odourless
- ⇒ Colourless
- ⇒ Tasteless
- ⇒ Gas



Symbol

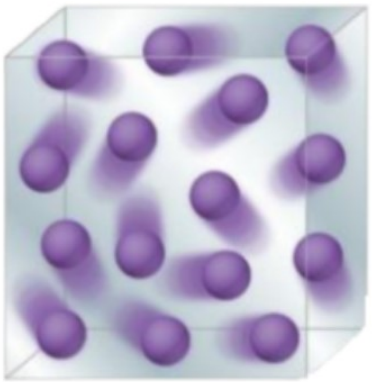
- ⇒ O

My Notes

STATES OF MATTER

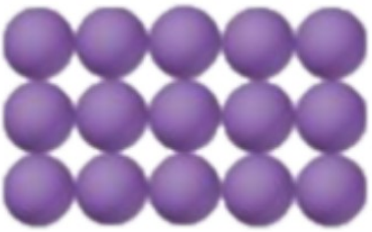
Revision

Gas



Liquid

Solid



Learning Scenario 9: Exploring Light and Sound

TOPIC	GROUP	TIME
Sound and Light	Year 8	80 minutes

Materials and Resources

Whiteboard or chart paper, markers, torch, white paper, aluminium foil, mirrors, black paper, cloth, screen for reflection, flashlight, objects of different shapes and sizes, slinky spring, various videos, various student notes, record sheet – 'What happens to the sound?', online quiz, worksheets, tuning fork, bowl with water, tissue papers.

Learning Outcomes

1. I can draw rays to show how objects can be seen.
2. I can describe how sounds are produced as a result of vibrations.
3. I can use the slinky spring to demonstrate sound waves.

Teacher's Objective and Learning Intention

Science

- Students will be able to draw rays to demonstrate how objects can be seen.
- Students will be able to describe how sounds are produced as a result of vibrations.
- Students will be able to use a slinky spring and tuning fork to demonstrate sound waves.

English

- Students will be able to use adjectives to describe surfaces.
- Learners can improve their vocabulary, express themselves better, and create vivid descriptions using descriptive words.

Success Criteria

ALL students must be able to:

- understand how we see objects by the means of rays;
- understand that sounds are made when objects vibrate.

MOST students should be able to:

- understand reflection or absorption of light;
- to perform simple experiments to demonstrate sound waves;
- use adjectives to describe surfaces.

SOME students could be able to:

- to interpret results from the experiments through their observations.

Tasks and Questions

Introduction (5 minutes)

- Begin the lesson by asking the students questions about their senses: "What are our five senses?" (sight, hearing, touch, taste, smell).

- Explain that today's lesson will focus on two senses: sight and hearing, specifically how we see objects and how sounds are produced.

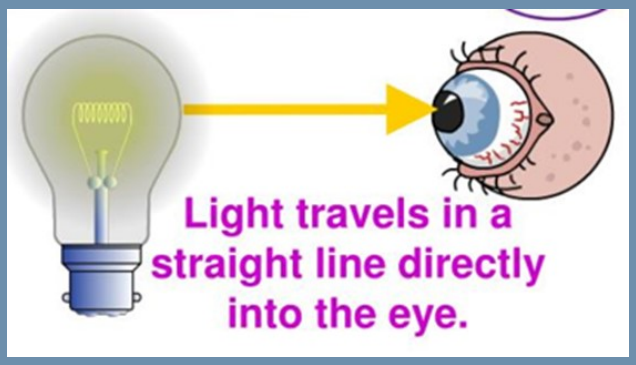
- Ask the students if they know how we see objects and hear sounds.

Task 1: Seeing Objects (10 minutes)

- Draw a large eye on the whiteboard or chart paper.

- Explain that our eyes help us see objects by capturing light.

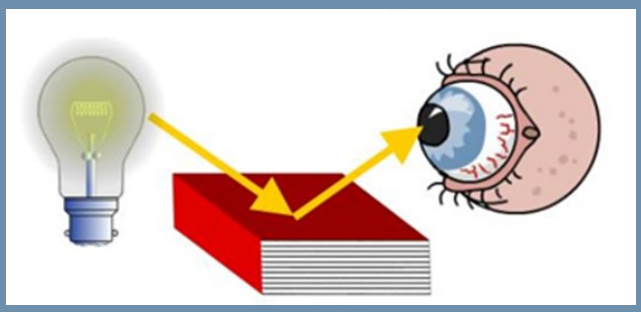
- Introduce the concept of light rays by drawing rays emanating from the objects in the classroom toward the eye.



- Explain to the students that light travels in a straight line called a ray.

- Select an object and demonstrate how to draw rays from the object to the eye, showing how the rays bounce off the object and enter our eyes.

- Invite students to come forward and draw rays to show how other objects in the classroom can be seen.



- NOTE: Teacher should encourage students to first identify the source of light and then student needs to draw the ray of light from the light source, which then bounces on the object and into the eye.

- Discuss how the shape, size, and texture of objects affect the way they reflect or absorb light.

- Teacher can discuss an example of 2 people standing in the sun. One person is wearing a black t-shirt, while the other is wearing a white t-shirt. Students will be asked how they think these persons will feel and why. (Later you can explain to students that the person wearing the black T-shirt absorbs more light energy and converts it into heat, making him/her feel warmer. Meanwhile, the person wearing the white T-shirt reflects more light energy and experiences less conversion to heat, resulting in a relatively cooler sensation.

Task 2: Speaking (15 minutes)

- At this point introduce adjectives to the students by using descriptive language for an object. Discuss the shape, the size and the texture of an object. It is encouraged to use everyday life objects.

- Explain that the shape of an object determines how light bounces off its surface:
  Smooth surfaces, like mirrors, reflect light in a predictable way.
  Rough surfaces scatter light in different directions.

- Ask students to give you examples of both type of surfaces and encourage them to use descriptive language by adding an adjective. If students do not understand the meaning of smooth and rough, teacher can show real objects such as a mirror and a piece of unpolished wood to explain the difference. Encourage students to come up with more examples. Ask 2 students to write the mentioned adjectives on a chart for future reference.

- Examples of smooth surfaces:
- *Mirrors – shiny, rectangle, oval, small, big*
- *Glass panes – smooth, transparent*
- *Polished metals (e.g., stainless steel) – shiny, polished, smooth*
- *Still water surfaces – still, calm, smooth*
- *Marble countertops – smooth, polished*

- Examples of rough surfaces:
- *Unpolished wood – brown, unpolished*
- *Textured walls – rough, uneven*
- *Concrete sidewalks – rough, rugged*
- *Rough fabrics – thick, coarse*
- *Frosted glass – rough, opaque*

- Size of an object: The quality of reflected light does not change based on the object's size, but the amount of light reflected is affected by the object's surface area. Examples:
- *Smooth and polished surfaces like mirrors reflect light uniformly.*
- *Flat and large surfaces such as calm water reflect light in a consistent manner.*
- *Rough surfaces like textured walls scatter light in various directions.*
- *Small particles suspended in the air, such as dust or smoke, can cause light to scatter.*
- *Irregular or uneven surfaces on objects like frosted glass scatter light due to their microscopic bumps and imperfections.*

- Texture of an object: Rough surfaces scatter and absorb light, while smooth surfaces reflect light more directly.

- Examples of rough surfaces that scatter and absorb light:
- *Textured paper or cardboard: The uneven surface of these materials scatters light in different directions, resulting in a diffused reflection.*
- *Fabric with a rough texture: Fabrics like burlap or canvas have irregular surfaces that scatter light, making them appear less reflective.*
- *Rough plastered walls: The roughness of the plaster surface causes light to scatter, leading to a less focused reflection.*
- *Frosted glass: The roughened surface of frosted glass scatters light, diffusing the reflection and creating a blurred or hazy appearance.*

Examples of smooth surfaces that reflect light more directly:

- *Mirrors: Mirrors have a highly polished and smooth surface that allows light to reflect in a very predictable and direct manner, creating a clear and sharp reflection.*
- *Polished metals: Metals that have been polished to a smooth finish, such as stainless steel or chrome, reflect light more directly, resulting in a mirror-like reflection.*
- *Glossy surfaces: Objects with a glossy finish, like polished ceramic or lacquered wood, have smooth surfaces that enable more direct reflection, producing a shiny and reflective appearance.*
- *Still water surfaces: When the surface of water is undisturbed, it can act as a smooth mirror, reflecting light in a more direct and clear manner.*

Task 3 – Understanding reflection of light through an experiment (15 minutes)

- To demonstrate how light is reflected, teacher will lead a class experiment using white paper, foil, mirrors, black paper, and cloth with a torch.

- Materials needed: torch or flashlight, white paper, aluminium foil, mirrors, black paper, cloth (any colour), screen for reflection

- Procedure - With the participation of different students:

Create a shaded area where you can control the lighting conditions.

Set up a flat surface, such as a table, as the base for your experiment and put the screen on top (to use for the reflective light).

Place the white paper on the surface. This will be your first surface for reflecting light.

Turn on the torch or flashlight and position it at an angle relative to the white paper. Observe how the light falls on the paper and how it is reflected. Note that white pa per reflects most of the incident light in various directions, providing diffuse reflec tion.

Replace the white paper with aluminium foil. Fix the foil on the surface securely and ensure it is smooth and flat.

Shine the light onto the aluminium foil from the same angle as before. Notice how the foil reflects the light in a more focused and mirror-like manner compared to the white paper. The foil acts as a good reflector, producing a clearer reflection.

Now, introduce the mirrors into the experiment. Place a mirror on the surface, tilted at an angle. Make sure it is securely positioned.

Direct the light towards the mirror and observe how the mirror reflects the light. Mir rors provide full reflection in one direction and where the angle of incoming light is equal to the angle of reflected light.

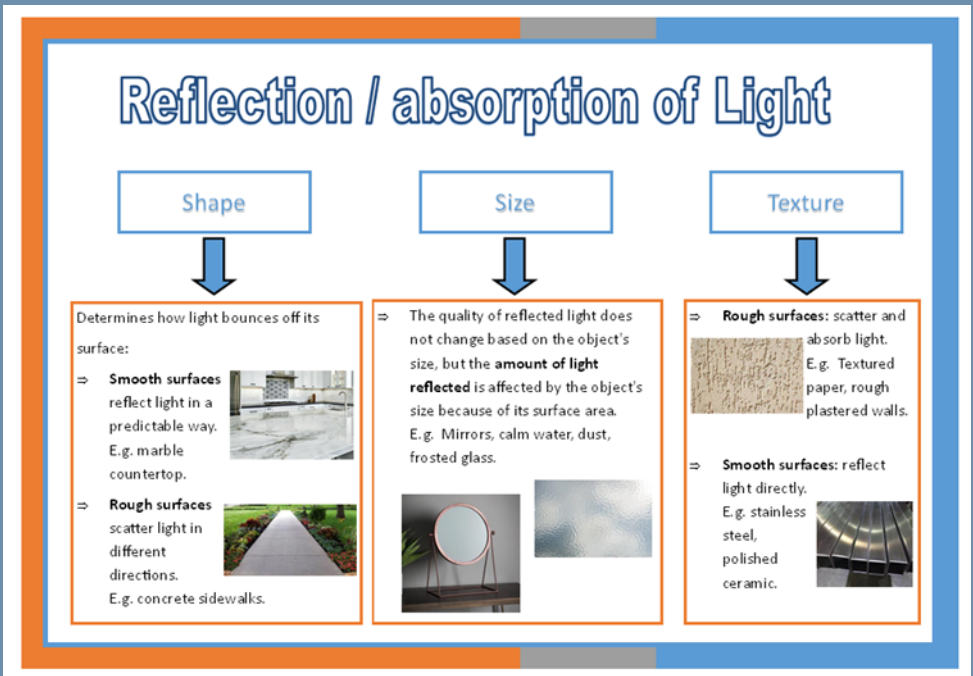
Replace the mirror with the black paper. Fix the black paper securely on the surface.

Shine the light onto the black paper and notice how it absorbs most of the incident light, resulting in minimal reflection. The black paper appears dark because it absorbs light rather than reflecting it.

Finally, take the cloth (of any colour) and drape it over the surface. The cloth will demonstrate how different colours can affect light reflection. The cloth's properties will determine the amount of light absorption and reflection.

Experiment with shining the light onto the cloth from various angles and observe how the colour influences the reflection and absorption of light.

- Students will be given the note on 'REFLECTION OR ABSORPTION OF LIGHT', as a summary of what has been just discussed.



Task 4 – Listening (10 minutes)

- Gather the students in a circle or a designated area.

- Show them a flashlight and explain that just like light, sound also travels in waves.

- Discuss how sound is produced through vibrations and ask the students to share examples of objects that vibrate to produce sound (e.g., vocal cords, guitar strings).

- Instruct students to be prepared to take some notes while showing them the video Sound Waves In Action | Waves | Physics | FuseSchool - YouTube. Before watching the video, put these questions on the board to which students can write the answer while listening:

  Mention 3 types of particles that act as medium, where sound can travel through. *(Answer: solid, liquid and gas.)*

  How can sound travel? *(Answer: Sound vibrations travel in a wave pattern.)*

  Does sound travel in a vacuum? *(Answer: There is no sound in a vacuum as there are no particles to vibrate the sound.)*

Task 5 – Listening (5 minutes)

- Hold the flashlight and tap it against a surface to create a sound.

- Explain that when the flashlight vibrates, it creates sound waves that travel through the air to our ears.

- Play a short video Guess the Sound Game | 20 Sounds to Guess - YouTube of various sounds and before playing the video, tell the student to identify the objects or actions that produce those sounds while they are watching.

Task 6 – Slinky Spring Sound Waves / Writing (15 minutes)

- Distribute a slinky spring to each pair or group of students.

- Introduce the concept of sound waves and how they are produced through vibrations.

- Instruct students to hold the slinky spring at one end and stretch it out.

- Demonstrate how to create sound waves by vibrating the slinky spring; stretching and compressing back and forth.

- Encourage students to experiment with different ways of vibrating the slinky spring to produce different sounds.

- Have the students describe their observations, such as the motion of the slinky spring and the waves it creates.

- Encourage students to list their observations in the record sheet – 'What happens to the sound?'

- Hand out the notes 'Vocabulary related to sound'. The students have definitions and illustrations of vocabulary related to sound to enhance what has been discussed during the slinky spring experiment.

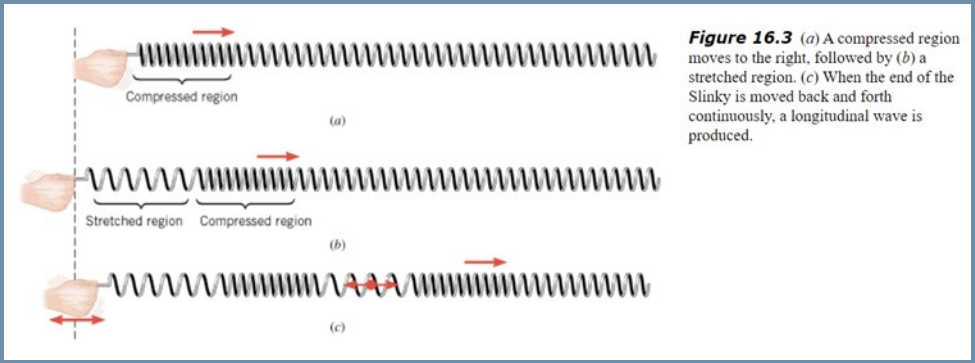


Figure 16.3 (*a*) A compressed region moves to the right, followed by (*b*) a stretched region. (*c*) When the end of the Slinky is moved back and forth continuously, a longitudinal wave is produced.

Conclusion (5 minutes)

- Recap the key points of the lesson, emphasizing the connection between light, sound, and our senses.

- Ask students to share one interesting thing they learned about seeing objects and producing sounds.

- Encourage students to explore their surroundings and pay attention to how light and sound interact in their daily lives.

Assessment for learning HW

- Task 1 – Digital skills: Assign a small project where students observe and record the different sources of light and sound they encounter at home or in their environment. Have students create a simple poster or presentation showcasing their findings, including examples of objects that reflect light and produce sound waves.

- Task 2 – Using adjectives: Assign an online quiz to enhance descriptive language and the use of adjectives for surfaces. Using adjectives to describe objects. (office.com)

- Task 3 - Reading: Reading Comprehension – 'Light and Sound travel as Waves' / Worksheet – 'Match the correct definition'.

Assessment

Observe students' participation and engagement during the hands-on activities. Take note of their contributions to group discussions, their ability to describe objects, rays, vibrations, and sound waves, and their understanding of the concepts being taught.

Fun Times

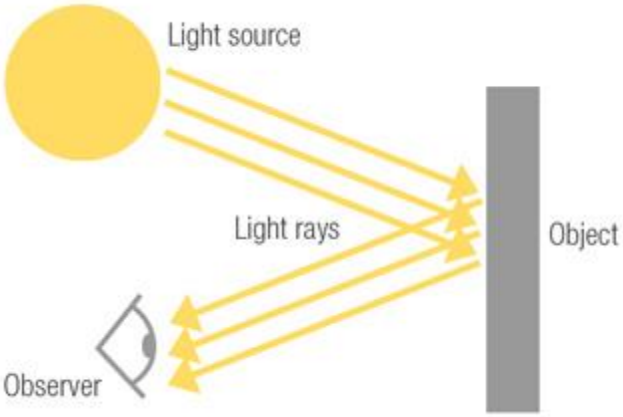
Tuning Fork Experiment.

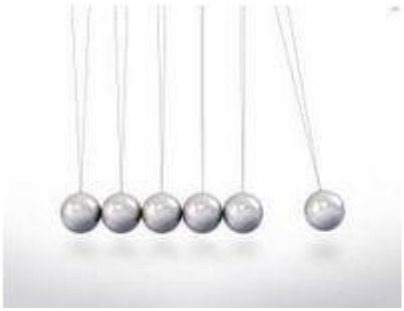
Instruct the students to make the tuning fork produce sound by striking it with the bottom of a shoe. Ask them to describe the sound it produces. Is the volume loud or soft? Does it produce a high-pitch or low-pitch sound? Demonstrate to the students how to stop the vibrations of the tuning fork by using their hands.

Place a bowl of water on a paper towel. Have the students activate the tuning fork again and gently place it on the surface of the water without submerging it. Observe how waves form in the water as the vibrations from the tuning fork are transmitted through it.

Light and sound are all around us. Light waves and sound waves move from one place to another and can be seen and heard, respectively.

Light is the energy we can see when it bounces off an object's surface and enables us to perceive sight.

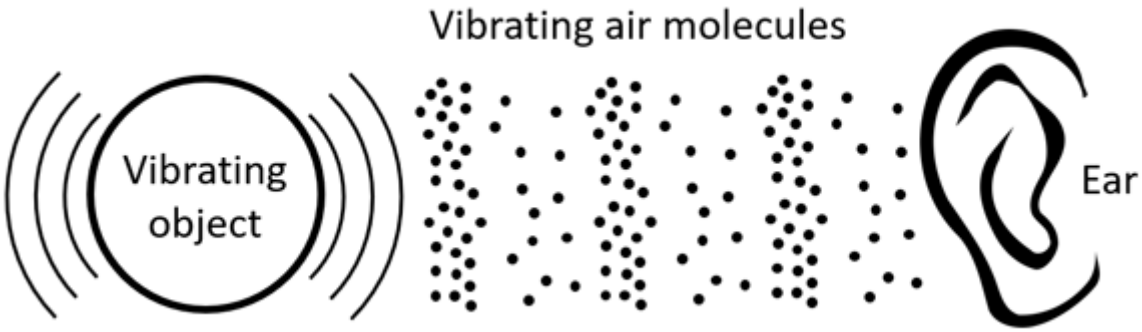




Sound is a type of mechanical vibration that can travel through solids, liquids, and gases, and it is detected by our sense of hearing.

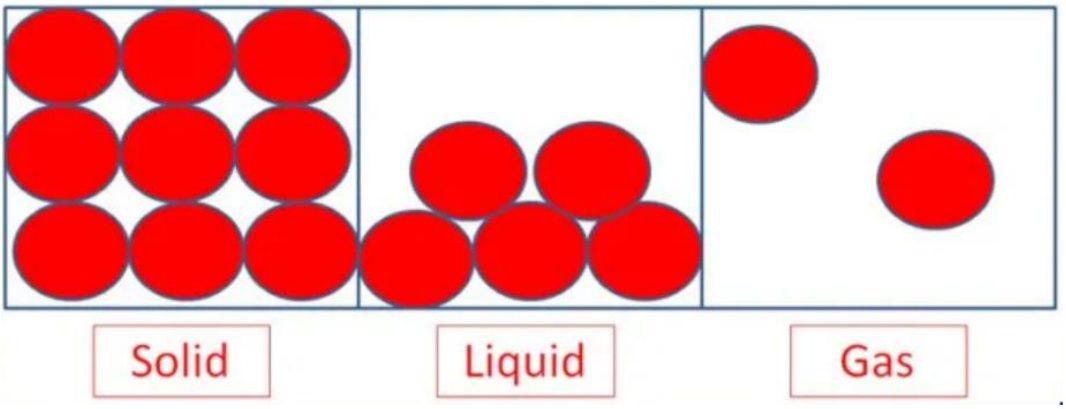
Light waves travel through the air without needing any material to carry them. It is believed that light travels faster than anything else in the universe, at a speed of 186,000 miles per second. While light cannot pass through solids, it can move through liquids and gases.

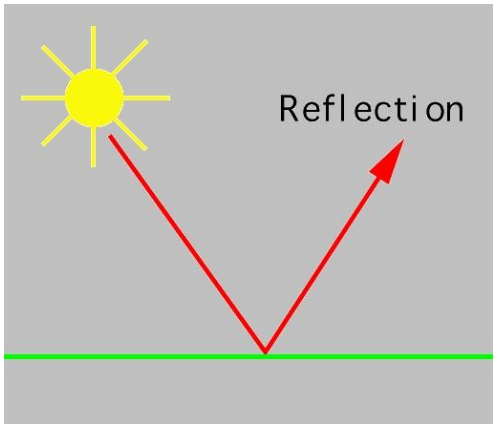
Sounds come in various forms, but they all have one thing in common: they are produced by vibrating objects. The vibrations of sound waves can travel through solids, liquids, and gases. Sound waves move faster through solids than through liquids or gases, and they travel faster through liquids than gases.



Solids have closely packed molecules, allowing sound to travel faster through them. Molecules are the building blocks of solids, liquids, and gases.

In liquids, the molecules are further apart, which makes sound waves travel slower. In gases, the molecules are spread even farther apart, causing sound waves to travel much slower. Consequently, sound is better heard when travelling through a solid compared to a gas.

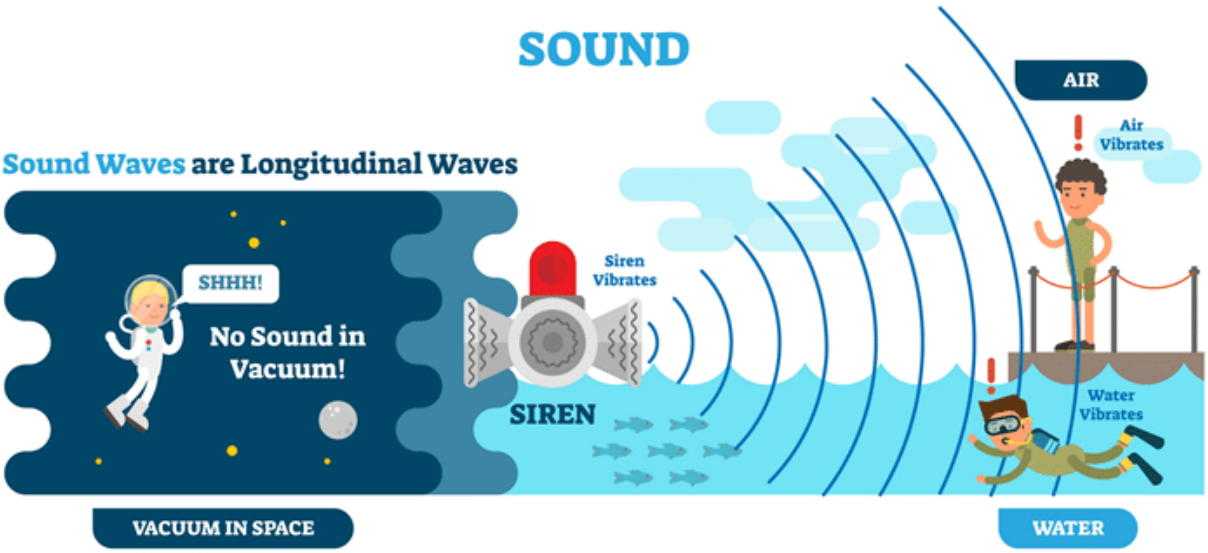




In summary, light and sound are present everywhere.

Light is a visible form of energy that we perceive when it reflects off objects.

Sound is a mechanical vibration that can pass through solids, liquids, and gases.



Light has properties like reflection and refraction. Sound travels faster through solids than liquids or gases. The proximity of molecules in a solid allows sound to travel faster. Light travels much faster than sound.

<u>Answer the following questions by choosing the correct answer.</u>

1) Light can be….

   a) heard.

   b) <u>seen.</u>

   c) tasted.

   d) eaten.

2) How can we see objects?

   a) Light from a light source or reflected off an object enters our eyes.

   b) Light goes directly to our eyes.

   c) Through vibrations.

d) By closing our eyes.

3) We can find light and sound…

a) in the countryside only.

b) in schools only.

c) in shops only.

d) everywhere.

4) How are molecules in liquids?

a) Closely packed.

b) Parallel.

c) Further apart.

d) Spread further apart.

5) Which of the following is a mechanical vibration?

a) Sound.

b) Light.

c) Water.

d) Reflection.

6) Which of the following statements is true?

a) Light travels at the same speed as sound.

b) Sound travels faster than light.

c) Light travels faster than sound.

d) The speed of light and sound depends on the temperature.

7) Light travels at…

a) One thousand and eighty-six thousand miles per second.

b) One hundred and sixty-eight thousand miles per minute.

c) One hundred and eighty-six thousand miles per second.

d) One thousand and eighty-six thousand miles per minute.

8) Which of the following makes up the substances of solids, liquids, and gases?

a) Molecules.

b) Minerals.

c) Vibrations.

d) None of the above.

9) What medium does sound travel fastest through: solids, liquids, or gases?

a) Solids.

b) Liquids.

c) Gases.

d) All the above.

10) Which of the following will sound travel faster?

a) Air.

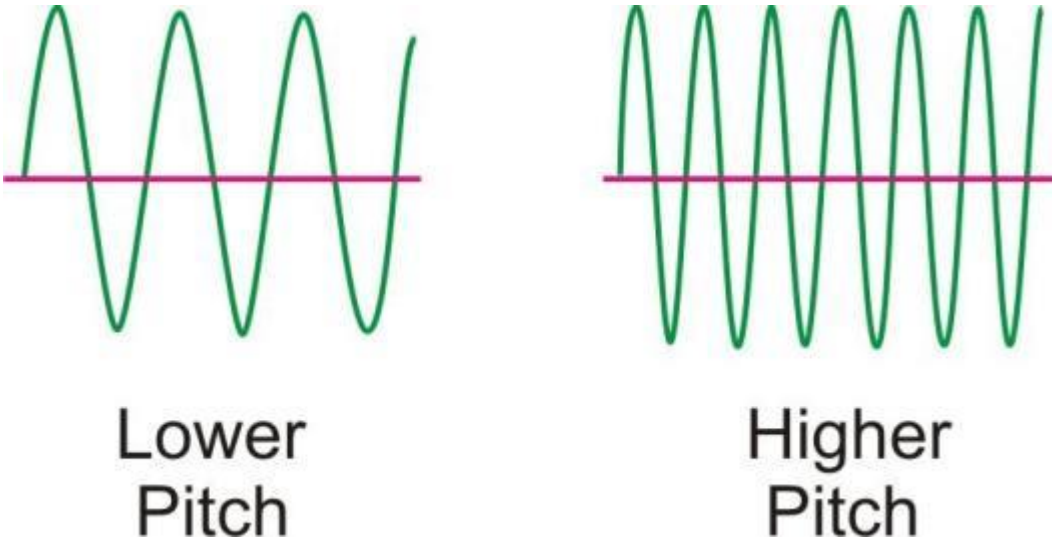
b) Water.

c) Sea.

d) Wood.

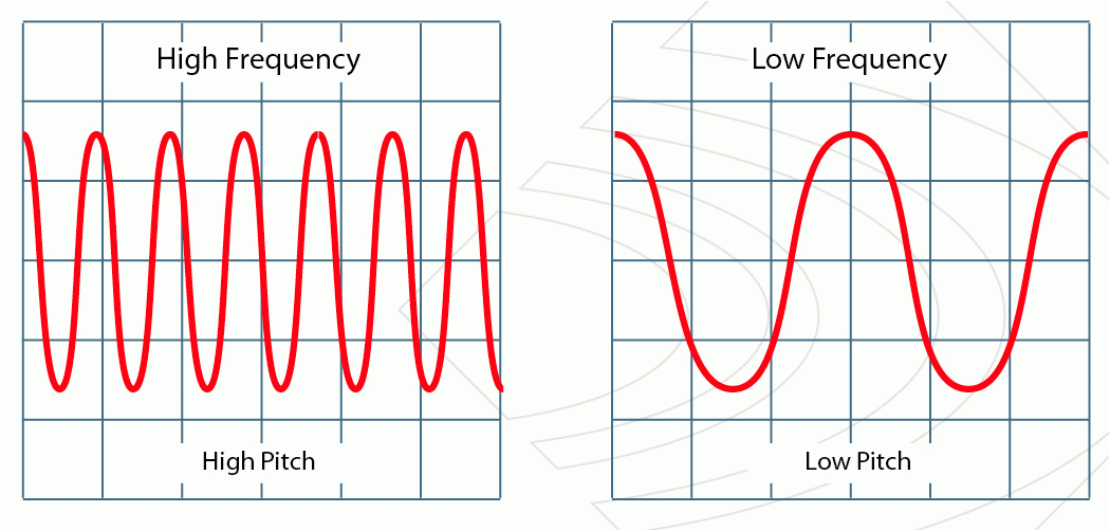
Vocabulary related to sound.

Pitch - sound pitch refers to how high or low a sound is. It is related to the frequency of the sound waves. Higher-pitched sounds have faster vibrations or more waves per second, while lower-pitched sounds have slower vibrations or fewer waves per second. For example, a high-pitched sound might be like a squeaky mouse or a whistle, while a low-pitched sound could be like a deep rumble or a bass guitar.



Sound frequency - refers to how many times an object vibrates or completes a cycle of motion in a given amount of time. It is a measure of how fast the sound waves are vibrating. Frequency affects the pitch of the sound:

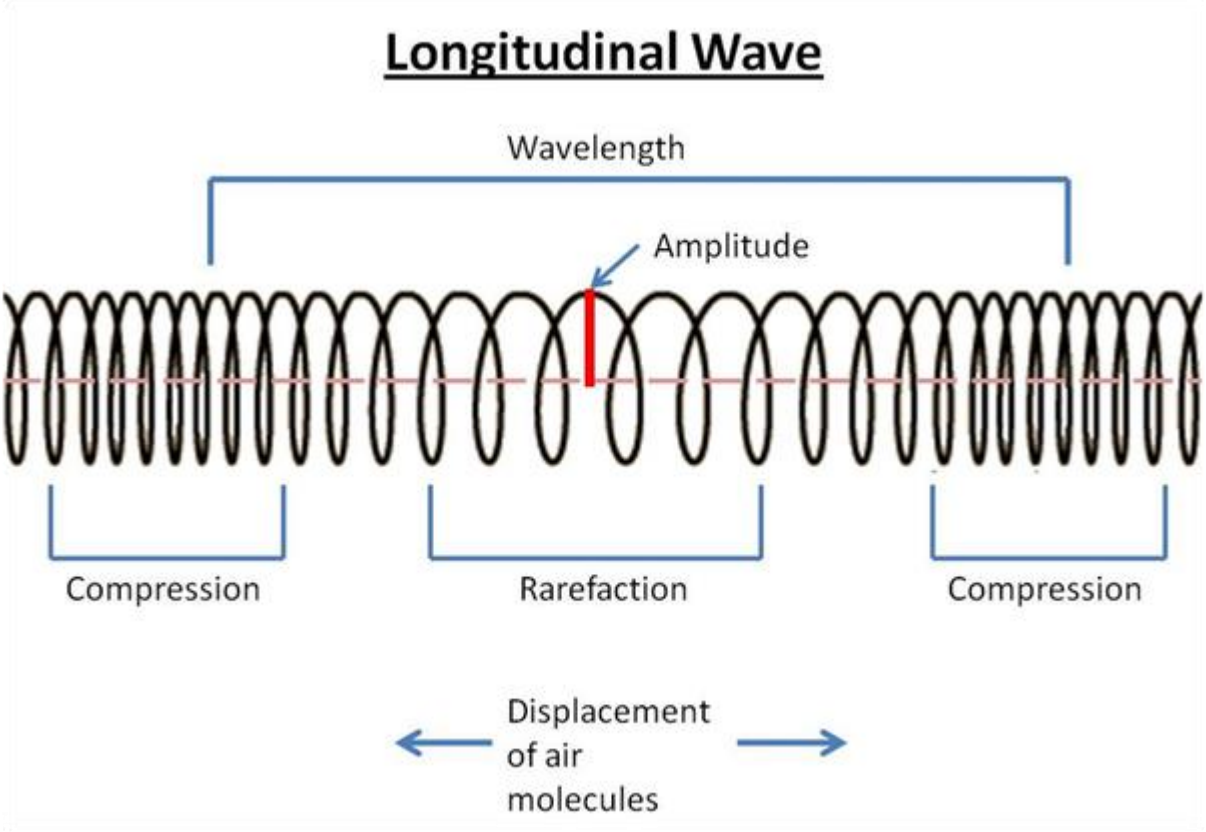
- Higher frequency (more waves per second) results in a higher-pitched sound.
- Lower frequency (fewer waves per second) produces a lower-pitched sound.



Amplitude - refers to the strength or intensity of a sound wave. Amplitude is related to the volume or loudness of a sound.

- A larger amplitude corresponds to a louder sound.
- A smaller amplitude corresponds to a softer sound.

In other words, amplitude determines how strong or weak a sound is.


Longitudinal Wave
Wavelength
Amplitude
Compression
Rarefaction
Compression
Displacement of air molecules

What happens to the sound? *(Record Sheet)*

	Observation
When stretching and releasing the spring faster?	
When stretching the spring more?	
When making larger movements?	
When compressing the spring?	

Learning Scenario 10: **Investigative Science**

TOPIC	GROUP	TIME
Forensic Science	Year 8	80 minutes

Materials and Resources

Interactive TV, YouTube videos, whiteboard, handout, lab coats, safety goggles, 2m lengths of different grades of sandpaper, 2m slippery plastic, 2m foil, 2m plastic wrap, 2m wax paper, flat surface, 2 small toy cars, stopwatch, big cardboard box labelled 'EVIDENCE', skateboard.

Learning Outcomes

1. I can recognise that science can be used to test evidence and solve problems.
2. I can assess simple observations of a situation and match pieces of evidence.
3. I can evaluate the effect of friction on different surfaces and its use in everyday life.
4. I can describe what friction is.
5. I can make observations, communicate findings and conclusions effectively

Teacher's Objective and Learning Intention

Science

- Recognise the use of science in real life situations.
- Learning how to observe and record and communicate my observations in a systematic way.
- Understand and describe friction in my own words.

English

- To increase vocab related to science, and learn how to format an observation report

Success Criteria

ALL students must be able to:

- What is meant by the word friction, and how this effects objects in motion.

MOST students should be able to:

- Record systematically their findings.
- Link the importance of taking proper and accurate records during this experiment to the importance of doing so in real life forensic situations.

SOME students could be able to:

- Write a report to communicate their observations and findings, using the correct scientific vocab.

Tasks and Questions

Introduction Listening (15 minutes)

- Teacher takes a box to class with 'EVIDENCE' written all over it. He/She is to play the following video: (62) CSI Season 13 intro - YouTube.

- Then ask, do you know who these people are? What do they do?

- After taking some replies, say 'they are scientists, they studied science and use their knowledge to solve crime'. They are forensic scientists, and their job is to investigate crime scenes to collect evidence and put criminals behind bars.

- Teacher presents this scenario: These Crime Scene Investigators have called the school this morning, they need help! They wanted to know if there were any science students who could help with their investigation. And we said yes, we have a class full of scientists!

- They got information that there is going to be a big money heist in Valletta and that the criminals have a boat waiting for them in Mellieha. They have very fast cars, much faster than the police cars. So, our job is to find a way how to slow down their cars to aid the police in catching these criminals.

- So here we are being asked to be forensic scientists for the day.

Task 1 – Reading (20 min)

- The head of the Crime Scene Investigation unit gave us this box. Open this box and inside you will have a letter. Put it up on the interactive white board and ask students to read the letter. Take out the content of the box as they read.

> *"Dear Science Students,*
>
> *We had an idea of putting a layer of one of these materials on the roads leading to Mellieha to create the right amount of friction to slow down the getaway cars just enough for our police cars to catch up with them.*
>
> *Unfortunately, we do not have time to conduct an experiment to test these materi als' to find which will provide the best friction to slow down the cars. Please help us with this. May we remind you that it is very important to record the results for each material and report back to us your observations and findings in a detailed report."*

- Teacher asks concept-checking questions to see if students have understood the statement.

- Examples include:

> *Why did police put the layers of material?*
>
> *Why is it very important to record results?*
>
> *Where are you going to write the information?*

- Go over the words experiment, conduct, friction, record, observations, findings.

- Then ask students to explain in their own words what needs to be done.

- Help them conclude that they need to constantly record their findings throughout the experiment to be able to report back to the CSI department. Otherwise, they will not be able to remember their findings.

- Hand out an observation sheet to all students. (HANDOUT 1)

- **Task 2 – Experiment - Talking and Writing (30 min)**

- Set up the experiment: Place the flat surface at a very low sloping angle, ensuring it has enough space for the toy cars to move freely.

- Prepare the tracks: Attach a strip of each material (sandpaper, slippery plastic, foil, plastic wrap, and wax paper) along the length of the tracks. Ensure that the tracks are secured tightly, and the materials are smooth and flat for accurate results.

- Teacher is to point out the need for fair testing, and asks for student contributions. How do we ensure our test is fair? (always use the same car, always drop the car from the same point, let the car go without applying any force (do not push it), repeat at least 3 times, take an average of the time obtained). Prompt until all the above are mentioned.

- Conduct the experiment:

  Place the toy cars at the starting point of the track.

  Release the toy cars, allowing them to travel along their respective tracks.

  Use a stopwatch or timer to measure the time it takes for each car to reach the end of the track. Record the time for each surface.

- Repeat the experiment:

  Repeat the experiment two or three times for each surface to ensure accuracy.

  Analyse and compare results.

- Draw conclusions:

  Make observations about the differences in speed and ease of movement between the surfaces. Based on the results, draw conclusions about the levels of friction ex hibited by each surface.

  Discuss the factors that might contribute to these differences, such as surface tex ture, smoothness, or material properties.

- **Conclusion - Speaking (15 min) (allow 5min to explain assessment)**

- Reflect and communicate: Encourage students to share their observations, conclusions, and thoughts on the experiment.

- Discuss the practical applications of friction in everyday life and how these findings can be relevant to real-world scenarios.

- Example, the right quality of tiles to avoid slipping, road surfaces to be smooth, and cleaning of roads and streets to avoid accidents etc.

Assessment

Assessment for learning HW – writing

Fill in the individual report sheets and keep in file as reference of how to record data and draw conclusions for next experiment.

Fun Times

Skateboard hour!! If safe to do so, take a skateboard and go out to the playing field and let students use it on different surfaces.

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CSI: CRIME SCENE INVESTIGATION

Investigating Friction: Comparing Different Surfaces

Objective: To explore and compare the levels of friction exhibited by different surfaces.

Material	Test number 1	Test number 2	Test number	Average
Sand paper fine				
Sand Paper rough				
Aluminium foil				
Wax Paper				
Plastic sheet				
Bubble wrap				
Best material to slow down cars in				

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WORD BANK : Find the meaning of the following words and write it in the box.

evidence	friction	record	experiment
observations	communicate	forensic	conduct
evaluate	conclusion	investigate	findings
effect	result	test	insert

What was the scope of this experiment ?

(write a short paragraph about why we did this experiment, use words from the word bank on page 3)

What materials and what methods were used to conduct this experiment?

(write a short paragraph describing the experiment, use words from the word bank on page 3)

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Based on these results, what is your conclusion?

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Learning Scenario 11: **Saving Our Planet**

TOPIC	GROUP	TIME
Climate Change	Year 8	80 minutes

Materials and Resources

Interactive TV, YouTube videos, whiteboard, globe, a sheet, Fire blanket, Greenhouse model, solar panel, wind turbine, alternative energy student kit, recycling bins

Learning Outcomes

1. I can explain what climate change is and identify some signs of climate change.
2. I can describe greenhouse effect and global warming.
3. I can identify energy sources as renewable or non-renewable.
4. I can describe advantages and disadvantages of using different types of sources of energy.
5. I can assess ways of reducing air pollution.
6. I can identify and describe the 3R's as the basis of waste management.

Teacher's Objective and Learning Intention

Science

- Understand what is meant by climate change.
- Explain by using a globe and a blanket the impacts of the greenhouse effect.
- List alternative energy sources and the basic science behind them.
- Familiarise with the concept of the 3Rs and how it helps the planet.

English

- List and discuss the advantages and disadvantages of any given topic, (pros and cons, positive and negatives, good and bad) to encourage critical thinking, and make informed decisions. This can eventually be liked to an argumentative writing task.

Success Criteria

ALL students must be able to:

- Understand what global warming is and appreciate that to reduce global warming every individual's action counts.

MOST students should be able to:

- Describe the effects of global warming and how pollution is the main cause.
- Recognise that one should start using renewable energy sources to help the planet.
- Remember the basics of recycling and the importance of reduce, reuse, and recycle.

SOME students could be able to:

- List all the alternative renewable energy sources and elaborate by discussing the advantages and disadvantaged on each source.

Tasks and Questions

Introduction (15 minutes)

- Teacher shows an example of a poster used by an 'Eco-Warrior'. What do you think Eco warriors do? Save the planet. We can only do this by educating ourselves.

- Start the lesson by asking students if they have heard of climate change. Write the term "climate change" on the board and briefly discuss their prior knowledge.

- Explain that climate change refers to long-term shifts in temperature and weather patterns caused by human activities. Climate change is a natural phenomenon but due to human activities, it is happening too quickly, and living things will not manage to adapt to these changes so quickly.

- Write terms 'Global Warming' and 'Greenhouse Effect': Can anyone tell us why global warming is happening? Did you ever hear of the Greenhouse effect? Create a class discussion supporting students with language where needed.

Task 1 – Listening (15 min)

- Give students HANDOUT 1. Students are to fill in the handout step by step as they watch the video below: (40) Greenhouse Effect video for Kids | The Greenhouse Effect - YouTube

- After watching the video, place the globe on a table, and ask a student to hold the flashlight to represent the sun. Place a light-coloured breathable material in between the sun and the earth. Explain that this is the natural way it should be, however with our air pollution we have thickened the layer to look like the thick dark blanket. Replace the first cloth with the second. So now once the rays of the sun enter our atmosphere, they cannot escape very easily, and therefor bounce back to earth, making the earth get warmer and warmer and unbalancing the natural way of thing.

Task 2 – Writing / Speaking (20 min)

- Place students in teams of 3, give them 3 sticky notes and ask them to jot down 3 effects of the greenhouse effect and global warming. Allow them 5 minutes to brainstorm.

- In the meantime, on the white board, under the word climate change, divide the board in two, and on one side write advantages/positives/pros, and on the other side disadvantages/negatives/cons. Explain the meaning of these words, the words with synonyms of good and bad, or the ✓sign and the × sign may be used.

- Ask the students to stand up and read their climate change effect, and to stick it on the board under the positive or negative heading.

- The effects the students choose will be mostly/all under the negative. Therefore, global warming is a negative/bad thing for our world and us.

Can we as individuals, do something about it?

Task 3 - Reading (20 min)

- Explain the difference between Renewable and Non-renewable Energy Sources.

- Non-renewable energy sources are finite resources (resources that finish - give the water well analogy). They cannot be replenished within a human lifetime. They took millions of years to form, and once they are used up, they are gone. Examples of non-renewable energy sources include fossil fuels like coal, oil, and natural gas, as well as nuclear energy.

- Renewable energy sources are types of energy that can be replenished naturally over a relatively short period of time. They are considered sustainable because they don't run out. Examples of renewable energy sources include sunlight (solar energy), wind, moving water (hydropower), and biomass (organic matter like plants and wood).

- While explaining this show students some models (solar panel and wind turbine).

- Use these models and flashcards to help students better visualise and understand.

- Give students Handout 2

Conclusion – Discussion / Reading / Writing (10 min)

- How can we, as individuals, help the situation? Explain that every small action is important, if the millions of people all over the world made one small, good action every day, the world would improve in no time. We can help by:

- Reducing Air Pollution: Discuss with students the importance of reducing air pollution and its impact on climate change and human health, like allergies, asthma etc. Ask for different ways to reduce air pollution, such as using cleaner energy sources, promoting public transportation, and adopting energy-efficient practices. Ask students to suggest additional ways to reduce air pollution. Planting trees etc..

- Waste Management and the 3R's : Point to the 3 bins and ask what they are for. Introduce the concept of waste management and explain the 3R's: Reduce, Reuse, and Recycle. Discuss the importance of each component and how they contribute to minimizing waste and conserving resources. Ask for examples of how individuals can implement the 3R's in their daily lives.

- Give students Handout 3

Assessment

Assessment for learning HW – Project

Give students Handout 4 and a specific renewable or non-renewable energy source to research and present to the rest of the class. Explain that they should write what energy source they are researching in the middle of an A4 sheet, and after writing a brief description, they should write at least 2 advantages and 2 disadvantages of using that energy source.

Depending on level, students may list, or write a short paragraph.

Fun Times

Organise a nature clean up outing through a local NGO

Alternative Energy Sources
Clean and renewable

Solar energy comes from the sun and can be turned into electricity or used for heating. It is obtained by using solar panels or collectors to capture the sun's energy. Solar power is renewable and eco-friendly.

Biomass energy uses organic materials like agricultural waste, wood pellets, or energy crops. It involves burning or converting biomass into heat or biofuels. These can be used to generate electricity, provide heat, or serve as transportation fuels. Biomass energy is renewable and doesn't add to carbon emissions, making it an eco-friendly energy source.

Wind energy is obtained by using wind turbines to convert the energy of the wind into electricity. It's a renewable energy source that offers a clean and sustainable solution, producing power without greenhouse gas emissions. Wind farms can be located on land or in the ocean to capture the energy of the wind.

Hydropower, or hydro energy, generates electricity by using moving water. It makes use of dams or flowing rivers to turn turbines and create clean and renewable energy. Hydropower is a dependable source of electricity and helps in reducing greenhouse gas emissions.

Geothermal energy is heat from the Earth's internal sources, like volcanoes and radioactive decay. It can be used by accessing hot water or steam reservoirs underground to produce electricity or provide heating and cooling for homes and buildings.

Ocean energy involves capturing power from tides, waves, and currents in the ocean. It can be converted into electricity using technologies like tidal turbines, wave energy converters, or ocean thermal energy conversion. Ocean energy provides a renewable and sustainable source of power.

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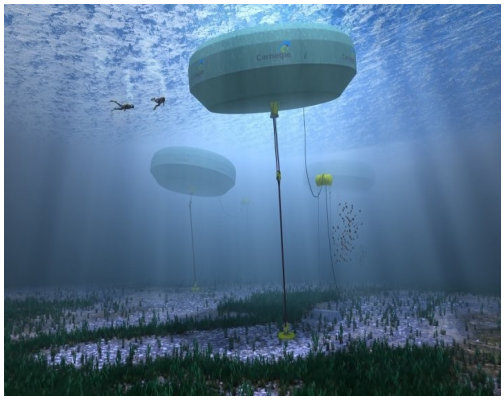
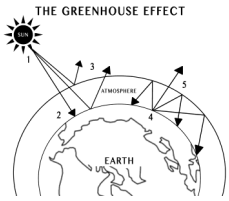
Cut out the alternative energy sources and stick them near the right text.



Climate Change



Task 1. Before you watch the video:

Match the words (column A) to their meaning (column B)

1	Greenhouse gases		To support or provide for
2	Atmosphere		Cannot escape
3	To consume		To use up (a resource)
4	trapped		Examples of these are: methane and carbon dioxide
5	To maintain		Using less energy to do something
6	Energy efficient		Layers of gas surrounding plant Earth

Task 2. Watch the first part of the video (till 1:05) and fill in the blanks by choosing a word from the box below.

Rock Warming Cold Temperature

1. The greenhouse effect is the _____ of Earth's surface and the air above it.
2. Without the greenhouse effect, Earth would be too _____ for life to exist. It would be a solid ball of _____ and ice.
3. Scientists say that without the greenhouse effect, the average _____ of the Earth would drop to 14 degrees Celsius to as low as -18 degrees Celsius.

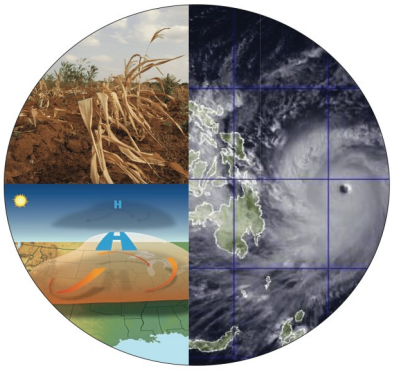
Task 3. Watch the second part of the video (till 2:24):

Decide if these sentences are True (T) or False (F).

1. Sun rays enter the Earth's atmosphere, after they pass the greenhouse gases. ____
2. The Earth does not take in energy from the sun. ____
3. A lot of energy remains in the atmosphere trapped by the greenhouse gases. ____
4. Some human activities lower greenhouse gases. ____
5. The more gases there are, the higher the temperature. _____

Task 4. Watch part 3 of the video (from 2:25) and tick ✓ 5 things that can reduce greenhouse gases.

	Reduce, reuse, recycle
	Buy energy-efficient products
	Buy standard products
	Plant trees
	Use less heat and air-conditioning
	Use fewer sprays
	Drive less



Reduce Reuse and Recycle

The principles of "Reduce, Reuse, and Recycle" (commonly known as the 3R's) play a crucial **(very important/ not important at all)** role in mitigating **(fighting/accepting)** climate change. Here's how each principle contributes **(helps/destroys)** to climate change mitigation:

Reduce: Reducing **(adding/making less)** the consumption of resources and waste generation directly reduces greenhouse gas emissions. When we consume less, we reduce the demand for energy-intensive production processes that contribute **(adds/removed)** to emissions. By making choices to reduce our consumption **(what we use/ what we do not use)** of goods and resources, we can reduce carbon footprints and lessen **(make bigger/ make smaller)** the strain on the environment.

Reuse: Reusing **(using again/ throwing away after using once)** things instead of buying new ones helps in many ways. Firstly, reusing things extends **(makes them longer/makes them shorter)** their lifespan and reduces the need for new production, which often requires energy and resources. Secondly, by reusing items, we reduce the waste that ends up in landfills, reducing greenhouse gas emissions from decomposing waste.

Recycle: Recycling reduces the need for raw materials and energy-intensive manufacturing **(building /destroying)** processes. When we recycle materials like paper, plastic, glass, and metal, they can be turned into new products, reducing the demand **(want/not need)** for extracting and processing new resources. This saves energy and reduces greenhouse gas emissions associated **(linked to/not linked to)** with resource extraction **(take out of the earth/ put back in)**, transportation, and manufacturing.

Furthermore, recycling helps divert waste from landfills, where decomposing organic **(nature made /manmade)** waste produces methane, a potent greenhouse gas. By recycling, we reduce methane emissions and the associated climate impact.

Now we know!

The 3R's contribute to climate change mitigation by reducing resource consumption, energy use, greenhouse gas emissions, and waste generation. By keeping to these principles, we can minimize **(make less/make more)** our environmental footprint and work towards a more sustainable and climate-friendly future.

Find the meaning of the words written in blue.

Emissions _____

Decomposing _____

Raw Materials _____

Sustainability _____

Name of renewable energy source: _____

Some information about it :

- _____
- _____
- _____

Advantages (pros)	Disadvantages (cons)

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COAL

OILS Like PETROLIUM

Petrolium - Non Renewable Energy Resources

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NATURAL GAS

INTEGRA

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NUCLEAR ENERGY

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WIND ENERGY

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SOLAR ENERGY

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HYDRO ENERGY

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BIOMASS

Learning Scenario 12: **Our Solar System**

TOPIC	GROUP	TIME
Earth and Space	Year 8	80 minutes

Materials and Resources

Interactive TV, YouTube videos, whiteboard, handout, poster of the solar system, globe, torch, magnetic solar system, solar system model, telescope.

Learning Outcomes

1. I can describe the orbit of the Earth around the Sun.
2. I can describe day and night in terms of the spinning of the Earth on its axis.
3. I can name the planets of the Solar System in their proper order.
4. I can identify some of the features of the planets in the Solar System.
5. I can describe the Solar System as made up of the Sun and all the planets orbiting it.
6. I can link objects' downward movement to gravity and describe weight as caused by gravity.
7. I can explain benefits of space exploration such weather forecasting, communication and GPS.

Teacher's Objective and Learning Intention

Science

- Describe the Earth's orbit around the Sun and spinning of the Earth on its axis.
- Describe the Solar System, including the Sun and all the planets orbiting it.
- Link the downward movement of objects to gravity and describe weight as caused by gravity.
- Explain benefits of space exploration such as weather forecasting, communication and GPS.

English

- Learn new vocab related to comparative and superlative adjectives.
- Identify when and where to use these adjectives.

Success Criteria

ALL students must be able to:

- Understand why there is day and night and how it happens.
- Describe the solar system and recognise the names of the planets.

MOST students should be able to:

- Describe the solar system and the planets, using comparative and superlative adjectives.
- Understand that gravity is a force related to mass.

SOME students could be able to:

- Recall the advantages of space exploration and what it can be used for.
- Use comparative and superlative adjectives effectively.

Tasks and Questions

Introduction (10 minutes)

- Teacher can enter the class wearing sunglasses. Teacher asks, 'Why do I have these on?'.

- Today we will be learning about our Solar System, which is made up mainly of the Sun, and the planets, as well as others such as moons.

- Class discussion: Have you ever looked up at the sky at night? What do you see? What objects are brightest? Which ones look biggest? How far are these objects? How can we have a closer look? Do you know what a telescope is?

- Explain that this can be used to study the universe. Show students the telescope in class, and explain that this is only a tiny one, there are many sizes. There are small, and big ones.

- Google the biggest telescope in the world, to give students an idea of size.

Task 1 – Discussion / Speaking (25 min)

- Show the students a poster of the solar system, or a 3D model. Explain that the planets orbit around the sun at different speed, some are fast, others faster but the fastest is Mercury, as it is closer to the sun. It also does not have a long distance to go. However, the further the planets are, their orbit becomes slow and slower. Look at the 3D solar system model. Which one is the slowest planet? (Neptune)

- Explain that the Earth also spins on an axis. This is an invisible line that passes through the Earth from the North pole to the South pole. The axis of Earth is slightly tilted. As the Earth spins on its axis, day becomes night.

- Earth also orbits around the Sun. Show the Earth's position in the solar system using the magnetic model in relation to the Sun.

- Activity: Eight students are handed one of the magnetic planets. At the word go, they should stand up and position themselves in order according to distance from the sun.

- Ask the students to describe what they know about the Earth's orbit, and then provide additional information as needed. The Earth's orbit is the path that it follows as it moves around the Sun. It is not a perfect circle, but an oval shape orbit. The Earth takes 365.25 days to orbit around the Sun (discuss leap years every four years).

- We have seasons, because Earth is orbiting the Sun and it has a tilted axis. The side of the Earth which is tilted towards the Sun would have Summer while the side of the Earth which is tilted away from the Sun would have Winter.

- Ask the student holding the earth model to simulate the earth's orbit and ask the class to say when the earth is in the summer and winter seasons.

Task 2 – Listening & Reading (20 min)

- Ask the students if they know why day and night occur. Use the globe and a torch to show how the Earth also rotates on its axis, causing different parts of the planet to face towards or away from the Sun at different times.

- Focus once again on the planets of the Solar System, starting with Mercury and moving outwards in order. Show them this video: (24) The Planet Song - 8 Planets of the Solar System Song for Kids | KidsLearningTube - YouTube.

- Give out Handout 1 and ask the students to rewatch the video at home and mark the correct adjective. After the video ask the students if they remember any special features about the planets. The students may look at the chart to remember.

- In the handout students can find more information about each planet, including its size, distance from the sun, and any unique features or characteristics.

- Role change. Ask students to describe the Solar System to you.

- Ask questions such as which is the biggest planet? Which one is the coldest?

- **Task 3 – Talking (15 min)**

- Drop a pencil and ask why the pencil fell down and not up.

- Ask the students if they ever heard about the force called gravity?

- Discuss how weight is the downward force caused by gravity. Explain that weight changes according to the mass of the object.

- Pick three objects. Which object will have the biggest gravity pull? Again emphasise big, bigger and biggest.

- **Conclusion - Writing skills (10 min)**

- Ask students if they know what space explorers are called.

- What are the benefits of space exploration?

- Discuss: Is space exploration a waste of money? (Mention how space exploration has led to the development of satellites, which are used for weather forecasting, for television and radio broadcasting, telecommunications, and internet connectivity and Global Positioning System).

- Use pictures showing people finding these technologies useful in everyday life.

- HW: writing and reading — Handout 2—Reading comprehension about the solar system.

Assessment

Observe student participation and engagement during the class activity class discussion, and roleplay.

Review student's homework handout to check understanding.

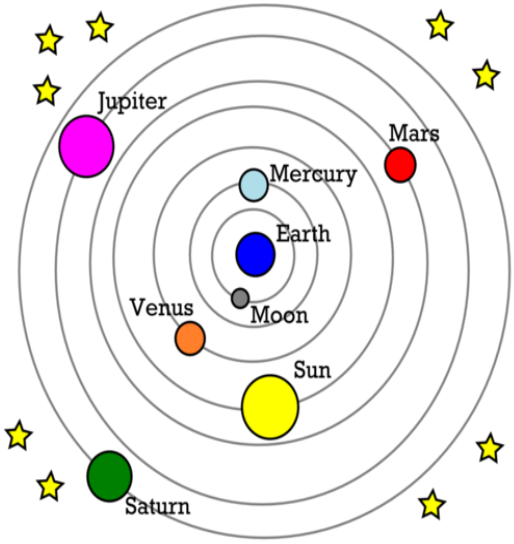
Fun Times

Want to know more? Check out the NASA educational page.

https://spaceplace.nasa.gov. You might even want to play a spatial game or two.

School may organise a star observation evening, where students come to school after sunset and are given a chance to observe the starts through the telescope. This could be turned into a family event, encouraging the school community to come together.

The Solar System



There are eight planets in our solar system
We all revolve around the sun
Join us to learn about the different planets
Now sing along and have some fun

My name is Mercury
I'm the second *(warmest/coldest/hottest)* planet
The *(near/further/closest)* one to the sun
A year on my surface is 88 days
I'm the smallest but I'm lots of fun

My name is Venus
I'm the *(cold/hottest/prettiest)* planet
But the second planet from the sun
I'm the (*brightest/hottest/coldest)* planet in our solar system
And I'm too hot for anyone

My name is Earth I'm the planet you live on
The Third Planet from the sun
I'm the only planet with organic life
So take care of me because we're all one

My name is mars I am red in colour
The fourth planet from the sun
I have the (*coldest/lowest/highest)* mountain in our solar system
A volcano named Olympus Mons

There are eight planets in our solar system
We all revolve around the sun
Join us to learn about the different planets
Now sing along and have some fun

My name is Jupiter
I am covered in clouds
I'm the fifth planet from the sun
My giant red spot is a raging storm
As for size, I'm the *(coolest/brighter/biggest)* one

My name is Saturn
I am brown in colour
I'm the sixth planet from the sun
My outer rings are extremely thin
They're made of dust and icy chunks

My names Uranus
I am blue in colour
I'm the seventh planet from the sun
Humans have named me the icy planet
Because I am the *(warmest/coldest/hottest)* one

My name is Neptune
I am blue in colour
I'm the eighth planet from the sun
I have too many storms in my atmosphere
And I'm the *(far/further/furthest)* planet from the sun

There are eight planets in our solar system
We all revolve around the sun
Join us to learn about the different planets
Now sing along and have some fun

Link to song : https://www.youtube.com/watch?v=mQrlgH97v94

The Solar System

The solar system is made up of the Sun and all the 8 planets that orbit around it. There are also other objects, like dwarf planets, moons, asteroids, and comets. **(paragraph 1)**

The Sun is at the centre of the solar system and is the largest object. It is a massive ball of hot gas that gives light and heat to the planets. **(paragraph 2)**

The eight planets in the solar system, in order from the Sun, are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. These planets are divided into two groups: the rocky planets (Mercury, Venus, Earth, and Mars) and the gas giants (Jupiter, Saturn, Uranus, and Neptune). **(paragraph 3)**

Each planet in the solar system has unique characteristics and features. For example, Mercury is the smallest planet and has the shortest orbit around the Sun, while Jupiter is the largest planet and has the most moons. **(paragraph 4)**

The solar system is also home to several dwarf planets, including Pluto, Ceres, and Eris. These are smaller than the planets and have different characteristics, such as irregular shapes and orbits. **(paragraph 5)**

Moons are natural satellites that orbit planets and dwarf planets. Some planets, such as Jupiter and Saturn, have dozens or even hundreds of moons. **(paragraph 6)**

Asteroids and comets are small bodies that orbit the Sun. Asteroids are made up of rock and metal, while comets are made up of ice and dust. **(paragraph 7)**

The solar system is a fascinating and complex system that continues to be explored by scientists and researchers. **(paragraph 8)**

Exercise 1 – Match the words with the pictures

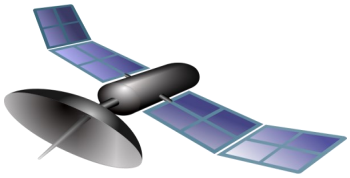
ASTEROID

MOON

COMETS

Exercise 2: Fill in the table with information from the text

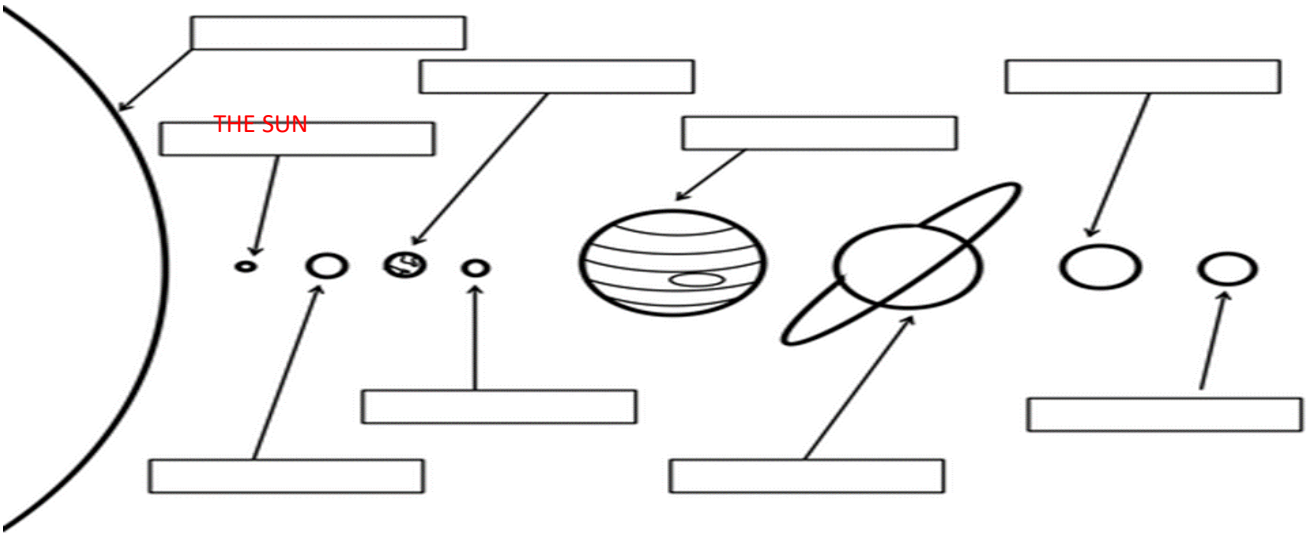
A	The name of two rocky planets	
B	The name of two gas giants	
C	The name of the smallest planet	
D	The name of the planet with the most moons	
E	The name of two dwarf planets	



Exercise 3: Answers these questions

1. What is the solar system?
2. What is the largest object in the solar system?
3. What are the names of two groups of planets in the solar system?
4. What is special about Mercury?
5. What is special about Jupiter?
6. What are dwarf planets?
7. What are asteroids and comets made up of?
8. Who continues to explore the solar system?

Exercise 4: Using information from paragraph 3, label the diagram.



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