SCIENCE YEAR 8

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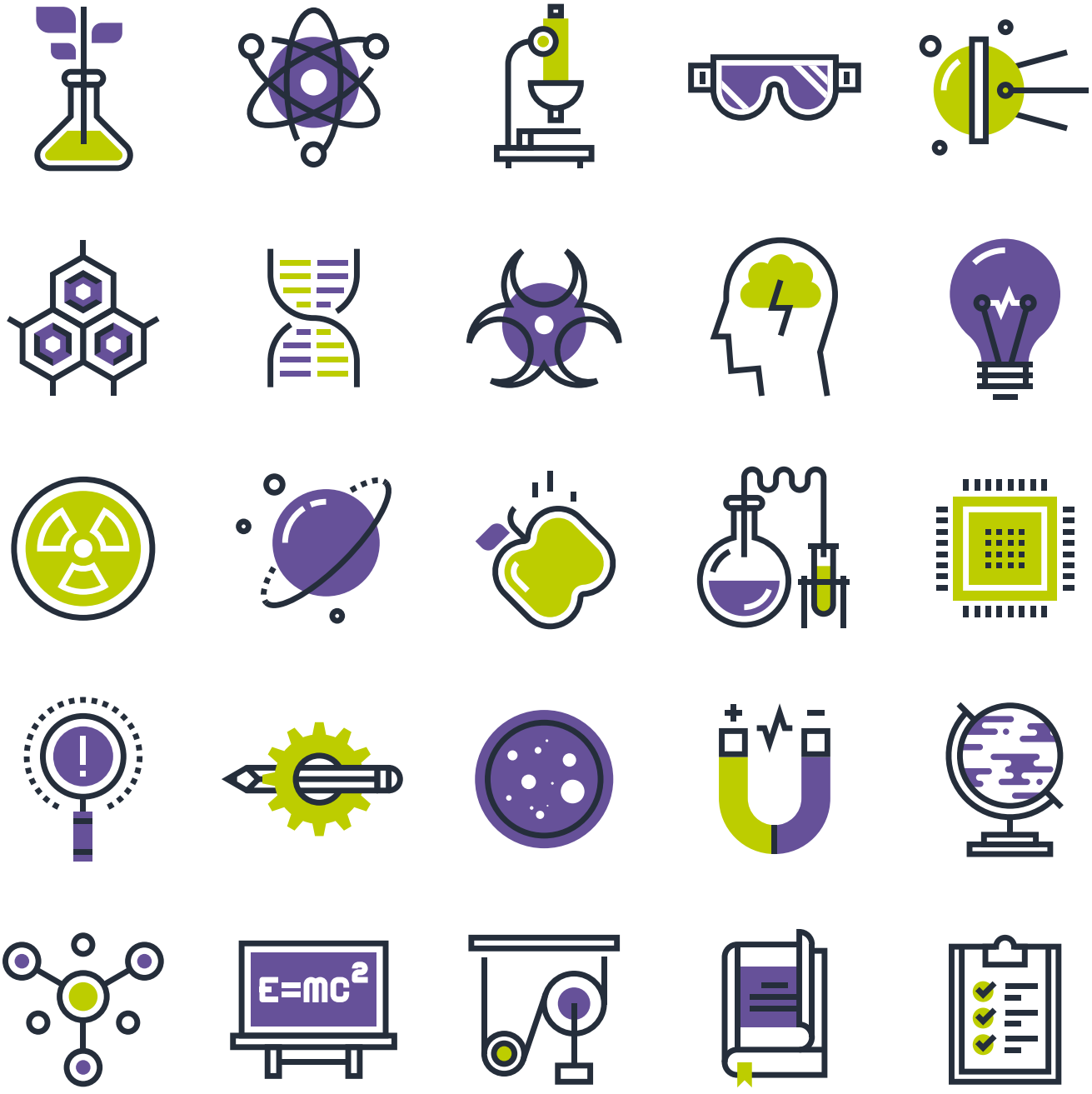

ALIGNED TO THE **AUSTRALIAN CURRICULUM**

ClickView

Science Year 8
Lesson Plans for the ClickView Curriculum Library

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SCIENCE YEAR 8

LESSON PLANS FOR THE CLICKVIEW CURRICULUM LIBRARY

ALIGNED TO THE **AUSTRALIAN CURRICULUM**

Hola again, Science Teachers!

We hope that you've enjoyed using our Year 7 lesson plans and they've helped to make teaching less stressful and more enjoyable in any way for you!

We've heard your feedback and queries at ClickView, and we want to thank you for the kind responses that we have received for the previous book as they motivate us to provide you with more valuable and useful content.

Many of you have been wondering if we were going to create similar lesson plans for the other year groups. Well here we are, happy to present to you the second book of lesson plans for Year 8 science students.

As in the previous book, these 20 brand-new lesson plans are also aligned to the Australian Curriculum to ensure and maximise their usefulness and relevance.

We've had fun creating these lesson plans and we hope you'll have fun with them as well.

Until next time, cheers!

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Key to Icons in Book


ClickView Video


Presentation

SCIENCE YEAR 8
ALIGNED TO THE **AUSTRALIAN CURRICULUM**

CONTENTS

An Introduction to Cells

OBJECTIVES

In this lesson, students will develop an understanding of the cell theory, recognise that there are different types of cells, and acknowledge the differences that exist between plant cells and animal cells.

ACARA CONTENT DESCRIPTIONS

Cells are the basic units of living things; they have specialised structures and functions (ACSSU149)

- distinguishing plant cells from animal or fungal cells
- examining a variety of cells using a light microscope, by digital technology or by viewing a simulation
- identifying structures within cells and describing their function

Communicating:

Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS148)

- selecting and using appropriate language and representations to communicate science ideas within a specified text type and for a specified audience

LESSON PLAN

Activities	Resources
Activity 1: What Are These Structures? Open the presentation to the first slide and put a simple LEGO® model on each desk. Use the following questions as discussion points: • What are the structures? *(LEGO® models)* • What are they made up of? *(Individual LEGO® pieces)* Link the LEGO® models to living things. For example: *In the same way that the LEGO® models are made up of individual LEGO® pieces, all living organisms are made up of individual components called cells.* 5	• Presentation: An Introduction to Cells • LEGO® models
Activity 2: An Introduction to Cells Give out the Learning about Cells worksheet and play the video. As students watch the video, ask them to complete Part A of the worksheet. Use slides 3 and 4 of the presentation to review the answers. Open the presentation to slide 5 and proceed to Part B of the worksheet. Guide students to complete this section. Review the topic using slide 6 of the presentation. 20	• Photocopies of the Learning about Cells worksheet • ClickView video *Introduction to Cells* • Presentation: An Introduction to Cells
Activity 3: Exploring Cell City Give out the Exploring Cell City worksheet. Using slides 7-9, ask students to complete questions 1 and 2 on the worksheet. Allow time for students to complete question 3. It is a summary of concepts taught. 15	• Photocopies of the Exploring Cell City worksheet • Presentation: An Introduction to Cells
Activity 4: Can You Haiku the Organelles? Give out the Can You Haiku the Organelles? worksheet. Haiku is a very short form of Japanese poetry consisting of three lines, with the first and last lines having 5 syllables, and the middle line having 7 syllables. Students are to choose 5 organelles and create a haiku poem for each of them, describing their characteristics. Allow students to share their poems with the class. 20	• Photocopies of the Can you Haiku the Organelles? worksheet

ANSWERS

Learning about Cells

Part A:

1. plants, animals, human beings, building blocks, chemicals, molecules, shape, size
2. spindle shaped, rod shaped, oval, spherical, star shaped, rectangular, irregularly shaped, polygonal
3. function

Part B:

1. Possible answers:

Item	Function
Pen	Writes on a surface
Ruler	Measures length
Eraser	Erases marks made by pencil
Calculator	Computes sums

a) Yes
b) No

2. functions

Exploring Cell City

1. Organelles are organised or specialised structures within a living cell, each with a unique function.

Part of City	Organelle	Function	A	P
City hall	Nucleus	Controls the activities of the cell	✓	✓
Transport system	Endoplasmic reticulum	Provides a network to move substances to the cell membrane and back	✓	✓
Environment	Cytoplasm	Inner area of the cell	✓	✓
Factory	Ribosome	Creates new proteins required by the cell	✓	✓
City police	Cell membrane	Allows some particles to move in and out of the cell	✓	✓
Power station	Mitochondrion	Produces energy for use by the cell from glucose	✓	✓
Post office	Golgi complex	Packs and transports proteins to various parts of the cell	✓	✓
Recycling facility	Lysosome	Breaks down worn out cell components and reuses parts	✓	
Water plant	Vacuole	Stores water for the plant to use		✓
City wall	Cell wall	Structural support for cell		✓
Solar power plant	Chloroplast	Site where photosynthesis takes place		✓

Refer to grey columns above for answers to the Venn Diagram.

Learning about Cells

Part A: Complete this section of the worksheet as you watch the video.

1. Fill in the missing words from the video.

   All living organisms, like _____, _____ and _____ _____ are made up of cells.
   Cells are the _____ _____ of all organisms. They are small compartments that contain all the _____ and _____ necessary to keep an organism alive.
   Cells vary in _____ and _____.

2. Circle the different shapes of the cells that were shown in the video.

triangular	spindle shaped	rod shaped	oval	heart
spherical	star shaped	rectangular	irregularly shaped	polygonal

3. The shape of the cell depends on the _____ of the cell.

Part B: Listen to instructions and complete the following task.

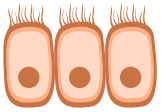
1. Write a function for each item.

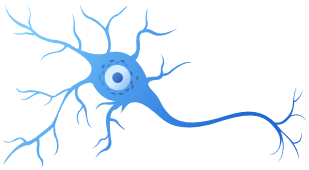
Item	Function
Pen	
Ruler	
Eraser	
Calculator	

   a) Does each item have its own function?
   Yes/No
   b) Is the function of each item interchangeable with the other items?
   Yes/No

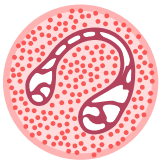
2. **Just as each stationery item has its own purpose, different types of cells have different _____. These different types of cells are specialised.**

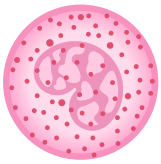
The cells below are each found in different parts in your body. Do you know where they are found?


epithelial cell

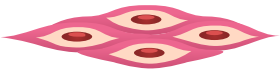

nerve cell


neutrophil


eosinophil

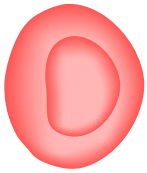

basophil


sperm cell


smooth muscle cell


red blood cell


bone cell


monocyte

Exploring Cell City

Complete the worksheet using the information from the presentation.

1. What are organelles?

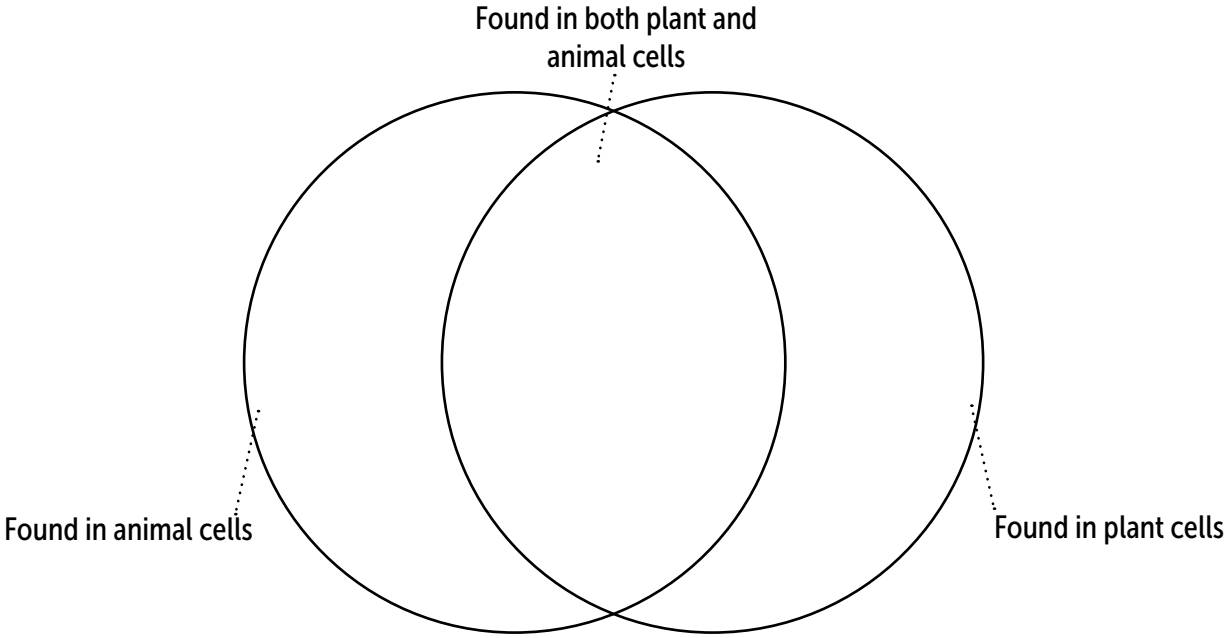
_____

_____

2. Fill in the table with relevant information from the slides.

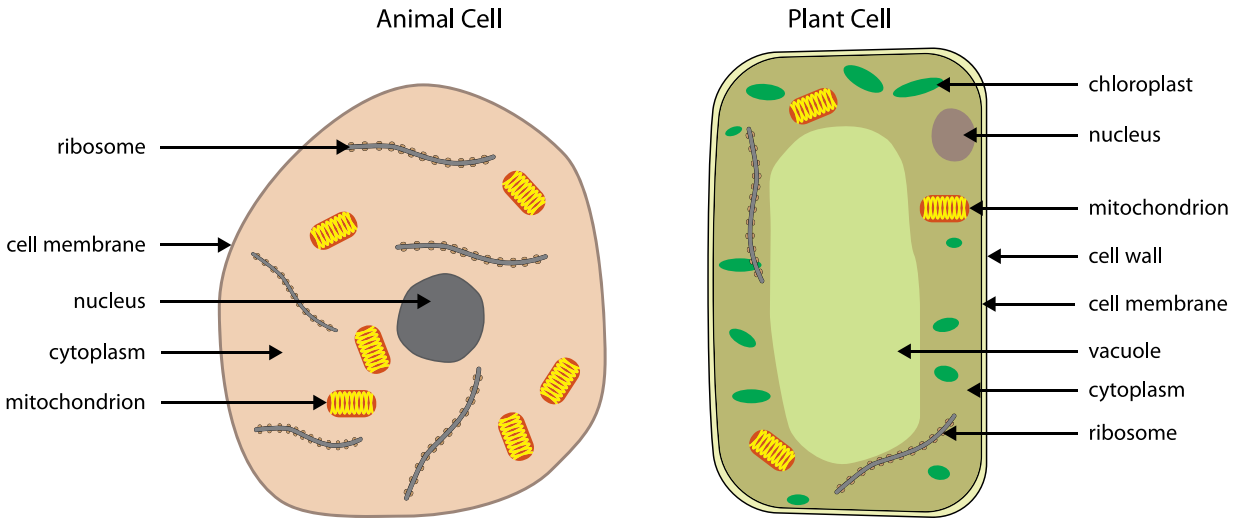
Part of city	Corresponding cell organelle	Function	Where is it found?	
			Animal	Plant
City hall				
Transport system				
Environment				
Factory				
City police				
Power station				
Post office				
Recycling facility				
Water plant				
City wall				
Solar power plant				

3. Classify the organelles using the Venn diagram below.



Can You Haiku the Organelles?

Haiku is a very short form of Japanese poetry. A traditional haiku poem consists of three lines, with the first and last line having 5 syllables, and the middle line having 7 syllables. Choose 5 organelles and create a haiku poem for each of them, describing their characteristics and functions. Don't forget to follow the 5-7-5 rule!



For example:

NUCLEUS

Membrane-bound structure,

found in plants and animals,

controlling the cell.

An Introduction to Microscopes

LAB LESSON

OBJECTIVES

In this lesson, students will gain skills and knowledge regarding the use of a microscope.

ACARA CONTENT DESCRIPTIONS

Cells are the basic units of living things; they have specialised structures and functions (ACSSU149)

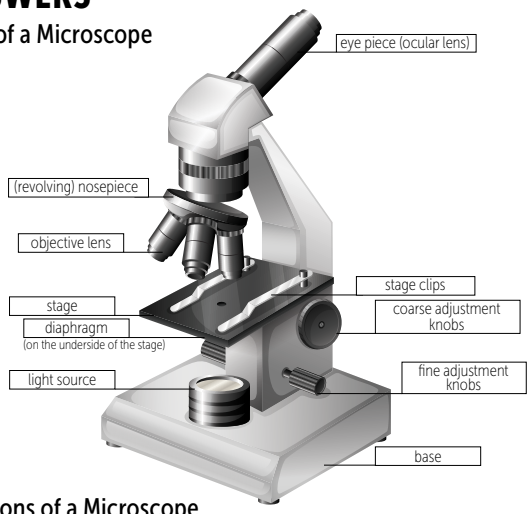
- examining a variety of cells using a light microscope

LESSON PLAN

Activities	Resources
Activity 1: What Do We Use to See? Use the following questions as discussion points: • What tool do you use to enlarge printed text that is too small for your eyes? *(Magnifying glass)* • What do people use to view things that are microscopic? *(Light microscope)* 5	
Activity 2: Parts and Functions of a Microscope Give out the Parts of a Microscope worksheet and play the video. As students watch the video, ask them to complete the worksheet. Give out the Functions of a Microscope worksheet and play the same video. As students watch the video, ask them to complete the worksheet. Use the presentation to review answers to the worksheets. 15	• Photocopies of the Parts of a Microscope and Functions of a Microscope worksheets • ClickView video *Using a Microscope - Lab Skills* • Presentation: An Introduction to Microscopes
Activity 3: Let's Use the Microscope Give out the Let's Use the Microscope worksheet. Play the same video from before, asking students this time to take note of the steps involved in using the microscope. Allow time for students to complete Part A of the worksheet individually. Divide students into groups of 3 and hand out the listed materials. Ask students to follow the instructions on Part B of the worksheet and see if they can find any form of life in the pond water. 40	• Photocopies of the Let's Use the Microscope worksheet • ClickView video *Using a Microscope - Lab Skills* • For each group of 3: Glass microscope slides, plastic dropper, pond water, plastic coverslip, paper towels, microscope

ANSWERS

Parts of a Microscope



Functions of a Microscope

Objective lens	Holds microscopic slide in place on the stage
Eyepiece (ocular lens)	A supportive structure that prevents the microscope from tipping over
Focus adjustment knobs (fine and coarse adjustment knobs)	Shines light up through the slide and is directed to the mirror
Stage	Collects light coming through the object and magnifies it
Stage clips	Controls the amount of light that comes through the aperture
Base	Contains the lens that allows you to view the specimen
Diaphragm	Holds objective lens in place
Light source	Moves the stage or upper part of the microscope up and down to focus on the specimen. There is a coarse adjustment knob (used first) and a fine adjustment knob (for fine-tuning the focus)
(Revolving) nosepiece	Holds and supports microscope slides containing the specimen

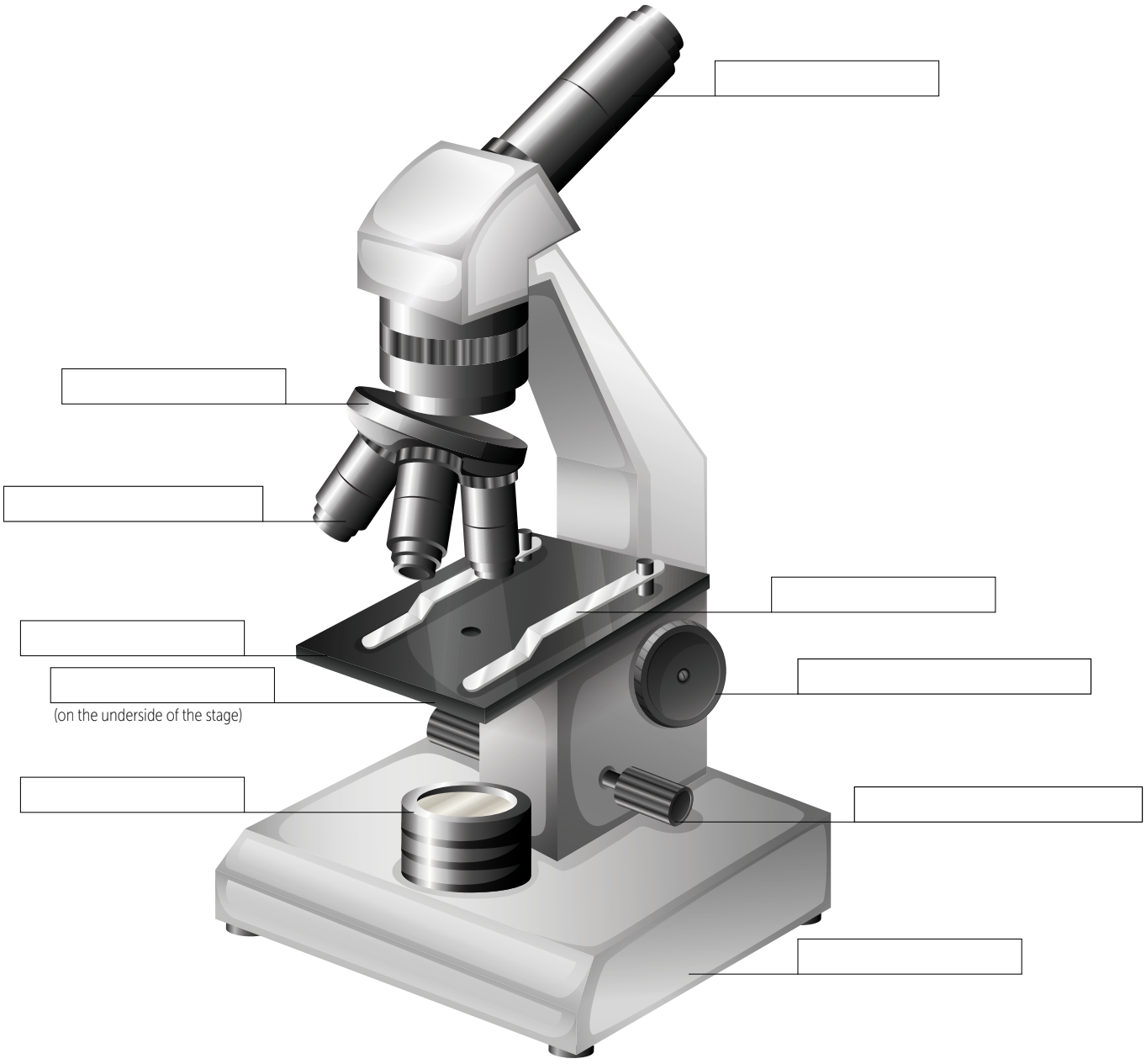
Let's Use the Microscope

1	Carry the microscope with two hands with one hand on the base.
2	Always begin focusing with the lowest power objective lens (e.g. 4x) and the stage in the lowest position so that the slide never touches the objective lens (this avoids cracking of the glass slides and coverslips, and damaging the lens).
3	Use the coarse adjustment knob to move the stage up and focus the specimen.
4	Use the fine adjustment knob to adjust visibility of the specimen, or change to a higher objective lens.
5	View the specimen under the microscope.
6	Lower the stage and then remove the slide when finished.
7	Return the lowest power objective lens into position over the stage, and be sure the stage is at its lowest function when you have finished using the microscope.
8	Turn off the light and wrap the cord correctly before putting it away.

Parts of a Microscope

Label the parts of the microscope with the words in the box below using information from the video and the presentation.

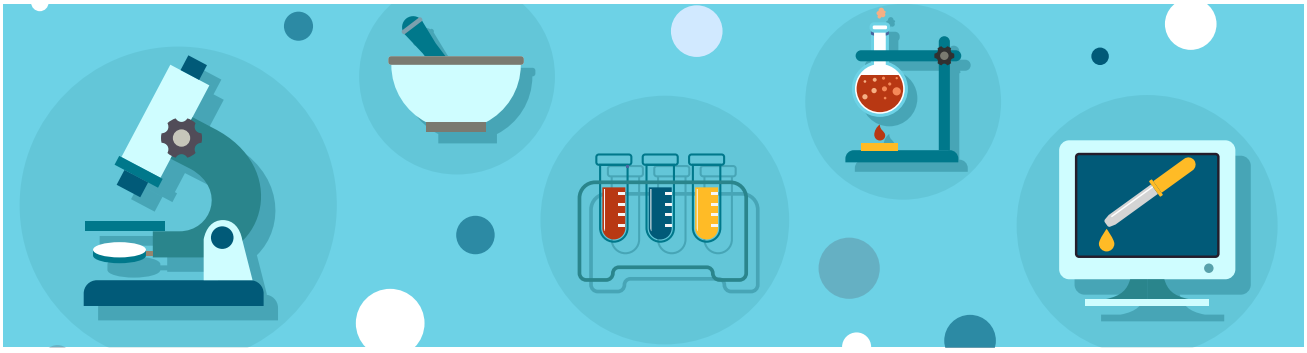
base	fine adjustment knobs	stage	stage clips	eyepiece (ocular lens)
diaphragm	objective lens	coarse adjustment knobs	light source	(revolving) nosepiece



Functions of a Microscope

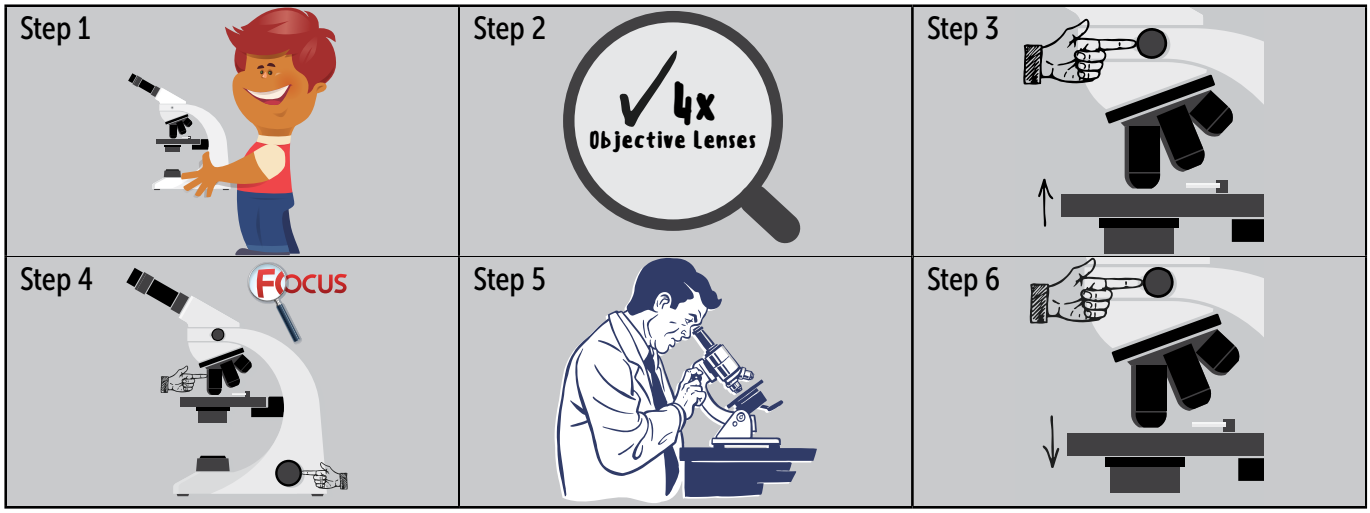
Draw a line to match the features of a microscope to their function. Use the information in the video and the presentation to assist you.

Objective lens	Holds microscopic slide in place on the stage
Eyepiece (ocular lens)	A supportive structure that prevents the microscope from tipping over
Focus adjustment knobs (fine and coarse adjustment knobs)	Sends light up to the slide and is directed to the mirror
Stage	Collects light coming through the object and magnifies it
Stage clips	Controls the amount of light that comes through the aperture
Base	Contains the lens that allows you to view the specimen
Diaphragm	Holds objective lens in place
Light source	Moves the stage or upper part of the microscope up and down to focus on the specimen. There is a coarse adjustment knob (used first) and a fine adjustment knob (for fine-tuning the focus)
(Revolving) nosepiece	Holds and supports microscope slides containing the specimen



Let's Use the Microscope

Part A: Using the pictures as clues, create an instructional manual on how to use a microscope. Some of the steps have been provided to assist you.



Step 1	
Step 2	
Step 3	Use the coarse adjustment knob to move the stage up and focus the specimen.
Step 4	
Step 5	View the specimen under the microscope.
Step 6	
Step 7	Return the lowest power objective lens into position over the stage, and be sure the stage is at its lowest function when you have finished using the microscope.
Step 8	Turn off the light and wrap the cord correctly before putting it away.

Part B: Prepare a slide and observe it under the microscope. Answer the question in the box below.

Materials:

- microscope
- glass microscope slide
- plastic dropper
- pond water
- plastic coverslip
- paper towels

Instructions:

1. Place a drop of pond water onto the microscope slide using a pipette or dropper.
   TIP: Too small a drop may result in the specimen in the water being crushed. Use the paper towel to remove excess water from the slide if necessary.
2. Place a coverslip on top of the specimen and observe it under the microscope.

What did you see under the microscope?

Unicellular Organisms

OBJECTIVES

In this lesson, students will learn about unicellular organisms and how they differ from multicellular organisms. They will understand the features of unicellular organisms, and research how these organisms are able to survive with only one cell.

ACARA CONTENT DESCRIPTIONS

Cells are the basic units of living things; they have specialised structures and functions (ACSSU149)

- examining a variety of cells through digital technology or by viewing a simulation
- identifying structures within cells and describing their function

Communicating:
Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS148)

- using digital technologies to construct a range of text types to present science ideas
- selecting and using appropriate language and representations to communicate science ideas within a specified text type and for a specified audience

LESSON PLAN

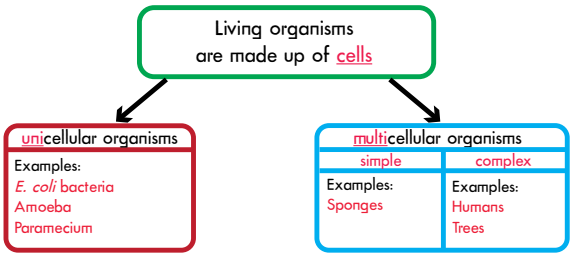
Activities	Resources
Activity 1: How Many Cells Do We Have? Start the lesson by asking students the following questions: • How many cells is the human body comprised of? • Would we be able to survive if we were only made up of one cell? Link discussion to the idea that some organisms in our universe are unicellular and are able to survive with just one cell. 5	
Activity 2: Types of Organisms Give out the Different Types of Organisms worksheet and play the video. As students watch the video, ask them to complete Part A of the worksheet. Review answers as a class. 15	• Photocopies of the Different Types of Organisms worksheet • ClickView video *Multicellular Organisms and their Nervous Systems* ChaThe pter 1
Activity 3: Getting to Know a Unicellular Organism! Divide students into groups of 3 and ask them to research a unicellular organism. Play the video to give students some examples of organisms they could research (Hydra or Amoeba). They may wish to use the template found on Part B of the worksheet as a guide to create an informative poster or PowerPoint presentation to document their findings. When students are finished, allow them to present their research to the class. 40	• Different Types of Organisms worksheet • ClickView video *Nutrition in Microscopic Animals - Amoeba, Hydra and Paramecium* • Laptops

ANSWERS

Different Types of Organisms

Part A:

1.



2.

Statement	Unicellular organisms	Multicellular organisms
These organisms have specialised cells with specialised functions.		✓
These organisms are more likely to reproduce asexually.	✓	
Everything that the organism needs to survive is found in one cell.	✓	
These organisms are usually large in size.		✓

Part B:

Example of an organism:

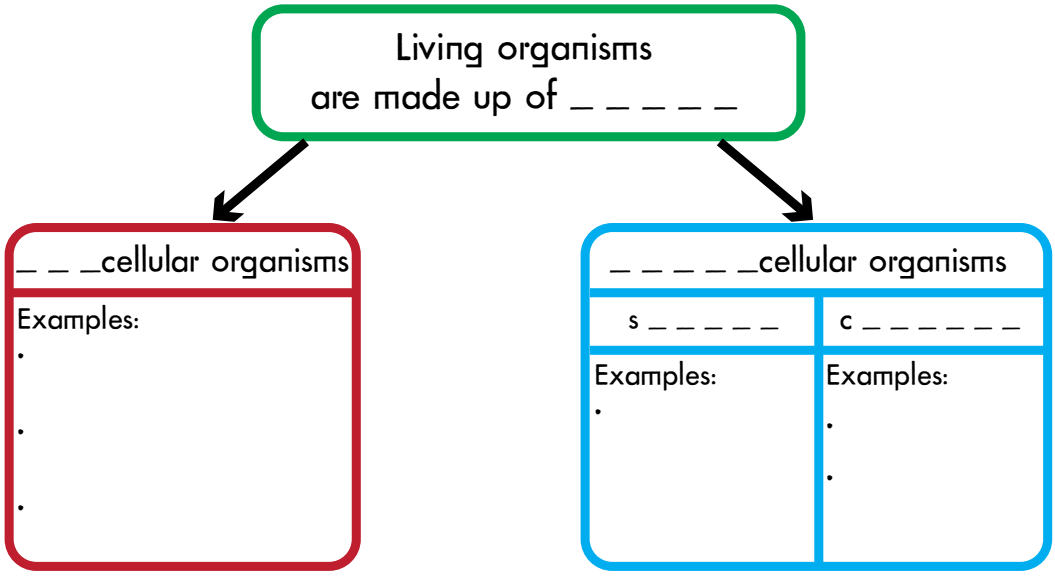
Amoeba			
What am I?	A unicellular organism found in every major lineage of eukaryotic organisms	Movement	Moves using pseudopods, which are bulges of cytoplasm due to coordinated action of actin microfilaments pushing out plasma membrane surrounding the cell
Where am I found?	Found in freshwater ponds and on the surface of leaves and plants	Reproduction	Asexual reproduction when conditions are right. No reproduction during high stress levels
What do I feed on?	Feeds on bacteria, other protists and sometimes dead organic material through phagocytosis	Feeding	Engulfs food with the pseudopods and forms food vacuoles. Food is digested by enzymes
What is found inside me?	No cell wall and contains a single nucleus	Interesting fact	Contains a contractile vacuole that expels excess water from the cell to maintain pressure

Other possible organisms: Euglena, *E.coli* bacteria

Different Types of Organisms

Part A: Types of Organisms

1. Complete the diagram as you watch the video.



2. Tick the correct box for each statement.

Statement	Unicellular organisms	Multicellular organisms
These organisms have specialised cells with specialised functions.		
These organisms are more likely to reproduce asexually.		
Everything the organism needs to survive is found in one cell.		
These organisms are usually large in size.		

Part B: Get to Know a Unicellular Organism!

There are many unicellular organisms out there in the universe. Choose one unicellular organism from the video or online and research its main features as well as its adaptations for survival. Refer to the sample poster below for inspiration. You may wish to present your findings on PowerPoint. You cannot choose paramecium for this task.

PARAMECIUM: a unicellular organism

What am I?

I am a unicellular organism of the phylum Ciliophora. I am a heterotroph, which means I cannot make my own food.

Where am I found?

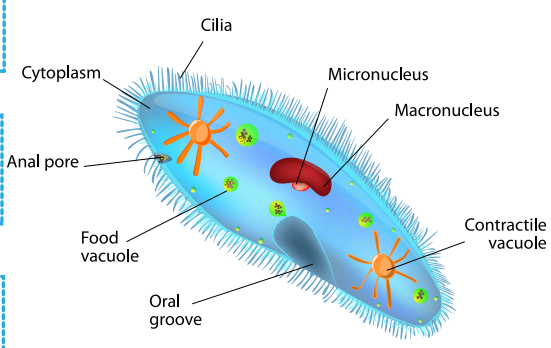
I am found in freshwater ponds.

What do I feed on?

I feed on algae and bacteria through a process known as phagocytosis.

What is found inside me?

I have more than one nucleus.
I have an oral groove for feeding and an anal pore for excretion.



Movement

I am covered with tiny hair-like structures called cilia and they help me push through water, enabling me to swim.

Reproduction

I can reproduce both sexually and asexually depending on stress levels.

Feeding

I use my cilia to sweep my food into my oral groove. When enough food has accumulated, a food vacuole forms and it is digested in my cytoplasm.

Interesting Fact

I have a contractile vacuole that helps maintain water pressure inside me by releasing water into the environment when required.

The Cell Cycle

LAB LESSON

OBJECTIVES

In this lesson, students will learn about the cell cycle through modelling and research activities. They will understand why the cell cycle is such an important process for any organism.

ACARA CONTENT DESCRIPTIONS

Cells are the basic units of living things; they have specialised structures and functions (ACSSU149)

- recognising that cells reproduce via cell division
- describing mitosis as cell division for growth and repair

Process and analysing data and information:
Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (ACSIS145)

- drawing conclusions based on a range of evidence including primary and secondary sources

LESSON PLAN

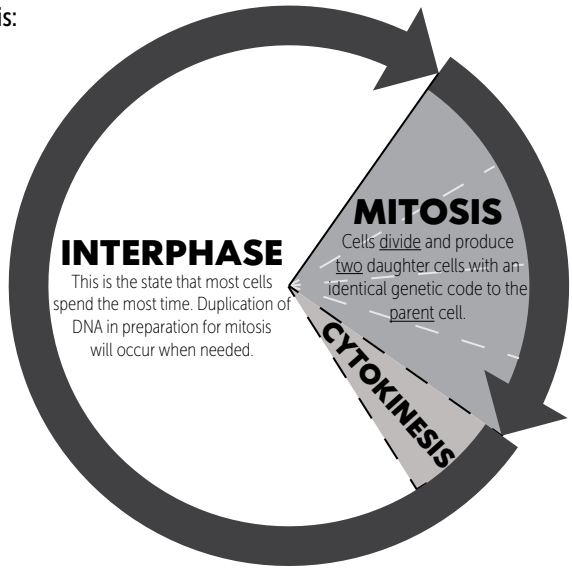
Activities	Resources
Activity 1: Learning about the Cell Cycle Give out the Learning about the Cell Cycle worksheet. Play Chapter 3 of the video and ask students to complete Part A while watching the video. Review answers as a class. 20	• Photocopies of the Learning about the Cell Cycle worksheet • ClickView video *Mitosis and Meiosis* Chapter 3
Activity 2: Assembling the Cell Cycle Give out the Assembling the Cell Cycle worksheet, divide students into groups of 3 and give out the materials required for the activity. Ask students to use the visual diagram and the materials to model the cell cycle. Walk around the class to offer guidance if required. Ask students to use information from the video and the Assembling the Cell Cycle worksheet to complete Part B of Learning about the Cell Cycle worksheet. Review answers when students have finished. 30	• Photocopies of the Assembling the Cell Cycle worksheet • For each group of 3: A3 paper, 80 cm of thick string, two 10 cm cut outs, 5 different pairs of coloured gummy snakes • For each group of 3: Camera, pencil, eraser, scissors • Learning about the Cell Cycle worksheet
Activity 3: All about the Cell Cycle Give out the All about the Cell Cycle worksheet. Ask students to choose 2 questions (1 odd numbered and 1 even numbered) to research. Students must present their findings in a PowerPoint slide. Allow students to present their findings when they are done. >30	• Photocopies of the All about the Cell Cycle worksheet • Laptops

ANSWERS

Learning about the Cell Cycle

Part A:

Mitosis:



The processes in the cell cycle allow the living tissues in our body to grow and repair.

Part B:

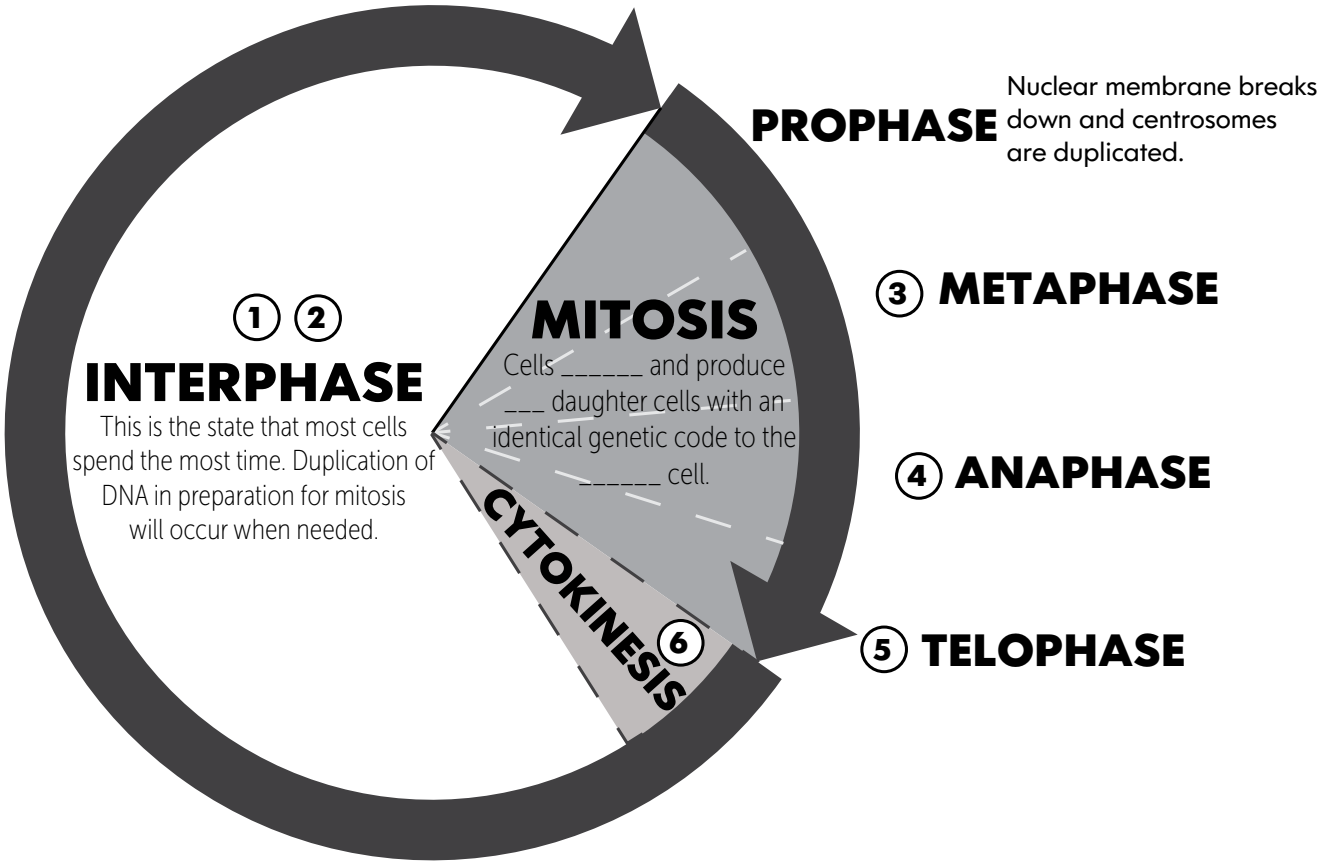
Description	Stage	Description	Stage
Chromosomes line up neatly end to end with spindle fibres attached to the centre of the chromosomes.	3	The chromatids (half of a chromosome) split and are pulled to either end of the cell.	4
A membrane forms around each set of divided chromatids.	5	The cell is in its resting state.	1
DNA in the cell is copied and the chromatids (original and newly copied DNA) condense to form an x-shaped structures known as chromosomes.	2	The cell pinches in the middle to form two daughter cells, each with one nucleus.	6

All about the Cell Cycle

Students' answers may vary.

Learning about the Cell Cycle

Part A: Complete this section using information presented in the video.



The processes in the cell cycle allow the living tissues in our body to ____ and _____.

Part B: Use the information from the video and the 'Assembling the Cell Cycle' worksheet to match each description below to steps 1-6 as shown above. Note: The numbering shown above corresponds to the steps on the 'Assembling the Cell Cycle' worksheet.

Description	Stage	Description	Stage
Chromosomes line up neatly end to end with spindle fibres attached to the centre of the chromosomes.		The chromatids (half of a chromosome) split and are pulled to either end of the cell.	
A membrane forms around each set of divided chromatids.		The cell is in its resting state.	
DNA in the cell is copied and the chromatids (original and newly copied DNA) condense to form an x-shaped structure known as chromosomes.		The cell pinches in the middle to form two daughter cells, each with one nucleus.	

Assembling the Cell Cycle

Model the processes of the cell cycle using the given instructions and materials below. Take a picture after each step.

CELL CYCLE: MITOSIS

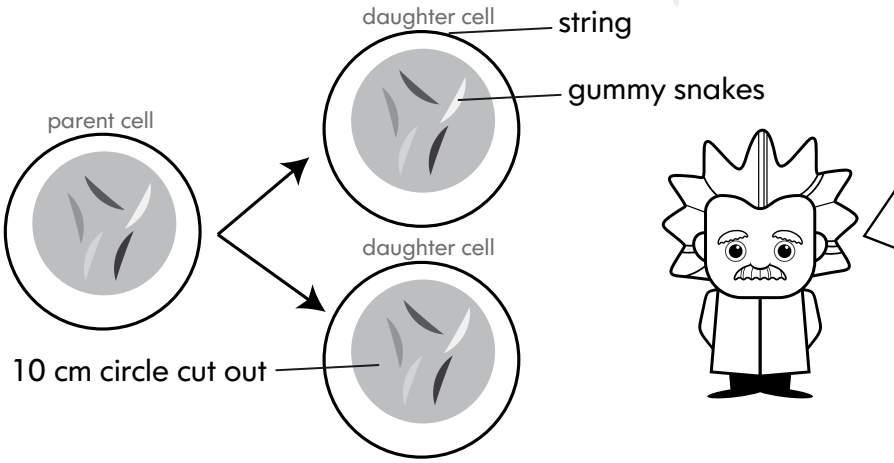
Instructions

Understand how mitosis works by following the step-by-step guide shown below using the given materials.

Materials

- a piece of A3 paper
- 80 cm of thick string
- 5 different pairs of gummy snakes
- two10 cm diameter circular cut outs (coloured paper)
- camera
- pencil
- eraser
- scissors

Mitosis results in two daughter cells, each having the same number and kind of chromosomes as the parent cell.



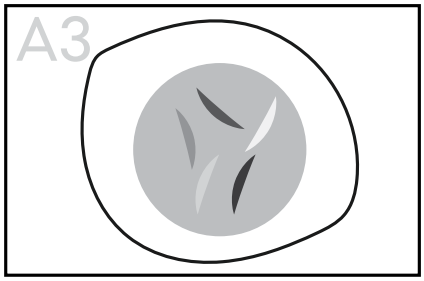
Key

take photo

cut string

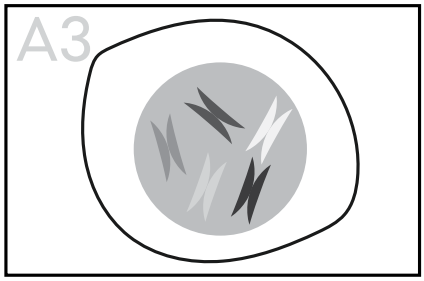
erase pencil marks

draw on paper



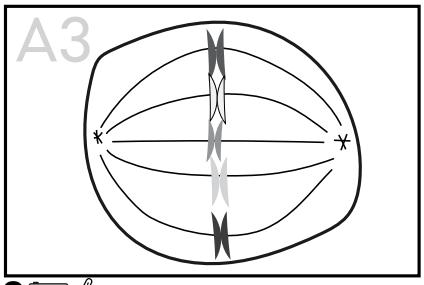
1

Use 80 cm of thick string, a 10 cm circle cut out and 5 different gummy snakes to form the diagram above on the A3 paper.



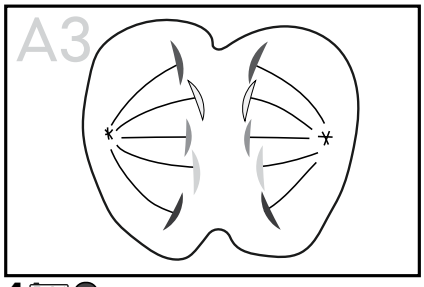
2

Pair each gummy snake with an identical gummy snake.



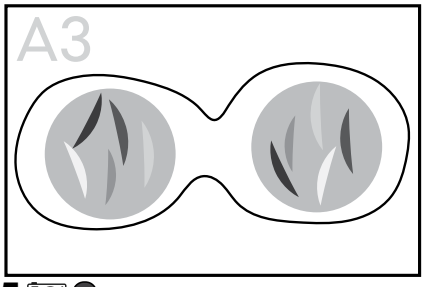
3

Remove the cut out and line the pairs of gummy snakes along the middle. Draw the two * symbols and the lines linking the gummy snakes to the symbols.



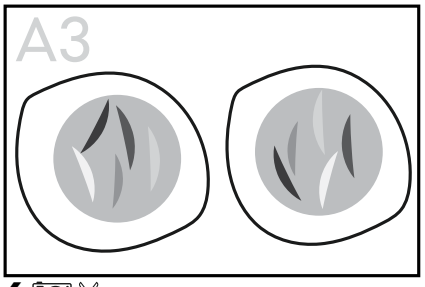
4

Erase part of the pencil marks to create a path between the gummy snake pairs.



5

Erase all pencil lines and put gummy snakes back onto the 10 cm cut outs.

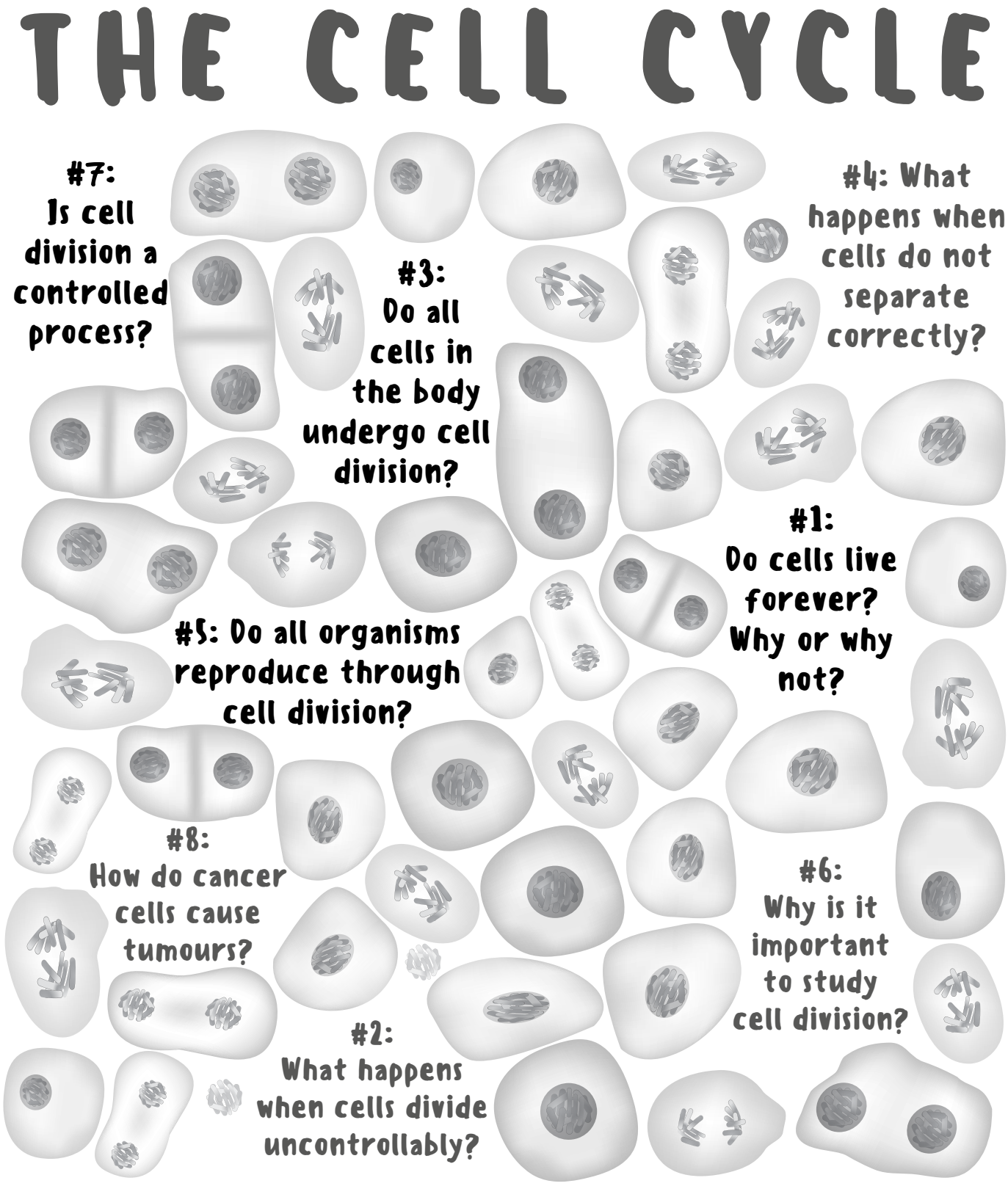


6

Snip the string to create two complete circles around the cut outs. You have just represented mitosis!

All about the Cell Cycle

Select two questions (1 odd numbered and 1 even numbered) and research their answers using reliable sources. Present the answers to your questions using PowerPoint using one slide per question. Include pictures with your findings and limit your answers to 10 sentences or less.



*Remember to credit your source.

An Introduction to Reproduction

OBJECTIVES

In this lesson, students will learn about reproduction. They will understand that it's possible for an organism to reproduce asexually and/or sexually.

ACARA CONTENT DESCRIPTIONS

Multi-cellular organisms contain systems of organs carrying out specialised functions that enable them to survive and reproduce (ACSSU150)

- distinguishing between asexual and sexual reproduction
- comparing reproductive systems of organisms

Processing and analysing data and information:
Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (ACSIS145)

- constructing tables, graphs, keys and models to represent relationships and trends in collected data
- drawing conclusions based on a range of evidence including primary and secondary sources

LESSON PLAN

Activities	Resources
Activity 1: How Are Babies Made? Start the lesson by asking students to write down 3-5 sentences about how human babies are conceived. This will test their prior knowledge. Possible questions that can be used for prompting: • How does it happen? • Who is involved? • How long does it take for a baby to be born from the time of conception? 10	• Notebook/blank paper
Activity 2: Learning about Reproduction Give out the Learning about Reproduction worksheet to each pair of students and play Chapter 1 of the video. As students watch the video, have them complete the worksheet. You may need to play the video more than once. 15	• ClickView video *Sexual and Asexual Reproduction* Chapter 1 • Photocopies of the Learning about Reproduction worksheet
Activity 3: Ocean Invaders Give out the Ocean Invaders 1 and 2 worksheets and instruct students to work in pairs/groups. After reading the newspaper article on Ocean Invaders 1, students are to complete the questions. Review the answers when students are done. 35	• Photocopies of the Ocean Invaders 1 and 2 worksheets

ANSWERS

Learning about Reproduction

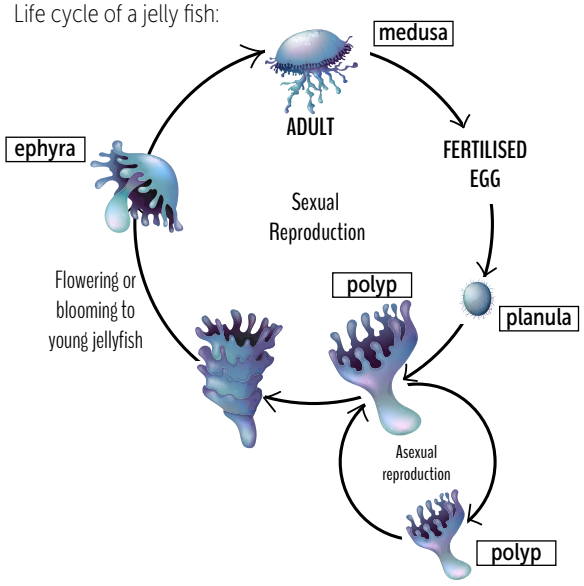
1. a) Asexual reproduction
   b) Sexual reproduction
2. Students' answers may vary.

	Asexual reproduction	Sexual reproduction
Number of parent cell(s)	1	2
Describe the differences in the exchange of genetic material in each of the reproductive strategies.	• no exchange of genetic material • offspring arise from one cell in one parent organism	• union of two cells usually from two different parents
Example of organisms:	Archea, bacteria, protists, daffodils, potatoes, cacti, fungi	Mammals, flowering plants

3. True
4. They are known as gametes.

Ocean Invaders

1. Asexual and sexual reproduction
2. No
3. Sexual reproduction usually takes a longer time. Processes such as mating are required so as to fertilise eggs, whereas asexual reproduction does not require any fertilisation (only involves 1 organism).
4. A jellyfish bloom is more likely to happen as there are more resources to support a large quantity of baby jellyfish. Polyps are able to choose when to reproduce and will do so when conditions are suitable.
5. Internal fertilisation results in higher survival rates than can occur with external fertilisation. It limits the space in which the sperm and eggs are found in and increases the chance of successful fertilisation.
6. Life cycle of a jelly fish:



Learning about Reproduction

Complete the following questions as you watch the video.

1. What are the two basic types of reproduction?

   a) _____

   b) _____

2. Fill in the table below.

	Asexual reproduction	Sexual reproduction
Number of parent cells:		
Describe the differences in the exchange of genetic material in each of the reproductive strategies.		
Examples of organisms:	*Cacti,...*	*Humans,...*

3. Tick **true** or **false**.

   Single-celled organisms usually reproduce asexually. True ☐ False ☐

4. What are sex cells otherwise known as?

   _____

Complete the following questions as you watch the video.

1. What are the two basic types of reproduction?

   a) _____

   b) _____

2. Fill in the table below.

	Asexual reproduction	Sexual reproduction
Number of parent cells:		
Describe the differences in the exchange of genetic material in each of the reproductive strategies.		
Examples of organisms:	*Cacti,...*	*Humans,...*

3. Tick **true** or **false**.

   Single-celled organisms usually reproduce asexually. True ☐ False ☐

4. What are sex cells otherwise known as?

   _____

Ocean Invaders 1

IN BLOOM

VOL 1. NO. 1 CLICKVIEW DAILY NEWS FREE

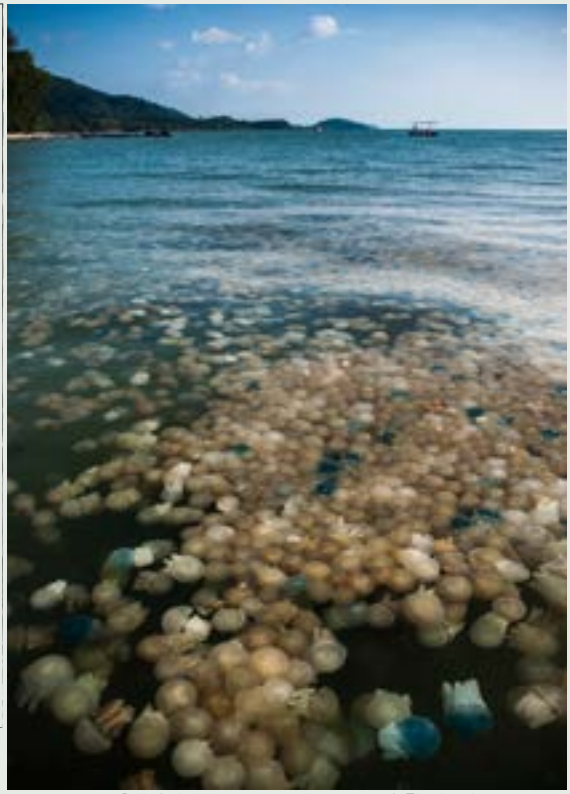
OCEAN INVADERS

CREATURES THAT HAVE HACKED EVOLUTION

If 'the survival of the fittest' is the basis of evolution, then we certainly need to keep an eye on the jellyfish who are perfecting both asexual and sexual reproduction!

Out of nowhere, a smack of jellyfish will suddenly appear in their hundreds of millions and invade a patch of sea. They wreak all kinds of havoc, including clogging nets and terrifying swimmers. They have even managed to block power plant cooling systems! But the strange thing is, they disappear as quickly as they appear. The million-dollar question is:

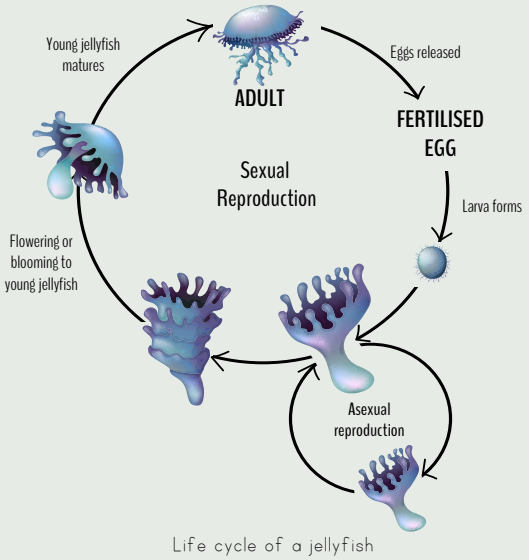
HOW DO THEY REPRODUCE SO QUICKLY?



Jellyfish blooming in the seas of Thailand

LIFE CYCLE OF A JELLYFISH

It turns out that baby jellyfish do not always look like the floating jellyfish we commonly see. These floating jellyfish are in the adult phase known as '**medusa**'. Prior to this phase, jellyfish exist as **planula** (larva) and then **polyps**. Male and female medusae release sperm and eggs from their mouth. Depending on species of jellyfish, fertilisation can occur in the water or internally in the female's mouth. These fertilised eggs eventually develop into planulae. A planula further develops and attaches itself to a hard surface and becomes a stalk-like structure known as a **polyp**. It is at this stage where the magic happens. When conditions are favourable, the polyps detach and bloom into **ephyra**, and finally morph into **medusa**, the form that victims of jellyfish stings are unfortunately familiar with.



Life cycle of a jellyfish

ASEXUAL REPRODUCTION

However, this form of sexual reproduction does not explain the explosive blooms seen frequently in the oceans surrounding Asia.

Polyps attached to a hard surface are able to reproduce asexually too by budding! This happens when a polyp divides into half and produces a clone of itself. No mating required! Generations of polyps can continue to build their underwater clone polyp colonies in this way until environmental conditions are favourable for blooming. In fact, polyps can remain dormant in this phase of the jellyfish life cycle for a year or longer if conditions are not ideal for blooming.

THE SECRET OF THE BLOOM

What happens then when conditions become ideal for blooming? Millions of polyps detach as ephyra (immature jellyfish) forming huge carpets of jellyfish across the sea! Now, when people say jellyfish blooms "appear out of nowhere", we can understand what they mean!

Ocean Invaders 2

Read the newspaper article and answer the following questions. If your answers come from the article, highlight the parts in the article.

1. What types of reproduction strategies do jellyfish use to produce offspring?

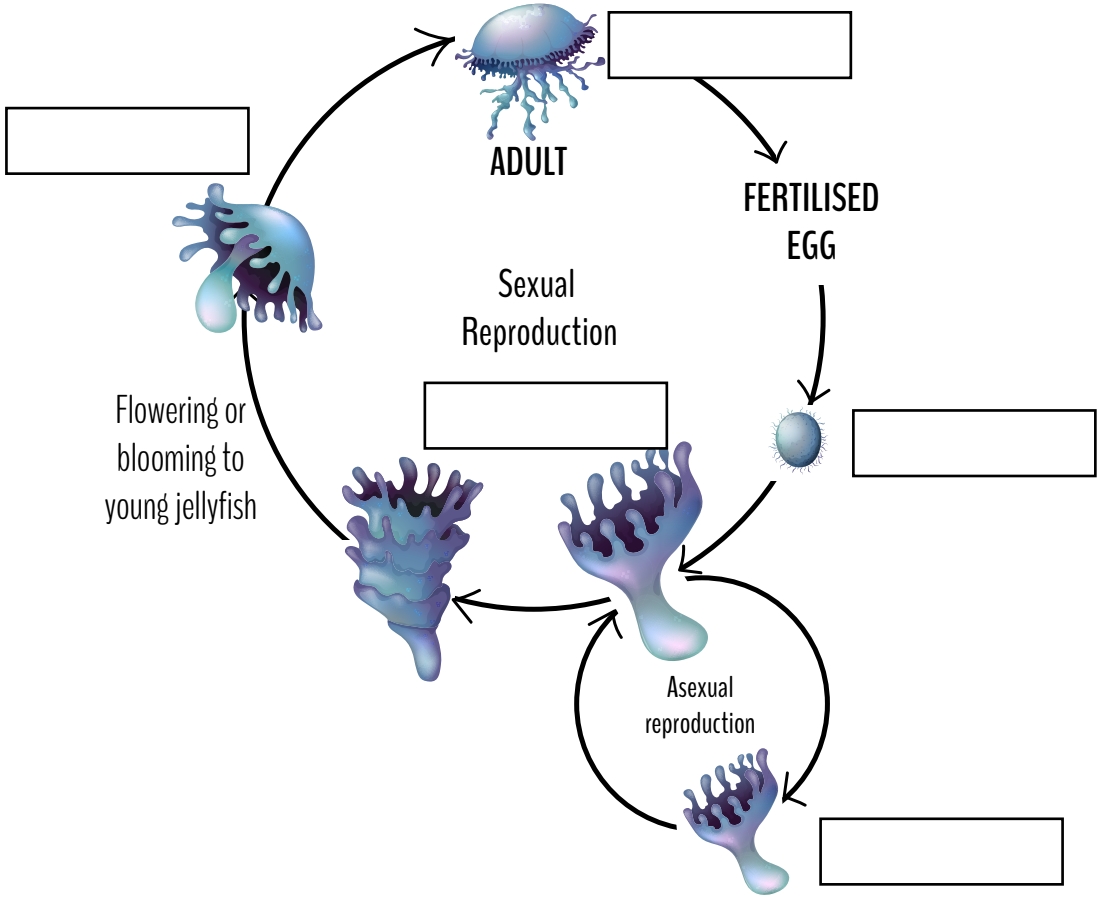
2. Is any form of mating involved during asexual reproduction?

3. Which type of reproduction takes longer, asexual or sexual? Why do you think this is the case?

4. In times when food is plentiful, will a jellyfish bloom be more or less likely to happen. Why?

5. Can you think of a reason why internal fertilisation for the jellyfish is more efficient than external fertilisation? (The answer is not found in the article.)

6. Complete the jellyfish life cycle with the life stages using information from the article.



Sexual vs. Asexual Reproduction

OBJECTIVES

In this lesson, students will learn about asexual and sexual reproduction, including the main processes of each reproduction type as well as the different subtypes of the production methods.

ACARA CONTENT DESCRIPTIONS

Multi-cellular organisms contain systems of organs carrying out specialised functions that enable them to survive and reproduce (ACSSU150)

- distinguishing between asexual and sexual reproduction
- comparing reproductive systems of organisms

Processing and analysing data and information:
Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (ACSIS145)

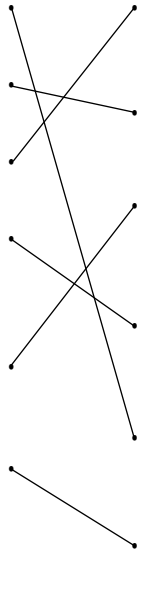
- drawing conclusions based on a range of evidence including primary and secondary sources

LESSON PLAN

Activities	Resources
Activity 1: Learning about Asexual Reproduction Ask students to list the two types of reproduction strategies organisms use: • Asexual reproduction • Sexual reproduction Give out the Learning about Asexual Reproduction worksheet and play Chapter 2 of the video. Ask students to complete the worksheet as they watch the video. The video may need to be played more than once. 20	• Photocopies of the Learning about Asexual Reproduction worksheet • ClickView video *Sexual and Asexual Reproduction* Chapter 2
Activity 2: Learning about Sexual Reproduction Give out the Learning about Sexual Reproduction worksheet and play Chapters 3 and 4 of the video. Ask students to complete the worksheet as they watch the video. Review the answers when students are finished. 10	• Photocopies of the Learning about Sexual Reproduction worksheet • ClickView video *Sexual and Asexual Reproduction* Chapter 3 Chapter 4
Activity 3: Sexual vs. Asexual Reproduction Give out the Sexual vs. Asexual Reproduction worksheet and let students work in pairs to complete the task. Ask students to share their answers and discuss how they arrived at their conclusion. Open the presentation and ask students to deduce whether each organism shown reproduces asexually or sexually. Clues are given for each example. 30	• Photocopies of the Sexual vs. Asexual Reproduction worksheet • Presentation: Sexual vs. Asexual Reproduction

ANSWERS

Learning about Asexual Reproduction



Binary Fission (Bacteria, protozoa)	Division of cytoplasm is unequal (involving an outgrowth that separates from the parent)
Multiple Fission (Bacteria, protozoa)	Asexual reproduction resulting in more than two daughter cells
Budding Yeast, hydra, coral	No exchange of genetic material (involving dispersal of genetic material from the parent through the environment)
Fragmentation Flatworms, marine worms, starfish (sea stars), sea urchins	Body of organism breaks down into two or more fragments
Spores Bacteria, protozoa, fungi	Asexual reproduction resulting in two daughter cells
Vegetative Propagation Strawberries, daffodils, potatoes, sweet potatoes, ginger	Forms offspring without spores or seeds

Learning about Sexual Reproduction

Reproduction in Animals

1. the combination of gametes from two different organisms
2. Suggested answers:

Direct development	Indirect development
Humans, birds, other mammals	Amphibians, echinoderms, insects
Inside the organism	Outside the organism
Offspring look similar to parents	Offspring do not look similar to parents
Small numbers	Large numbers

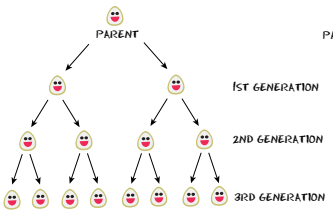
Reproduction in Plants

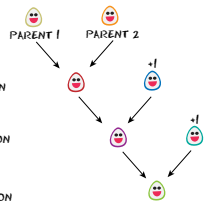
1. Suggested answers:

Reproductive organs in the human reproductive system	Reproductive organs in the plant reproductive system
Testes	Anthers
Ovaries	Carpels

2. pollen grains
3. Cross pollination ensures the genetic diversity of flowering plants.

Sexual vs. Asexual Reproduction





No. of offspring
Asexual: 8
Sexual: 0 (always requires 2 parents)

Learning about Asexual Reproduction

Match the following types of asexual reproduction to their descriptions as you watch the video.

Binary Fission

(Bacteria and protozoa)

•

- Division of cytoplasm is unequal (involving an outgrowth that separates from the parent)

Multiple Fission

(Bacteria and protozoa)

•

- Asexual reproduction resulting in more than two daughter cells

Budding

An example of an organism:

_____

•

- No exchange of genetic material (involving dispersal of genetic material from the parent through the environment)

Fragmentation

An example of an organism:

_____

•

- Body of organism breaks down into two or more fragments

Spores

An example of an organism:

_____

•

- Asexual reproduction resulting in two daughter cells

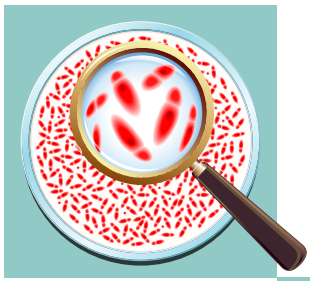
Vegetative Propagation

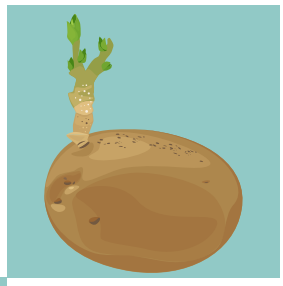
An example of an organism:

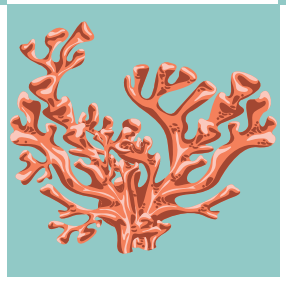
_____

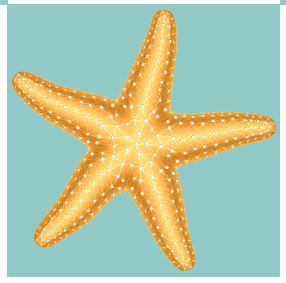
•

- Forms offspring without spores or seeds









Learning about Sexual Reproduction

Answer the following questions as you watch the video.

Reproduction in Animals

1. Complete the following sentence.

   Sexual reproduction usually involves _____.

2. Complete the table below.

	Type of development	
	Direct development	Indirect development
Examples of organisms		
Location where fertilisation takes place		
Appearance of juvenile offspring		
Offspring numbers		

Reproduction in Plants

1. Complete the table below using the video and your own knowledge.

	Reproductive organ in the human reproductive system	Reproductive organ in the plant reproductive system
Male	Testes	
Female	Ovaries	

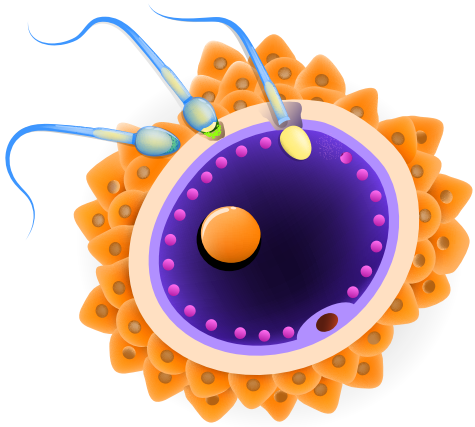
2. Complete the following sentence.

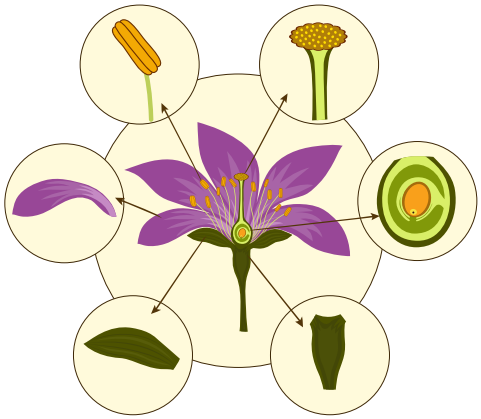
   Testes is to sperm as **anther** is to _____ _____.

3. What is the main advantage of cross pollination?

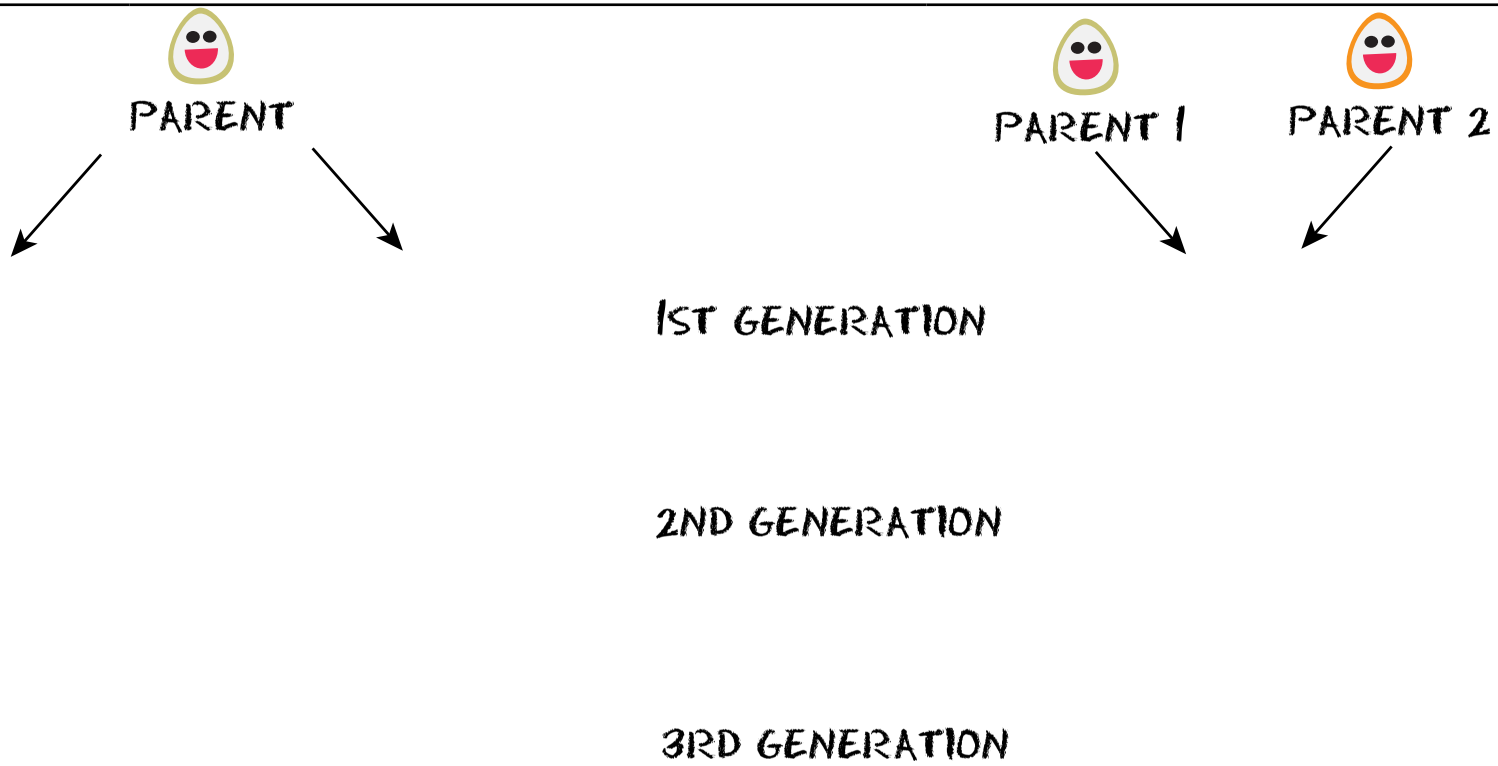
   _____

   _____





Complete the diagram to show how sexual and asexual reproduction differ for each generation.



By the 3rd generation, how many offspring can you produce with only one parent? Give your reasoning.		
	Asexual reproduction	Sexual reproduction
Number of offspring		
Reasoning		

Comparing Reproduction Methods

OBJECTIVES

In this lesson, students will explore the differences between asexual and sexual reproduction by comparing both methods and deciding which would be the ideal reproduction method for a new organism.

ACARA CONTENT DESCRIPTIONS

Multi-cellular organisms contain systems of organs carrying out specialised functions that enable them to survive and reproduce (ACSSU150)

- distinguishing between asexual and sexual reproduction
- comparing reproductive systems of organisms

Processing and analysing data and information:
Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (ACSIS145)

- drawing conclusions based on a range of evidence including primary and secondary sources

Communicating:
Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS148)

- selecting and using appropriate language and representations to communicate science ideas within a specified text type and for a specified audience

LESSON PLAN

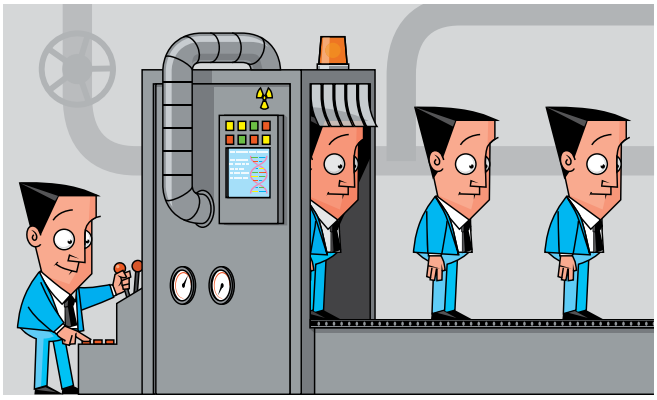
Activities	Resources
Activity 1: Reproductive Strategies Review what has already been learnt in the previous lessons regarding the two types of reproductive strategies: • Sexual reproduction • Asexual reproduction 5	
Activity 2: How Should I Reproduce? Open the presentation to slide 2 and ask students to read through the task. Play Chapter 5 of the video as a guide to help students choose an ideal reproduction method for the new species. Allow students to work in pairs to complete the task. 20	• Presentation: Comparing Sexual Reproduction • ClickView video *Sexual and Asexual Reproduction* Chapter 5
Activity 3: Let's Debate about Reproduction Divide the class into two groups: one supporting asexual reproduction and the other supporting sexual reproduction. Allow students to debate why they have chosen their respective reproduction strategy. As students debate, record the points mentioned on the board or on paper. Give out the Why Reproduce Asexually or Sexually? worksheet and discuss the points recorded. Ask students to fill up the worksheet with the relevant information. 35	• Photocopies of the Why Reproduce Asexually or Sexually? worksheet

ANSWERS

Why Reproduce Asexually or Sexually?

Advantages	
Asexual reproduction	**Sexual reproduction**
• Often more offspring produced • No partner/carrier required • Less complicated • Less energy required • More reliable • Faster	• Greater genetic variability and mixing • Better survival in changing habitats

Disadvantages	
Asexual reproduction	**Sexual reproduction**
• Lack of genetic diversity • Individuals can be easily wiped out during a change in their environment due to lack of genetic diversity	• Slower process • Requires a compatible partner • Competition for mates • Possible injury/death during courtship/mating • More complicated process • More energy required to produce offspring



Why Reproduce Asexually or Sexually?

List the **advantages** for reproducing asexually/sexually.

Asexual reproduction	Sexual reproduction

List the **disadvantages** for reproducing asexually/sexually.

Asexual reproduction	Sexual reproduction

Organs and Organ Systems

OBJECTIVES

In this lesson, students will learn about the different organ systems in the human body. They will learn that cells, tissues and organs make up an organ system.

ACARA CONTENT DESCRIPTIONS

Multi-cellular organisms contain systems of organs that carry out specialised functions that enable them to survive and reproduce (ACSSU150)

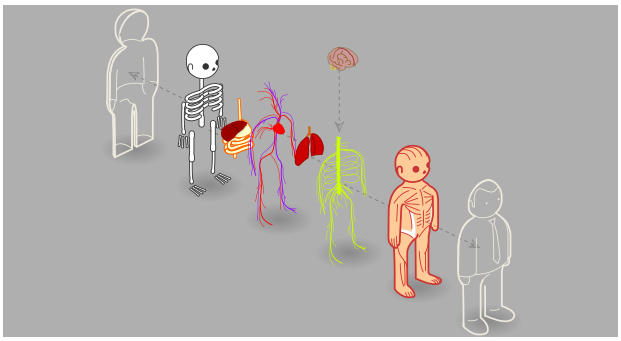
- identifying the organs and overall function of a system of a multicellular organism in supporting the life processes
- describing the structure of each organ in a system and relating its function to the overall function of the system

Processing and analysing data and information:
Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (ACSIS145)

- drawing conclusions based on a range of evidence including primary and secondary sources

LESSON PLAN

Activities	Resources
Activity 1: From Cells to Organism Give out the From Cell to Organism worksheet. Play Chapter 2 of the video and ask students to complete the worksheet while watching. Pause when required for students to catch up. 15	• Photocopies of the From Cell to Organism worksheet • ClickView video *Multicellular Organisms and their Nervous Systems* Chapter 2
Activity 2: How Many Organs Do You Know? Give out How Many Organs Do You Know? worksheet and divide students into groups of 3. Allow time for groups to complete the worksheet. Use the presentation to review the answers. 20	• Photocopies of the How Many Organs Do You Know? worksheet • Colour pencils • Presentation: Organs and Organ Systems
Activity 3: We Are the Organ Workers! Give out the We Are the Organ Workers! worksheet and ask students to complete it individually. Assign each student a different organ and allow them time to research using the Internet or their textbook. When students are finished, group them according to the organ system they belong to and allow them to share their answers. >35	• Photocopies of the We Are the Organ Workers! worksheet • Laptops/ textbooks



ANSWERS

From Cell to Organism

Cell	Tissue	Organ	Organ system
Different cells perform different functions Examples: • Nerve cells transmit electrical signals • Skin cells protect the body and serve as a barrier against the environment • RBC delivers oxygen to the body • Muscle cells for contraction	**A collection of cells** Different types of cells put together in a coordinated matrix that work together in a cooperative manner Plant tissues: • vascular • epidermis • ground Animal tissues: • muscle • connective • nervous • epithelial	**A collection of tissues** A group of tissues working together to perform a specific function or a group of functions Plant organs: • leaves • roots • flowers Animal organs: • lungs • eyes • kidneys • sex organs	**A collection of organs that allow different processes to occur in the body**

How Many Organs Do You Know?

Possible answers:

Circulatory system	Digestive system	Respiratory system
• heart • arteries • veins	• mouth • esophagus • stomach • small intestine • large intestine • rectum • anus • liver • pancreas • gallbladder	• lungs • nose • trachea • diaphragm
Excretory system		
• kidneys • ureters • bladder • urethra • lungs		
Muscular system	**Skeletal system**	**Nervous system**
• smooth muscular tissue • skeletal muscles • cardiac muscle	• bones • ligaments and joints • cartilage • tendons	• brain • spinal cord • nerves • sensory organs

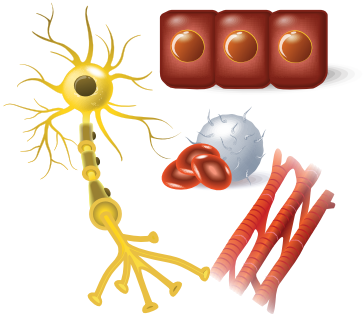
We Are the Organ Workers!

Students' answers may vary.

From Cell to Organism

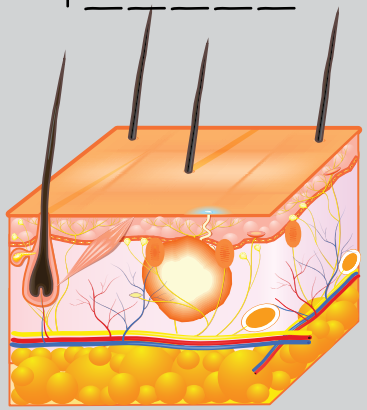
Complete the worksheet using the relevant information from the video.

C___ → T_____ → O_____ → ORGAN S_____ → ORGANISM



Different cell types perform different _____.

List two different types of cells and explain their functions:



A collection of _____

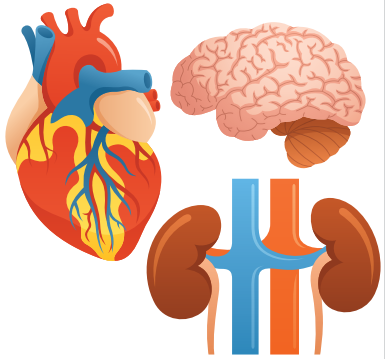
Different types of cells put together in a _____ matrix that work together in a _____ manner

Examples of **plant** tissues:

-
-
-

Examples of **animal** tissues:

-
-



A collection of _____.

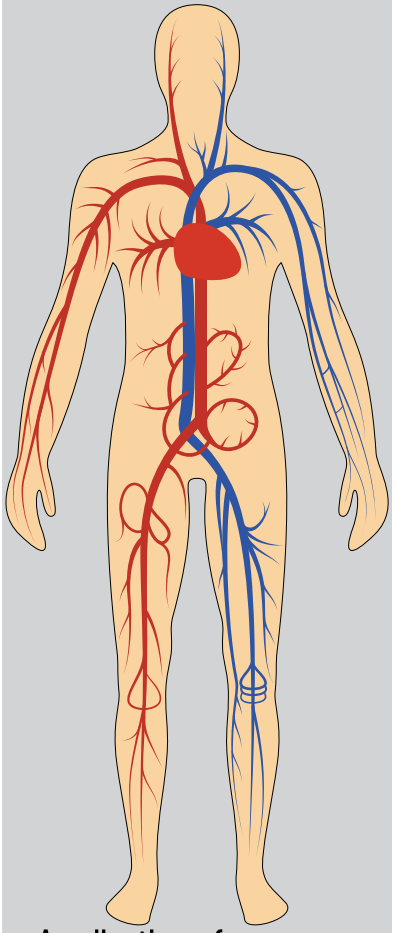
A group of tissues working together to perform a _____ function or a group of functions

Examples of **plant** organs:

-
-
-

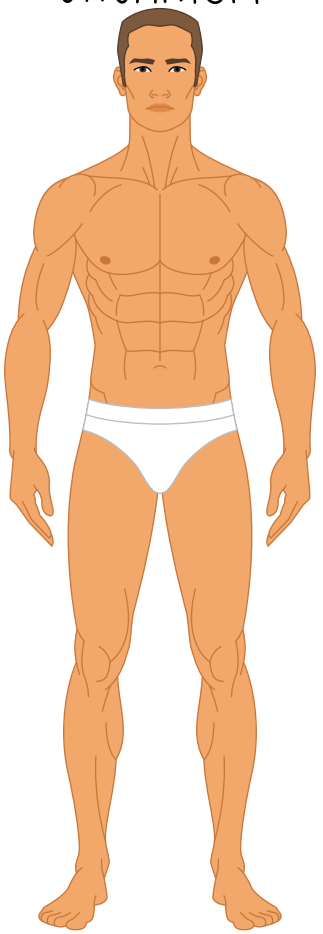
Examples of **animal** organs:

-
-
-



A collection of _____ that allow different _____ to occur in the body

(Circulatory system, respiratory system,...)

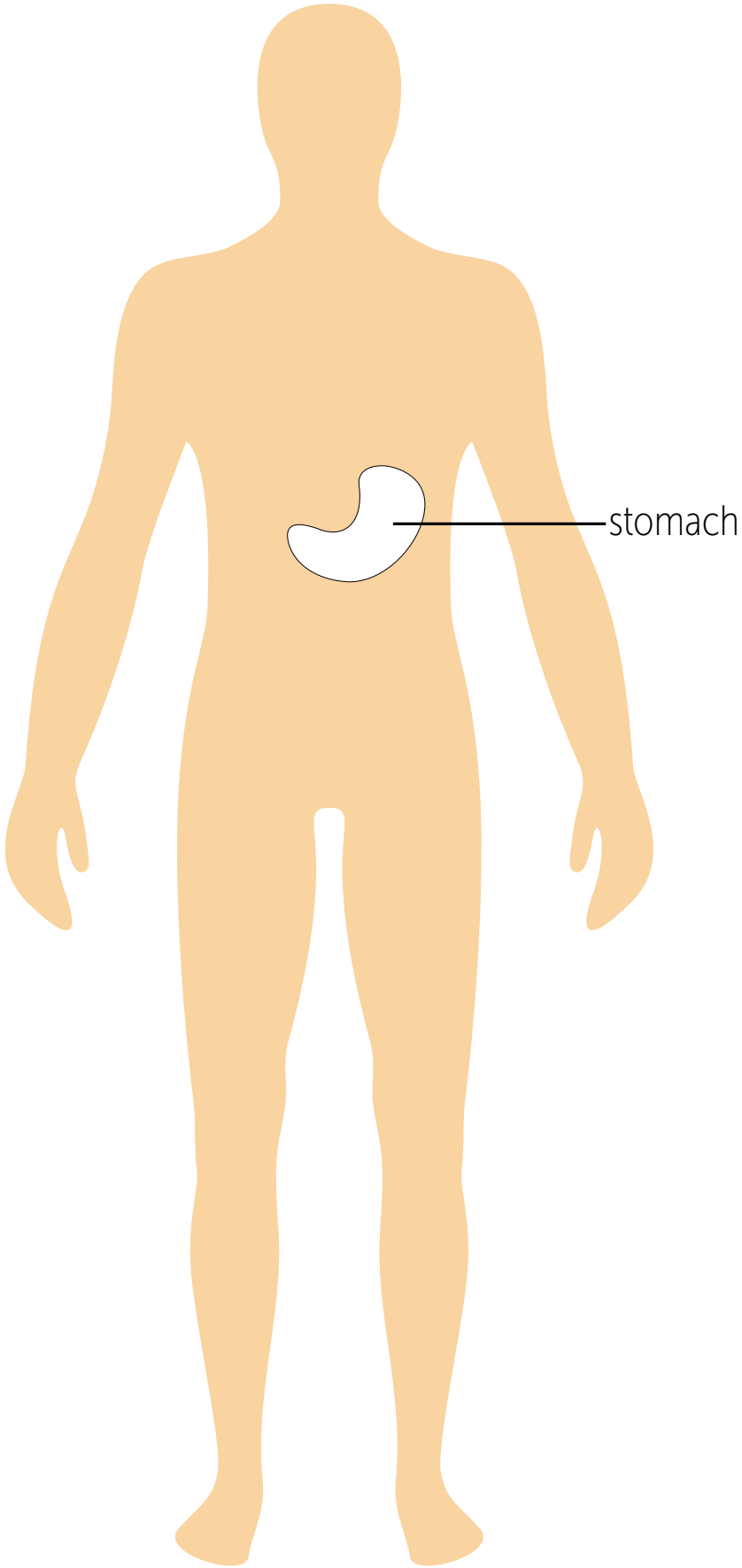


How Many Organs Do You Know?

How many human organs do you know? Label the scientific diagram below to show the shape of the organs and their locations inside the body outlined below. An example has been done for you.

Scientific diagrams are:

- 2D
- clear
- not shaded
- labelled correctly.



We Are the Organ Workers!

Imagine the human body is a factory. A new manager has just been appointed to oversee the functions of the factory. As an organ worker at the factory, you are asked to provide a description of your role to the manager. Complete the job description form found below based on the organ assigned to you.

JOB DESCRIPTION FORM

1. PERSONAL DATA

Please provide a picture of yourself.

WHAT IS YOUR NAME? *(name of organ)*

_____

WHICH PART OF THE FACTORY ARE YOU LOCATED IN? CHOOSE FROM THE FOLLOWING.

- ☐ Skeletal system
- ☐ Muscular system
- ☐ Reproductive system
- ☐ Excretory system
- ☐ Nervous system
- ☐ Respiratory system
- ☐ Circulatory system

WHAT KIND OF EMPLOYMENT DO YOU HAVE WITHIN THE FACTORY?

- ☐ Full-time employment
- ☐ Part-time employment
- ☐ Casual employment

2. JOB DETAILS

WHAT RESPONSIBILITIES ARE ASSOCIATED WITH YOUR JOB?

_____

_____

_____

_____

_____

WITH WHOM IN THE FACTORY DO YOU WORK CLOSELY WITH? NAME THE OTHER WORKERS.

_____

_____

CAN THE FACTORY FUNCTION WITHOUT YOU? WHY OR WHY NOT?

_____

_____

_____

DO YOU REQUIRE INPUT FROM EXTERNAL FACTORS? IF YES, WHAT ARE THEY?

_____

_____

THANK YOU FOR YOUR COOPERATION.

States of Matter

OBJECTIVES

In this lesson, students will learn about the different states of matter at the molecular level. They will learn about particle theory and the different processes each state undergoes.

ACARA CONTENT DESCRIPTIONS

Properties of the different states of matter can be explained in terms of the motion and arrangement of particles (ACSSU151)

- explaining why a model for the structure of matter is needed
- modelling the arrangement of particles in solids, liquids and gases
- using the particle model to explain observed phenomena linking the energy of particles to temperature changes

Questioning and Predicting:

Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS139)

- considering whether investigation using available resources is possible when identifying questions or problems to investigate

Processing and analysing data and information:

Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships, including using digital technologies as appropriate (ACSIS144)

- explaining the strengths and limitations of representations such as physical models, diagrams and simulations in terms of the attributes of systems included or not included

LESSON PLAN

Activities	Resources
Activity 1: What Is Happening on the outside of the Glass? As a demonstration, put some ice cubes into a drinking glass. Give out the Understanding the States of Matter worksheet and ask students to complete Part A. They are required to explain what they can observe when the glass is left to stand for 3 minutes. Proceed to ask students the following question to assess prior knowledge: • How many states does water exist in? *(3 states – solid, liquid, gas)* 15	• Drinking glass, ice cubes • Photocopies of the Understanding the States of Matter worksheet
Activity 2: Understanding the States of Matter Allow time for students to attempt Part B of the worksheet. Play the first video and ask students to fill in any missing answers that they did not manage to acquire. Give out the Particles in the States of Matter worksheet. Ask students to fill the worksheet in with as much information as they can from Chapter 3 of the second video. Then, ask them to complete the rest of the worksheet with the help of the presentation. 30	• Photocopies of the Understanding the States of Matter and Particles in the States of Matter worksheets • ClickView video *Changes in States of Matter* • ClickView video *Changing States of Matter* Chapter 3 • Presentation: States of Matter
Activity 3: We Are Molecules! Use this activity to explain what is happening to the state transitions at the molecular level. Refer to the We Are Molecules! 1 and 2 activity guides for instructions. 20	• Photocopy of the We Are Molecules! 1 and 2 activity guides
Activity 4: What's Hidden in the QR Code? Give out the What's Hidden in the QR Code? worksheet and allow time for students to complete the T/F section. Check their answers before students start shading the QR code and have them compete to finish shading first. This activity tests their understanding of the concepts taught and introduces them to the fourth state of matter - plasma. 20	• Photocopies of the What's Hidden in the QR Code? worksheet • A device that can scan QR codes

ANSWERS

Understanding the States of Matter

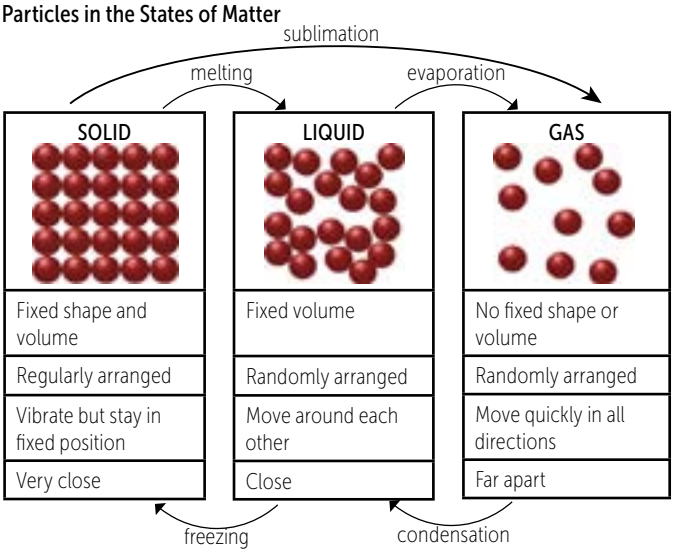
Part A:

Students' answers may vary

Part B:

states, solid, liquid, gas
freezing, melting
gaseous, evaporation, condensation
interchangeable

Particles in the States of Matter



When water changes from solid ⟶ liquid or from liquid ⟶ gas, **energy** is required.

What's Hidden in the QR Code?

Statement No.	T/F
1	F
2	T
3	F
4	T
5	T
6	F
7	F
8	T
9	T
10	T
11	F
12	T
13	F

Lightning is one of Earth's famous naturally occurring plasmas. Plasma differs from the other three states because the particles are not neutral.

CHEMICAL SCIENCES

Understanding the States of Matter

Part A: As you watch the demonstration, write down your observations and reasoning.

WHAT IS HAPPENING ON THE OUTSIDE OF THE GLASS?

Part B: Complete the following sentences by unscrambling the letters.

Solids, liquids and gases are the three _____ of matter, and these states are interchangeable. A _____ like ice
E T T S A S I D O L S

can be changed into water, which is a _____, and it can further be changed into a _____ such as steam.
L I D Q I U A S G

When we cool water in an ice tray, the water which was in the liquid state changes into ice, which is a solid state of matter.

This process is called _____. When we put ice cubes into a kettle and leave it on the table at room
F G I E N R E Z

temperature, the ice cubes change into water. This process is called _____.
M L T E I G N

When we heat water, it changes to water vapour. Water vapour is the _____ state of water. When water
S O U A S E G

changes from the liquid state to the gaseous state, the process is called _____.
E O R A T I V P O A N

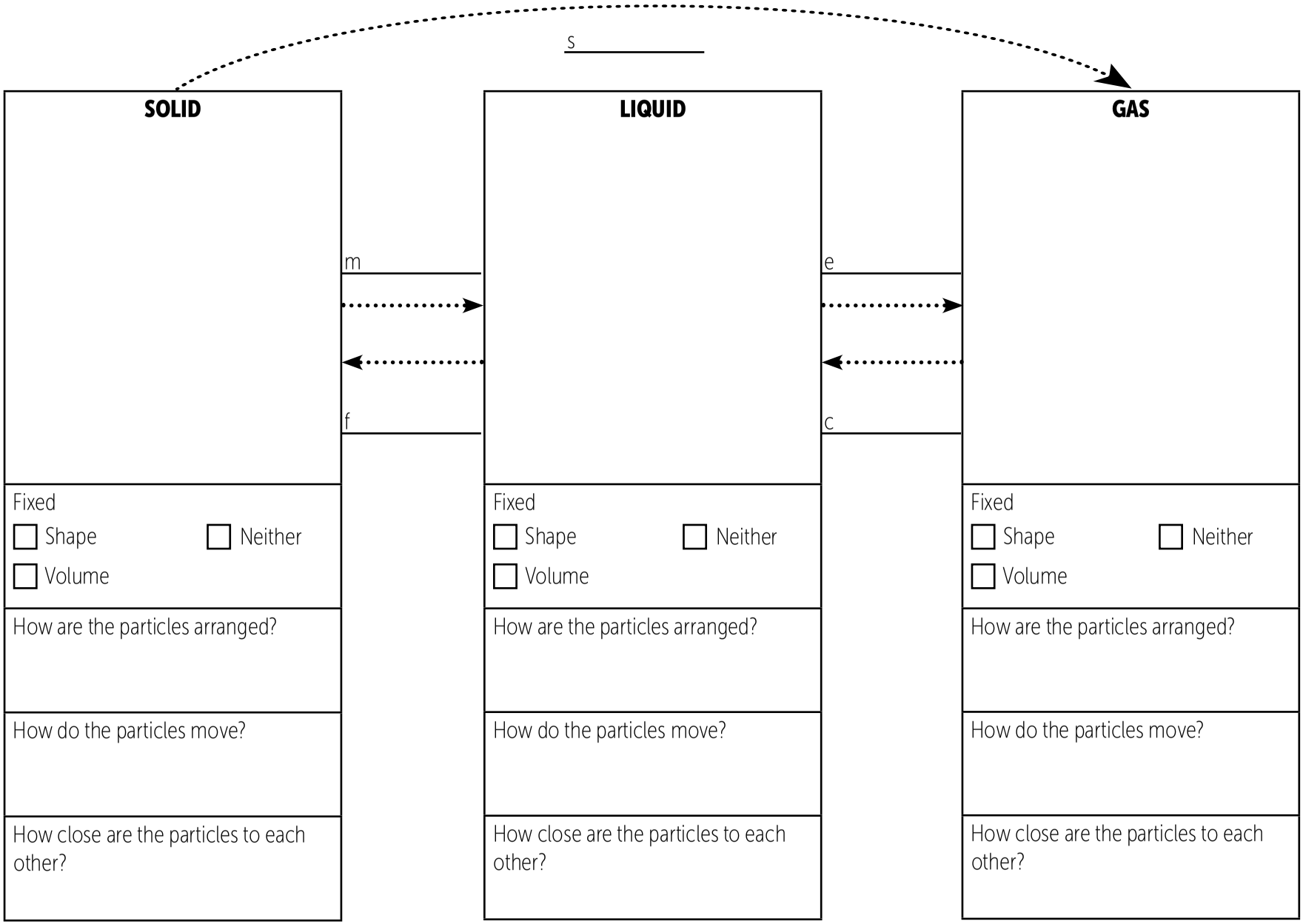
When water vapour comes in contact with a cold surface such as that of a metal plate, it changes to the liquid state. This

conversion is called _____.
C S D N O T N E O A N I

Thus, we see that all the states of matter are _____.
I B E A E N N T G H A R L E C

Particles in the States of Matter

Complete the diagram below about the properties of particles in each state with the help of the video and presentation.



When water changes from solid → liquid, or from liquid → gas, _____ is required.

We Are Molecules! 1

In this activity, students learn to see the states of matter from the molecular level as they pretend to be the molecules of a solid, liquid and gas. This analogy enables them to understand the phase transition concepts in a manner they can better relate to.

SOLID

Theory:

Molecules in a solid phase are tightly packed together, which creates a rigid structure.

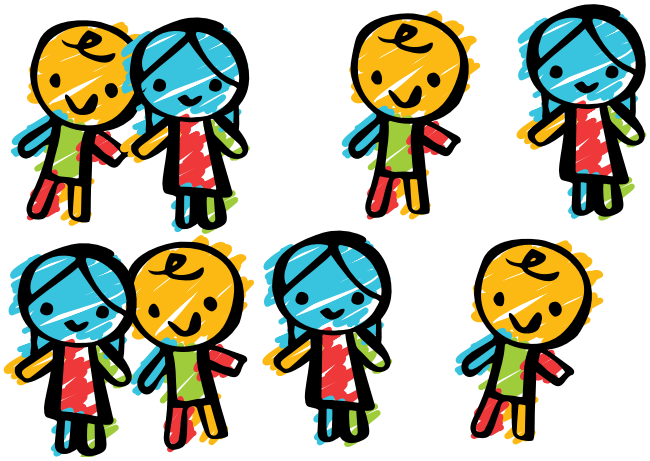
Analogy activity:

Ask students to stand close together, linking arms together.

Questions to ask students:

- Are you able to squeeze closer together?
  (No, they are already closely packed together and cannot be compressed further.)
- Are you able to move around freely?
  (No, they are not able to move around freely, just like the composition of a solid.)

LIQUID



Theory:

Molecules are not as tightly compressed within a liquid as they are in a solid.

A liquid's molecules have freedom to move around and occupy the space they are contained in. They don't hold their shape but they do have a fixed volume.

Analogy activity:

Ask the students to stand in close contact with each other (but still able to move around).

Questions to ask students:

- Are you able to squeeze closer together?
  (No, they are already closely packed together and cannot be compressed further.)
- Are you able to move around freely?
  (Yes, they are able to move around freely. This represents a liquid being able to take up the shape of a container.)

We Are Molecules! 2

GAS

Theory:

Matter in the gas phase doesn't hold its shape and does not have a fixed volume.
Gas particles move quickly in all directions. Gases can be compressed, and completely fill their container.

Analogy activity:

Ask the students to run anywhere in the classroom

Questions to ask students:

- Are you able to squeeze closer together?
  (Yes, they are not closely packed together and can be compressed further.)
- Are you able to move around freely?
  (Yes, they are able to move around freely. This represents gas molecules being able to be compressed further according to the size of the container.)

Phase Transitions

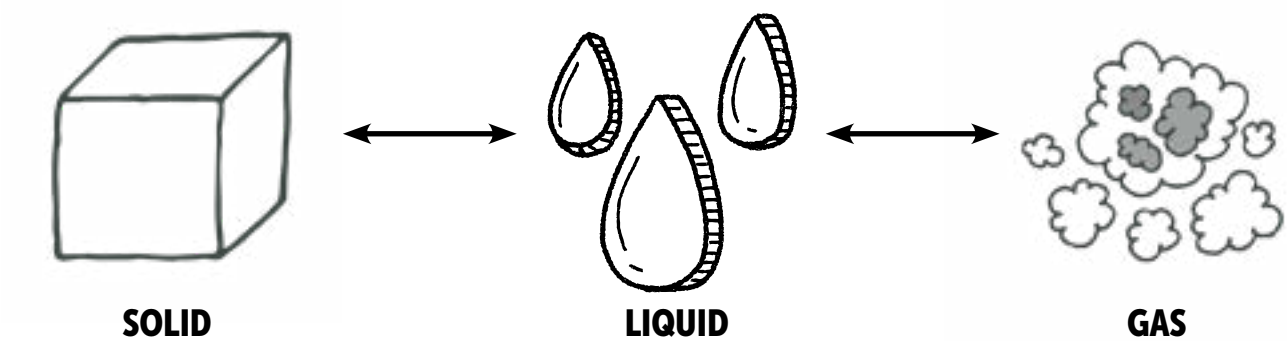
Even though a solid's molecules remain tightly connected to each other, they still vibrate. The "molecules" in the solid phase would be shaking back and forth while still holding hands as they do not have enough kinetic energy to break the bonds between the molecules.

When energy is supplied to the molecules and their vibrations speed up, eventually they will no longer be able to hold hands and will start to move around the classroom (liquid molecules). This can happen when temperature is increased.

If you speed up the vibrations of the liquid molecules even further, they will lose contact with each other and start running around the classroom (gaseous molecules). Gas molecules have the most kinetic energy.

Further Discussion Questions

- What is one advantage of using an analogy activity to understand concepts?
  (It allows us to compare one object or situation to another, allows us to understand a concept through familiar actions.)
- What is one disadvantage of using an analogy activity to understand concepts?
  (There is no perfect fit between the analogy and the concept and the analogue may sometimes not be able to illustrate a particular concept accurately.)



What's Hidden in the QR Code?

Determine whether each of the statements is true or false.

No.	Statements	True/False
1	Water is not the only substance on earth to exist naturally in the solid, liquid and gaseous states.	
2	The states of matter are interchangeable.	
3	Solids have a fixed shape but no fixed volume.	
4	Liquids take the shape of their container.	
5	Freezing is the process of changing a substance from liquid to solid.	
6	Condensation is the process of changing water from gas to solid.	
7	Steam is hot air.	
8	When an ice cube melts, there is no loss in mass.	
9	Energy is required to change matter from liquid to gas.	
10	Melting is the opposite process of freezing.	
11	Gases have the lowest amount of kinetic energy.	
12	The speed at which particles move depends on the amount of energy present in the matter.	
13	Sublimation occurs when a solid changes into a liquid and then to a gas.	

Check your answers are correct with the teacher, then shade the boxes in the QR code that contain the corresponding number for statements that are **true**. This activity will work best using a black pen.

Scan the completed code with a QR code scanner to find the words to complete the sentences.

_____ is one of Earth's famous naturally occurring plasmas. Plasma differs from the other three states because the particles are not _____.

The Periodic Table

OBJECTIVES

In this lesson, students will develop an understanding of the periodic table by learning about how it was created, and its main features. They will learn how to read the various symbols that represent the different elements.

ACARA CONTENT DESCRIPTIONS

Differences between elements, compounds and mixtures can be described at a particle level (ACSSU152)

- locating elements on the periodic table

Nature and development of science:

Scientific knowledge has changed peoples' understanding of the world and is refined as new evidence becomes available (ACSHE134)

- considering how the idea of elements has developed over time as knowledge of the nature of matter has improved

Planning and conducting

Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS140)

- working collaboratively to decide how to best approach an investigation
- taking into consideration all aspects of fair testing, available equipment and safe investigation when planning investigations

LESSON PLAN

Activities	Resources
Activity 1: Why Do We Use This? Open the presentation to the first two slides. These two slides show examples of short forms/ abbreviations commonly used in text messages. Use the following questions to lead into a discussion with students: • Why do people use short forms and abbreviations? *(It saves time and they are widely recognised.)* • What are some of the disadvantages of using short forms/abbreviations? *(If you do not know about them, you will not recognise/understand what is being communicated.)* Similarly, students should understand that the periodic table is a table of organised chemical elements represented by symbols. It is recognised by scientists everywhere (a common language). 15	• Presentation: The Periodic Table
Activity 2: Learning about the Periodic Table Give out the Learning about the Periodic Table worksheet and play Chapter 2 and 3 of the video. Ask students to complete the worksheet as they watch the videos. Using slides 3 and 4 of the presentation, review the answers and highlight the key features of the periodic table, including: • Metals and non-metals (and the in-betweens) • Groups and periods 15	• Photocopies of the Learning about the Periodic Table worksheet • ClickView video *The Periodic Table* Chapter 2 Chapter 3 • Presentation: The Periodic Table
Activity 3: Elements in the Periodic Table Give out the Elements in the Periodic Table worksheet. Using slides 5 and 6, ask students to fill in Part A of the worksheet. Allow time for students to complete Part B and C of the worksheet using the periodic table in the presentation. Review the answers when students have finished. 20	• Photocopies of the Elements in the Periodic Table worksheet • Presentation: The Periodic Table
Activity 4: Decipher the Message! Give out the Decipher the Message! worksheet and allow time for students to complete the activity. This activity allows them to get familiar with the symbols of the periodic table. 10	• Photocopies of the Decipher the Message! worksheet

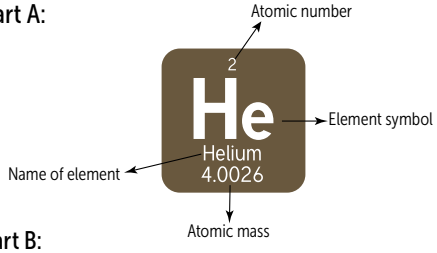
ANSWERS

Learning about the Periodic Table

1. Arsenic (in the mid-13th century)
2. atomic mass
3. periods
4. groups
5. Potassium (K)
6. The elements found in the same group have similar properties (recurring/periodic).
7. They are found in group 1.
   They only have 1 electron in their outer shells.
   They are metals.

Elements in the Periodic Table

Part A:



Part B:

Period	Group	Element name	Element symbol	Number of Electrons
1	1	Hydrogen	H	1
2	15	Nitrogen	N	7
4	7	Manganese	Mn	25
2	2	Beryllium	Be	4
6	11	Gold	Au	79
4	8	Iron	Fe	26
3	13	Aluminium	Al	13
1	18	Helium	He	2
3	2	Magnesium	Mg	12
5	11	Silver	Ag	47
4	4	Titanium	Ti	22

Part C:

1. Cl
2. S
3. Si
4. B
5. F

Decipher the Message

1. Oxygen Potassium ⟶ OK
2. Copper Tellurium ⟶ CuTe
3. Oxygen Magnseum ⟶ OMg
4. Nobellium! That's too Colbalt Radon Yttrium ⟶ No! That's too CoRnY!

Learning about the Periodic Table

Answer the following questions as you watch the video.

1. Which element was scientifically discovered first?

   _____

2. Mendeleev arranged the known elements in order of _____.

3. Horizontal rows are known as _____. (Circle an example on the periodic table.)

4. Vertical columns are known as _____. (Circle an example on the periodic table.)

5. Which element appears below sodium on the periodic table? (Write the symbol on the periodic table below.)

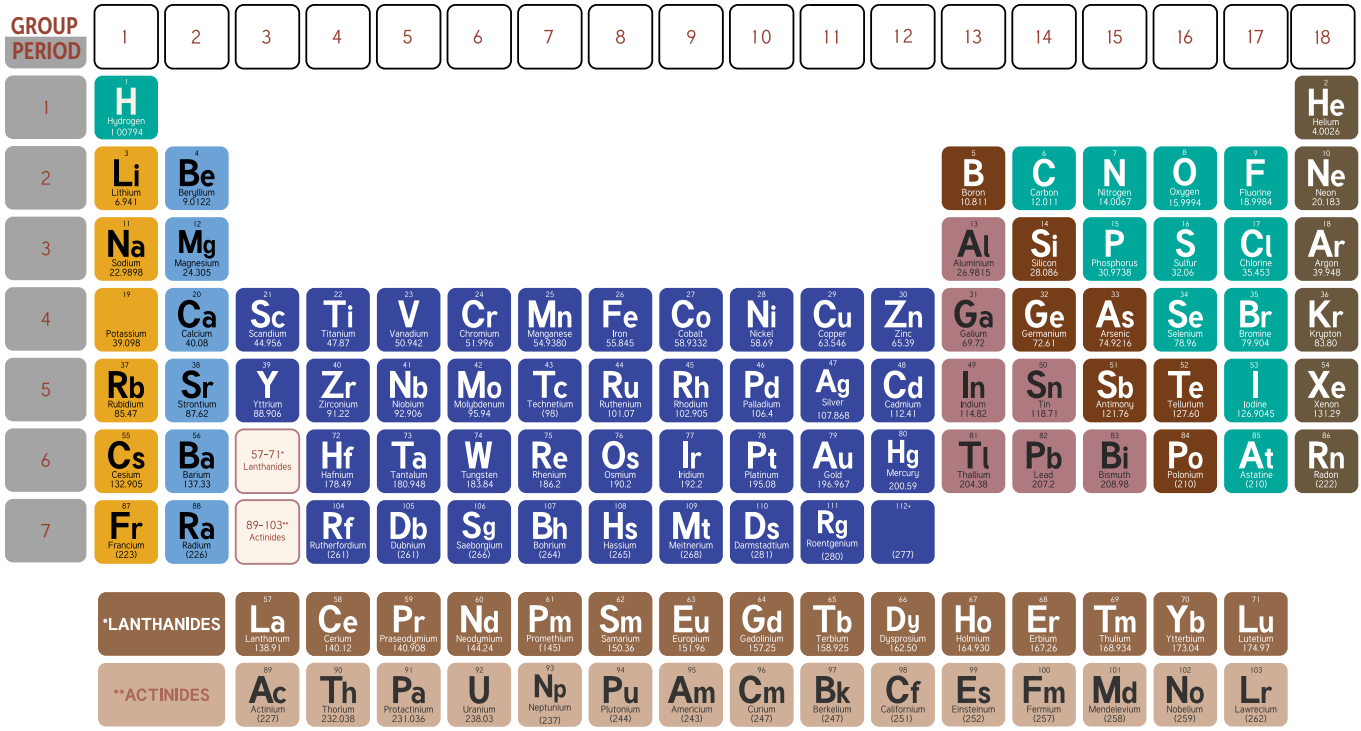
6. Why is the periodic table called the periodic table? (Hint: What does the word 'periodic' mean?)

   _____

   _____

7. What 3 things do sodium, potassium and rubidium have in common?

   - _____
   - _____
   - _____

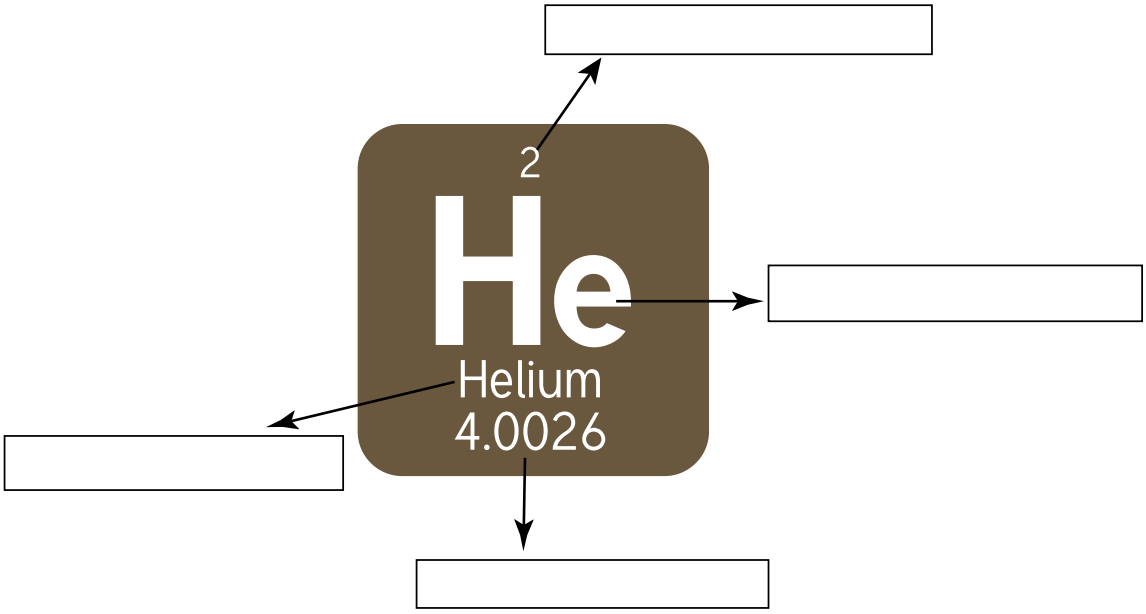


CHEMICAL SCIENCES

Elements in the Periodic Table

Part A: In the periodic table, four important details about each of the elements are provided. Write down what these four components are in the boxes below.

The atomic number shows the number of protons in an element.
In any element, number of electrons = number of protons.



Part B: Fill in the table below using the information found in the periodic table.

Period	Group	Element name	Element symbol	Number of electrons
1	1			
2	15			
4	7			
2	2			
6	11			
4	8			
3	13			
1	18			
3	2			
5	11			
4	4			

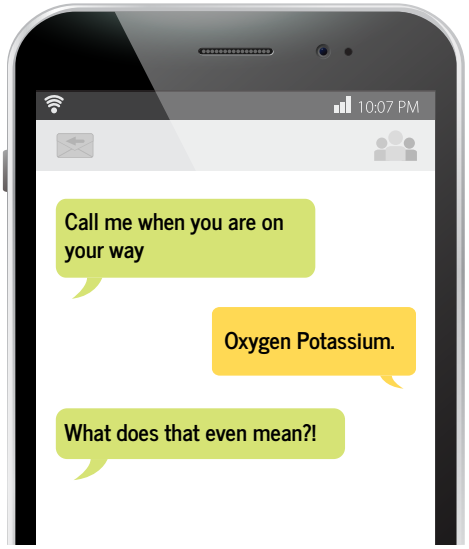
Part C: Choose the odd one out from the following elements in each row.

1.	He	Ne	Cl	Rn
2.	Li	N	O	S
3.	Ru	Fe	Co	Si
4.	Na	K	B	Fr
5.	Be	Mg	K	F

Decipher the Message!

You can say a lot with the periodic table! Decipher each of the messages by writing the symbol of each given element in the boxes to understand the meaning of each message.

1.



Answer: ☐☐

2.

Are you made of COPPER and TELLURIUM? Because you are very

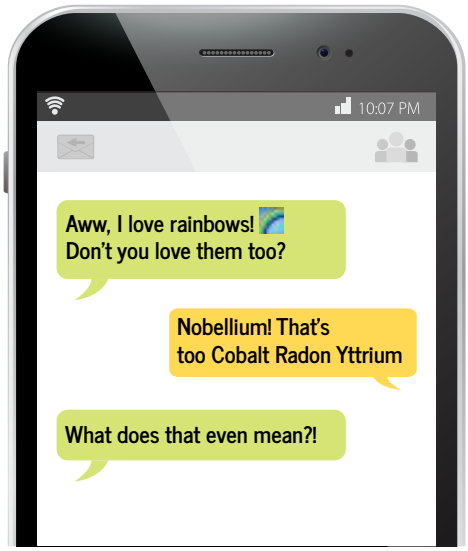
☐☐

3.

I heard that OXYGEN and MAGNESIUM were going out and I was, like, thinking...

☐☐

4.



Answer: ☐! That's too ☐☐☐!

Write your own periodic table message!

CHEMICAL SCIENCES

Atoms, Elements and Compounds

LAB LESSON

OBJECTIVES

In this lesson, students will learn about the particles in elements and compounds. They will understand how elements can combine together to form simple compounds that can be represented by symbols and formulae.

ACARA CONTENT DESCRIPTIONS

Differences between elements, compounds and mixtures can be described at a particle level (ACSSU152)

- modelling the arrangement of particles in elements and compounds
- recognising that elements and simple compounds can be represented by symbols and formulas

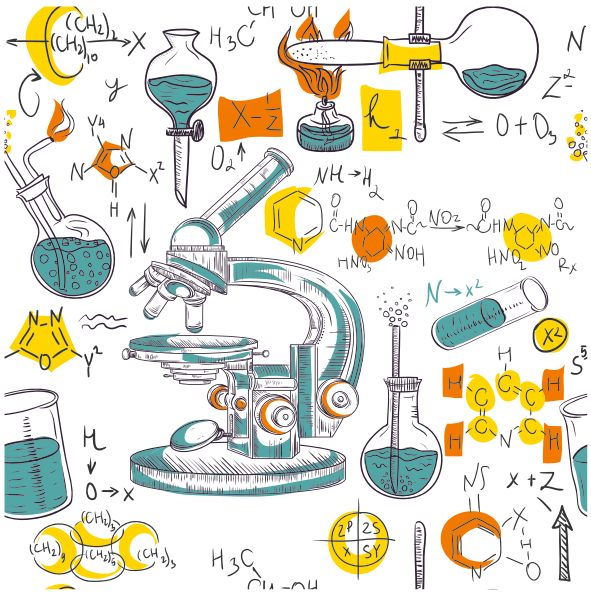
Planning and conducting

Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS140)

- working collaboratively to decide how to best approach an investigation

LESSON PLAN

Activities	Resources
Activity 1: The Element-ary Story Give out the The Element-ary Story worksheet to students and play the video. Ask students to complete Part A while watching the video, pausing and prompting when needed. After watching the video, allow time for students to complete Part B of the worksheet. Review the answers when students have completed the task. 30	• Photocopies of the The Element-ary Story worksheet • ClickView video *Physical and Chemical Changes*
Activity 2: Modelling the Particles Give out the Modelling the Particles worksheet. Divide students into groups of 3 and distribute the materials to them. Allow time for students to complete the experiment. Ask students to share their answers when they have completed the task. 25	• Photocopies of the Modelling the Particles worksheet • For each group of 3: green, red and blue modelling clay, blank A4 paper, camera or smart phone
Activity 3: Chemistry in Our Daily Lives Give out the Chemistry in Our Daily Lives worksheet. Ask students to complete the activity. Ask students to exchange their answers and peer mark. 5	• Photocopies of the Chemistry in Our Daily Lives worksheet



ANSWERS

The Element-ary Story

Part A:

Suggested answers:

1. Elements are arranged according to the number of electrons in the outer shell.
2. Atoms of non-metals form molecules when they combine with each other. (Noble gases do not form molecules.)
3. Hydrogen bonds with oxygen to form water.
4. A sodium atom reacts with a chlorine atom to form common salt. (sodium chloride - a negative and positive ion)
5. A physical reaction takes place when sodium chloride is melted.
6. Electrolysis is used to separate molecules back into their constituent atoms.
7. Carbon is able to react with many different atoms.
8. Brass is an alloy, consisting of a mixture of zinc and copper atoms. It does not result in a chemical change.

Part B:

1. Yes, they can react with non-metals to form salts. An example is sodium chloride.
2.

Formation of water	Formation of sodium chloride
non-metals	a metal and a non-metal
neutral molecules	a positive and a negative ion
electrons are shared	electrons are transferred

3. When an atom does not combine with another atom, it is a physical change. Examples include when copper is stretched, bent, heated or melted, boiled, cut into pieces or in the formation of alloys.
4. It is a physical change as there is no reaction between the elements.
5. Possible answer:
   It is a physical change as there is no change to the molecules and just a change in state.

Modelling the Particles

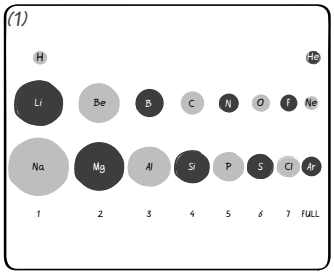
1. 4
2. a) A mixture is a combination of more than one type of pure substance that is not chemically combined.
   b) example (f)
3. It is a chemical change because a chemical bond is formed between the atoms. A physical change is any change that does not break the substance's chemical composition to form a new substance.
4. Water does not look like the elements it's made from, which are both gases. It undergoes a chemical change.
5. B, A, E, C, D

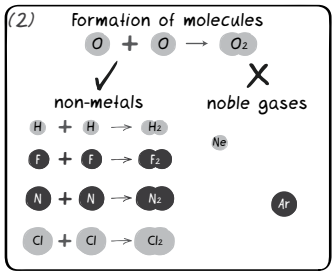
Chemistry in Our Daily Lives

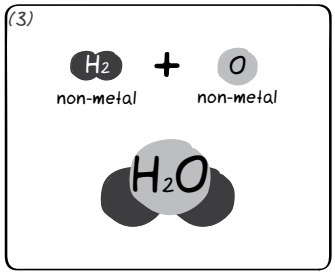
water ⟶ H_2O
sodium fluoride ⟶ NaF
hydrogen peroxide ⟶ H_2O_2
helium ⟶ He
silicon dioxide ⟶ SiO_2
calcium carbonate ⟶ $CaCO_3$
alcohol ⟶ C_2H_6O
common salt (sodium chloride) ⟶ NaCl
sugar (sucrose) ⟶ $C_{12}H_{22}O_{11}$

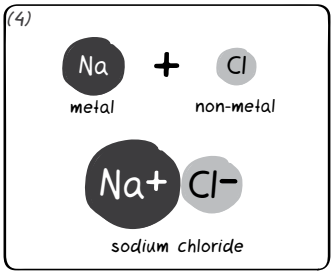
The Element-ary Story

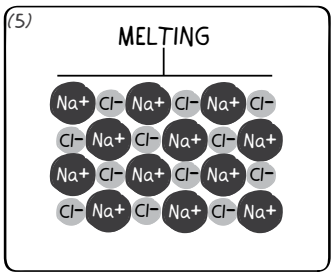
Part A: Each picture corresponds to a specific section of the video. Summarise the illustration in each box in one sentence.

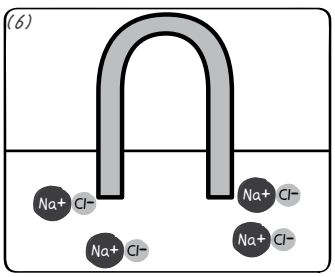


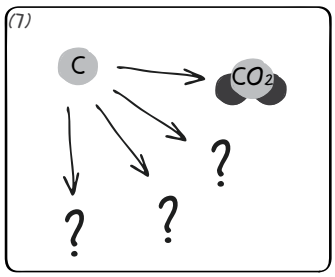


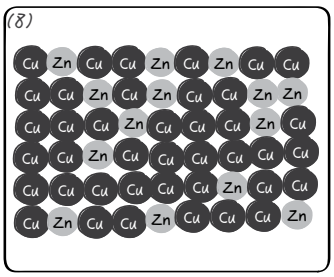












Part B: Answer the following questions after watching the video.

1. Are metals able to react with other atoms? If yes, give an example.

2. What are the key differences between the formation of water and sodium chloride? Complete the table below.

	Formation of water	Formation of sodium chloride
Types of atoms involved in the reaction (metals or non-metals)		
Types of products formed (neutral molecules or positive/negative ions)		
How do the electrons between different atoms interact?		

3. What is a physical change? What examples of physical changes were given in the video?

4. Is the formation of steel a physical or chemical change? Why?

5. Do you think the melting of ice is a physical change or a chemical change? Why?

Modelling the Particles

Materials:

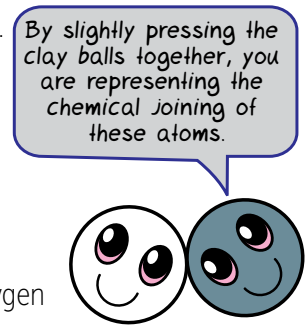
- green, red and blue modelling clay
- a blank piece of A4 paper
- camera or smart phone

Instructions:

1. Use the modelling clay to make 20 red balls, 15 blue balls and 15 green balls of equal size. Each colour represents a different element:

Red	Green	Blue
Hydrogen	Carbon	Oxygen

2. For each example, assemble the molecules on a blank piece of paper and take a picture. Then, disassemble and continue with the next example.
   (a) 4 molecules of hydrogen gas (2 hydrogen atoms)
   (b) 4 molecules of water (1 oxygen and 2 hydrogen atoms)
   (c) 3 molecules of carbon dioxide gas (1 carbon and 2 oxygen atoms)
   (d) 5 molecules of oxygen gas (2 oxygen atoms)
   (e) 2 molecules of methane (1 carbon and 4 hydrogen atoms)
   (f) 1 molecule of sugar (6 carbon, 12 hydrogen and 6 oxygen atoms), 2 molecules of oxygen gas and 2 molecules of hydrogen gas



Questions:

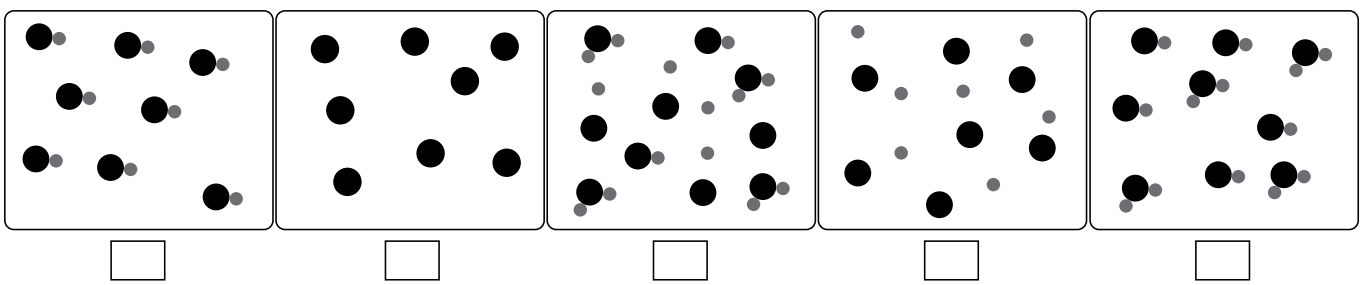
1. Compounds are molecules made up of two or more different kinds of atoms that are chemically joined. How many unique compounds are there in the examples? _____
2. In our activity, one of the examples is a mixture.
   (a) What is a mixture? _____
   (b) Which example is the mixture? _____
3. Do molecules undergo a physical or chemical change when they are formed? Explain your answer.

   _____

   _____
4. Think about the appearance of the compound water in example (b). How do we know that water is not simply a mixture of hydrogen and oxygen?

   _____

   _____
5. Correctly label each small box with the letter that describes it below:
   (A) Elements
   (B) Compounds
   (C) Mixture of elements
   (D) Mixture of compounds
   (E) Mixture of elements and compounds



Chemistry in Our Daily Lives

Write the chemical formulae of the substances in bold as you read the text.

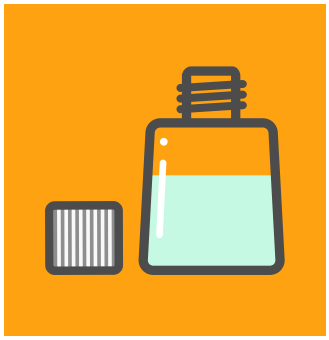
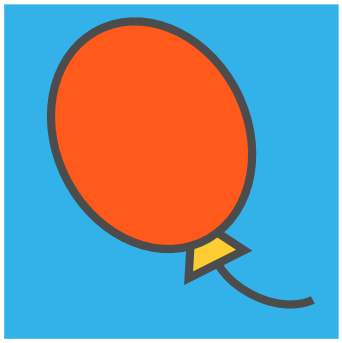
How to construct a chemical formula:

Step 1: Identify the elements in the compound.
Step 2: Identify the number of each element in the compound.
Step 3: Write the symbols for each element (with the help of the periodic table), followed by its number in subscript. If there is only one of each atom, you can omit the number. Refer to the right for an example.

Methane is made up of:
1 carbon atom
4 hydrogen atoms

CH_4

	Formula
Chemistry is involved everywhere. Everything you see and hear, the things you eat, even the air you breathe, can be represented by the symbols in the periodic table. These chemical formulae can sometimes be derived from their names. Let's figure them out! Let's take a look at the amazing human body. The human body is made up of approximately 60% water. Do you know what the chemical formula of **water** is? When we wake up and brush our teeth, the toothpaste we use contains **sodium fluoride**. Its job is to prevent cavities and strengthen enamel. This compound contains 1 sodium atom and 1 fluorine atom. The mouthwash we use contains **hydrogen peroxide**, which is made up of 2 hydrogen atoms and 2 oxygen atoms. This compound helps to kill bacteria and other germs that contribute to tooth decay. What about things we see in our daily lives? Think of the balloon flying in the sky, it is filled with **helium**. The chemical formula of helium consists of just 1 helium atom. When you visit the beach, what are you always surrounded by? Sand! The sand on the beach is mostly made up of **silicon dioxide**, made up of 1 silicon atom and 2 oxygen atoms. This same silicon dioxide (silica) is the main ingredient in glass! Chalkboard chalk is otherwise known as **calcium carbonate**. It is made up of 1 calcium atom, 1 carbon atom and 3 oxygen atoms. When someone grazes their skin, alcohol wipes are usually used to sterilise the wound. The **alcohol** is made up of 2 carbon atoms, 6 hydrogen atoms and 1 oxygen atom. Alcohol provides the skin with a "cool" feeling because it absorbs heat when it evaporates. How *cool* is that!? What chemistry is in the food we eat? Take the common table salt as an example. **Common salt** (sodium chloride) is made up of a single sodium atom and a single chlorine atom. Next time you eat, you could say: "Add a little more sodium chloride to your food." Whether we realise or not, we consume **sugar** (sucrose) on a daily basis. Sugar (sucrose) has a chemical formula consisting of 12 carbon atoms, 22 hydrogen atoms and 11 oxygen atoms. That is a huge compound! Can you imagine how complicated life would be if we called things by their scientific names rather than their common names?	


Physical and Chemical Changes

LAB LESSON

OBJECTIVES

In this lesson, students will gain an understanding of the differences between physical and chemical changes.

ACARA CONTENT DESCRIPTIONS

Chemical change involves substances reacting to form new substances (ACSSU225)

- identifying the differences between chemical and physical changes
- identifying evidence that a chemical change has taken place

Planning and conducting

Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS140)

- working collaboratively to decide how to best approach an investigation
- taking into consideration all aspects of fair testing, available equipment and safe investigation when planning investigations

LESSON PLAN

Activities	Resources
Activity 1: All about Physical and Chemical Changes Give out the All about Chemical and Physical Changes worksheet to each pair of students. Play the video and ask students to complete the worksheet as they watch it. Review the answers when students have completed the task. 15	• Photocopies of the All about Chemical and Physical Changes worksheet • ClickView video *Differences Between Physical and Chemical Changes*
Activity 2: Is It Physical or Chemical? Give out the Is It Physical or Chemical? worksheet to students before dividing them into groups of 3. Read through the instructions as a class before students undertake the experiments. Ensure Bunsen burner safety guidelines are followed throughout the lesson. Allow students to share their observations and responses when they have finished. 40	• Photocopies of the Is It Physical or Chemical? worksheet • For each group of 3: marshmallows, skewers, Bunsen burner, ice cubes, evaporating dishes, tripod stand, wire gauze, 2 x beakers, tap water, salt, glass rod, Alka-Seltzer®, aluminium foil, chocolate buttons, ice-cream stick
Activity 3: Chemistry in Our Daily Lives Give out the Chemistry in Our Daily Lives worksheet to students. The worksheet is a review to test their understanding of physical and chemical changes. 5	• Photocopies of the Chemistry in Our Daily Lives worksheet

ANSWERS

All about Chemical and Physical Changes

1.	C	9.	C
2.	P	10.	C
3.	C	11.	C
4.	C	12.	P
5.	P	13.	C
6.	C	14.	P
7.	P	15.	P
8.	P	16.	C

Is it Physical or Chemical?

Possible answers:

Task	Observations	Physical or chemical change?
a	The marshmallow changed in size.	Physical
b	The marshmallow turned brown when heated.	Chemical
c	The marshmallow remained brown.	Physical
d	The ice cube changed from a solid to a liquid to a gas.	Physical
e	The salt dissolved in the water.	Physical
f	Bubbles formed around the tablet as it dissolved.	Chemical
g	The chocolate changed from solid to liquid.	Physical
h	The chocolate turned hard and looked dull.	Chemical

Chemical Changes in Our Daily Lives

START

↓ Electrolysis of water

↓ Fizzing of baking soda in vinegar

↓ Burning firewood

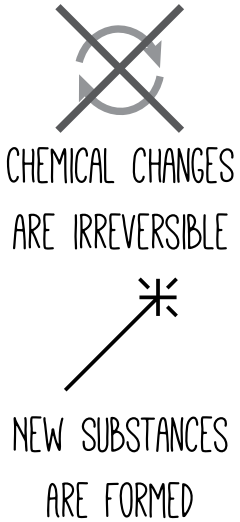
↓ Digesting food

↓ Lighting firecrackers

↓ Rusting iron

↓ Baking cupcakes

↓ FINISH



CHEMICAL SCIENCES

All about Physical and Chemical Changes

As you watch the video, write 'P' in the box if the information provided relates to a physical change, and 'C' if the statement is related to a chemical change.

	Information	P/C		Information	P/C
1.	Changes at the molecular level		9.	Reactants used up	
2.	Change in the physical properties		10.	Iron rusting	
3.	Heat generated		11.	A change in molecular structure	
4.	Usually irreversible		12.	A change in shape	
5.	A change in state		13.	Burning paper	
6.	New substances formed		14.	Melting ice	
7.	Cutting paper		15.	A change in size	
8.	May be reversible		16.	Eggs spoiling	

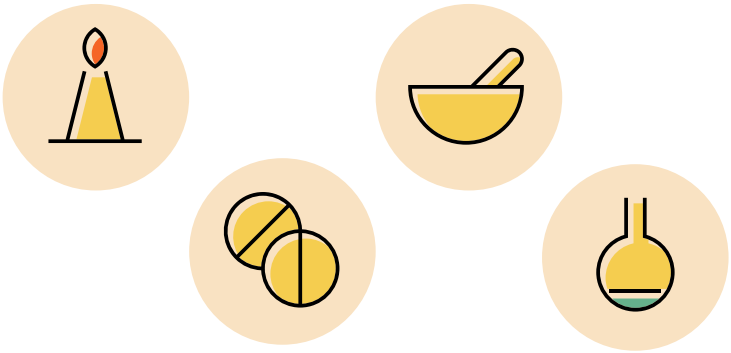
As you watch the video, write 'P' in the box if the information provided relates to a physical change, and 'C' if the statement is related to a chemical change.

	Statements	P/C		Statements	P/C
1.	Changes at the molecular level		9.	Reactants used up	
2.	Change in the physical properties		10.	Iron rusting	
3.	Heat generated		11.	A change in molecular structure	
4.	Usually irreversible		12.	A change in shape	
5.	A change in state		13.	Burning paper	
6.	New substances formed		14.	Melting ice	
7.	Cutting paper		15.	A change in size	
8.	May be reversible		16.	Eggs spoiling	

Is It Physical or Chemical?

Materials:

- marshmallows
- skewers
- Bunsen burner
- an ice cube
- evaporating dish
- tripod stand
- wire gauze
- 2 x beakers
- tap water
- salt
- glass rod
- Alka-Seltzer®
- aluminium foil
- chocolate buttons
- ice-cream stick



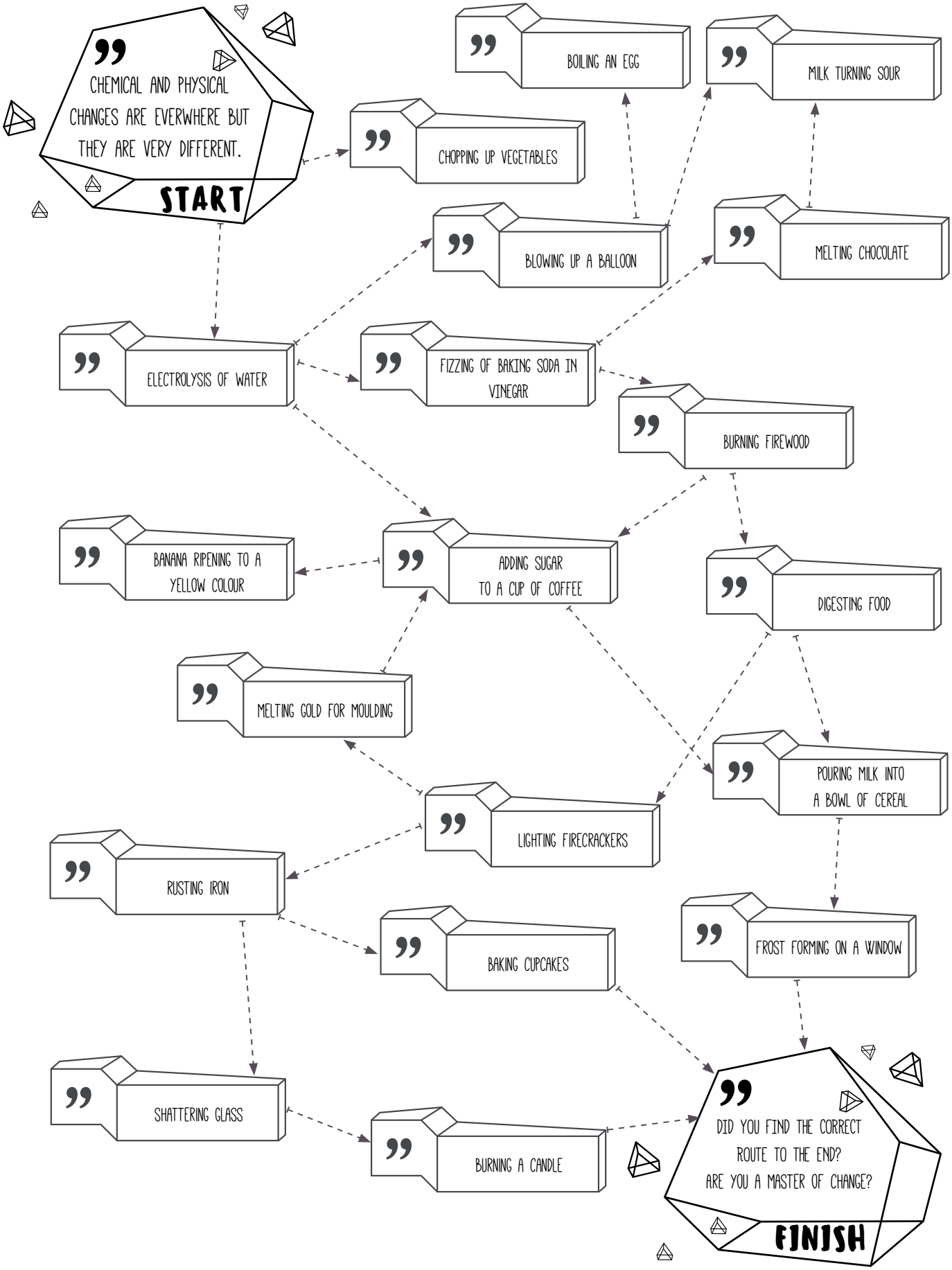
Instructions:

Carry out the following tasks and record your observations. Determine whether each task resulted in a physical or chemical change.

Materials	Task	Steps	Observation (Any changes?)	Physical or chemical change
• marshmallows • skewer • Bunsen burner	a	1. Tear a marshmallow in half.		
	b	1. Pierce the marshmallow with the skewer. 2. Heat the marshmallow over the Bunsen burner fire for 30 seconds.		
	c	1. Cool the marshmallow from the previous task.		
• an ice cube • evaporating dish • tripod stand • wire gauze • Bunsen burner	d	1. Put an ice cube in the evaporating dish. 2. Place a tripod stand with a wire gauze over the Bunsen burner. 3. Place the evaporating dish on the tripod stand. 4. Heat the ice cube until it eventually evaporates.		
• 2 x beakers • tap water • salt • glass rod • Alka-Seltzer®	e	1. Add 100 mL of water to an empty beaker. 2. Add 1 tbs. of salt to the beaker. 3. Stir the mixture with the glass rod.		
	f	1. Add 100 mL of water to an empty beaker. 2. Add one Alka-Seltzer® tablet to the beaker.		
• Bunsen burner • aluminium foil • tripod stand • wire gauze • chocolate buttons • ice-cream stick	g	1. Make a boat using the aluminium foil. 2. Place a tripod stand with a wire gauze over the Bunsen burner. 3. Put a chocolate button in the boat and put the boat on the tripod stand. 4. Melt the chocolate over the Bunsen burner. 5. Stir the melted chocolate with the ice-cream stick.		
	h	1. Heat the same sample of chocolate further until it is crusty (2-3 minutes).		

Chemistry Changes in Our Daily Lives

The maze provides examples of both physical changes and chemical changes. Can you find the correct route from start to finish? Note: The route can only be made of chemical changes.



The Rock Cycle

LAB LESSON

OBJECTIVES

In this lesson, students will develop an understanding of the rock cycle and its operation. They will investigate the three main types of rocks (sedimentary, metamorphic and igneous) and gain an understanding of how each type is formed through a modelling activity.

ACARA CONTENT DESCRIPTIONS

Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales (ACSSU153)

- representing the stages in the formation of igneous, metamorphic and sedimentary rocks, including indications of timescales involved

Questioning and predicting:

Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS139)

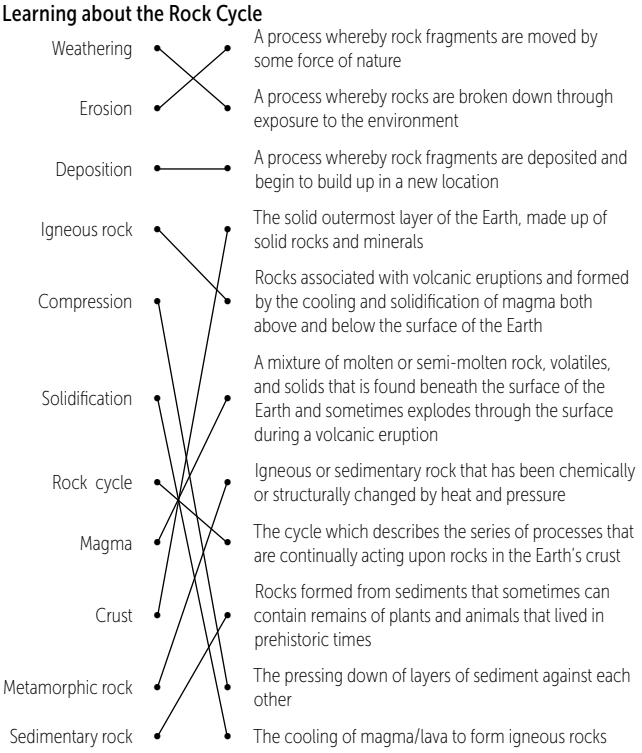
- using information and knowledge from their own investigations and secondary sources to predict the expected results from an investigation

LESSON PLAN

Activities	Resources
Before the lesson, set up both the hot water and cold water baths.	• Hot water and cold water baths
Activity 1: What Is a Rock? Bring any rock to class and ask students the following questions to lead for a discussion: • What is a rock? *(Rocks are made up of minerals)* • Why are rocks important to humans? *(Most things we use in our daily life contain some form of rock/ mineral)* Open the presentation to the first slide and use it to explain Earth's different layers and that rocks are classified by the way they are formed. 10	• Any rock • Presentation: The Rock Cycle
Activity 2: Learning about the Rock Cycle Give out the Learning about the Rock Cycle worksheet and play the video. As students watch the video, ask them to complete the worksheet. Depending on the ability of the students, you may need to play the video more than once. 10	• Photocopies of the Learning about the Rock Cycle worksheet • ClickView video *Rock Cycle - Rocks*
Activity 3: Crayon Rock Cycle Give out the Crayon Rock Cycle 1 and 2 worksheets. Divide students into groups of 3-4 and allow them time to carry out the activity and complete the worksheet. Notes for the activity *Ensure care is taken when handling the hot water.* Step 1: Ask students to unwrap their crayons and create a pile of crayon shavings on their aluminum foil (by scraping crayons with the scissors). Students should swap crayons to get a mixture of colours. Step 2: When students fold the aluminum foil, ensure they press down on the pile as hard as they can. The 'sedimentary' crayon rock will be fragile but should hold together in a packed layer. Step 3: Watch as the heat from the water melts the crayon. Ensure students remove the foil when the wax is soft to touch and the colours have swirled together, but not so mixed that the colours are indistinguishable. Place the foil in the cold water bath. Step 4 and 5: Ask students to put the foil boat back in the hot water bath. Allow the wax to melt until a smooth pool of liquid wax forms and the colours blend together uniformly. Carefully remove the foil from the hot water bath and cool it in the cold water bath. Review the answers to the worksheet when students have completed it. 40	• Photocopies of the Crayon Rock Cycle 1 and 2 worksheets • For each group of 3-4: A coloured crayon, scissors, aluminium foil, hot water bath, cold water bath

ANSWERS

Learning about the Rock Cycle



Crayon Rock Cycle

1. Students' answers may vary.

Observations	Igneous rock	Sedimentary rock	Metamorphic rock
Hardness	Hard	Softer	Hard
Layers/ Streaks	No layers	Layered appearance	Layered appearance
Fractures	No fractures	Many fractures	Some fractures

2.

1	Weathering, erosion, deposition
2	Compression
3	Heat and pressure
4	Melting
5	Solidification

3.

Rock stages conversion	Processes
Metamorphic → Sedimentary	Weathering, erosion, deposition, compression
Sedimentary → Igneous	Melting, solidification
Igneous → Metamorphic	Heat and pressure

EARTH AND SPACE SCIENCES

Learning about the Rock Cycle

Match the words on the left to their description using the video to help provide the answers.

Weathering •	• A process whereby rock fragments are moved by some force of nature
Erosion •	• A process whereby rocks are broken down through exposure to the environment
Deposition •	• A process whereby rock fragments are deposited and begin to build up in a new location
Igneous rock •	• The solid outermost layer of the Earth, made up of solid rocks and minerals
Compression •	• Rocks associated with volcanic eruptions and formed by the cooling and solidification of magma both above and below the surface of the Earth
Solidification •	• A mixture of molten or semi-molten rock, volatiles, and solids that is found beneath the surface of the Earth and sometimes explodes through the surface during a volcanic eruption
Rock cycle •	• Igneous or sedimentary rock that has been chemically or structurally changed by heat and pressure
Magma •	• The cycle which describes the series of processes that are continually acting upon rocks in the Earth's crust
Earth's Crust •	• Rocks formed from sediments that sometimes can contain remains of plants and animals that lived in prehistoric times
Metamorphic rock •	• The pressing down of layers of sediment against each other
Sedimentary rock •	• The cooling of magma/lava to form igneous rocks

Crayon Rock Cycle 1

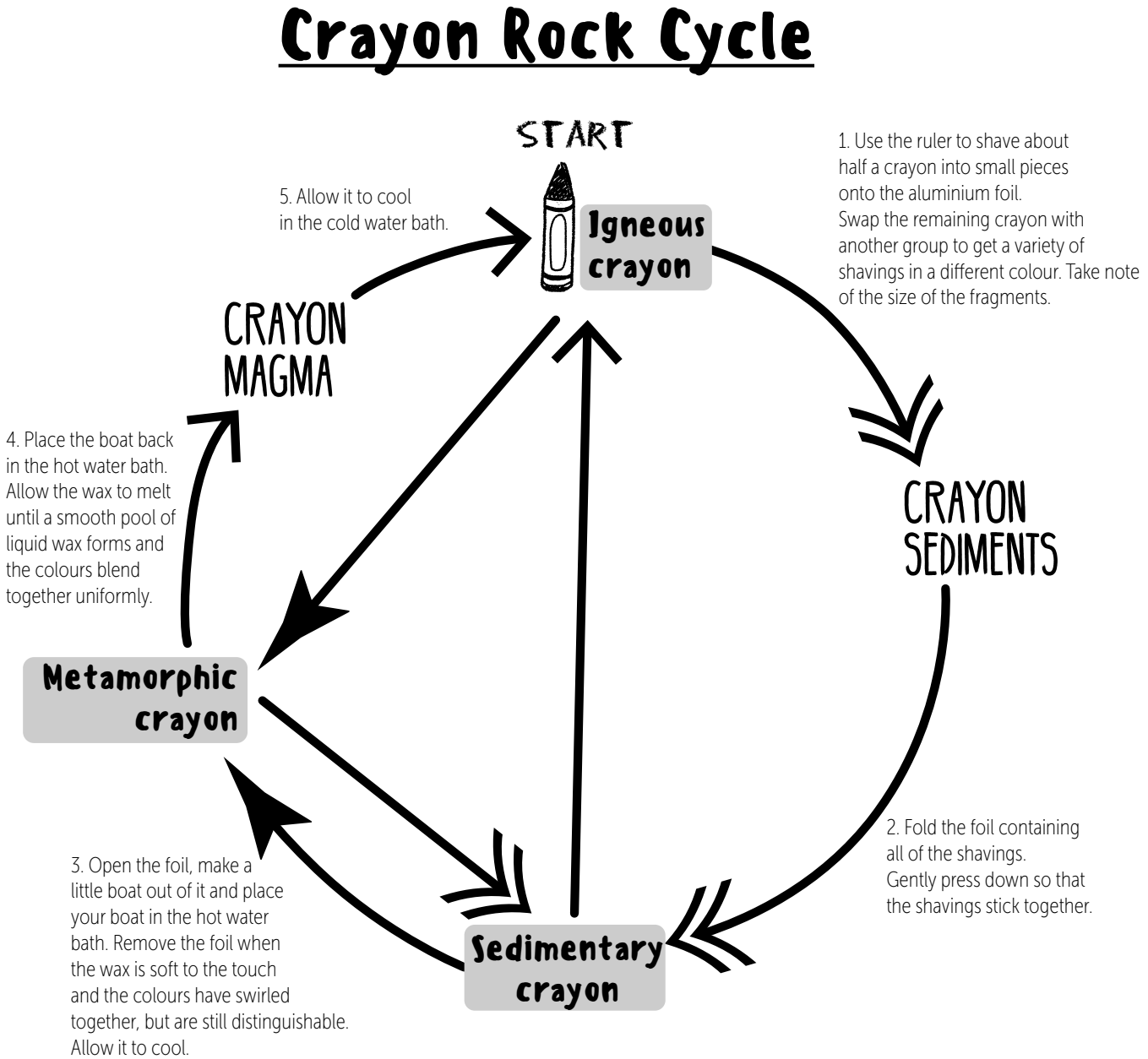
Rocks are broken down by the forces of nature. In this activity, the crayons represent rocks and the various actions that you will carry out on the crayons represent an agent in nature that causes the rocks to break down and/or transform.

Materials:

- ruler
- a crayon
- aluminium foil
- hot water bath
- cold water bath

Instructions:

In your groups, follow the numbered instructions on the diagram below and answer the questions found on the 'Crayon Rock Cycle 2' worksheet.



Crayon Rock Cycle 2

Complete the following questions as you work through your Crayon Rock Cycle.

1. Complete the following table at each rock stage.

Observations	Stage		
	Igneous crayon	Sedimentary crayon	Metamorphic crayon
Hardness			
Layers/Streaks			
Fractures			
Does the new rock look anything like the parent rock it was transformed from?			

2. Name the processes occuring at each step. Use the words in the box below. There may be more than one process occuring at each stage.

Heat and pressure		Compression	Melting
Weathering	Erosion	Solidification	Deposition

Step	Processes
1	
2	
3	
4	
5	

3. We can use the rock cycle to explain how the three rock types are related to each other and how a rock can change from one type to another when conditions are right. Write down the processes required for each of the following rock conversion.

Rock stages conversion	Step(s) required	Name of Processes
Metamorphic → Sedimentary	1,2	
Sedimentary → Igneous	4,5	
Igneous → Metamorphic	3	

Rocks, Minerals and Ores

LAB LESSON

OBJECTIVES

In this lesson, students will learn about rocks, minerals and ores. They will understand the difference between a mineral and rock and learn about the physical properties used to identify different minerals in rocks.

ACARA CONTENT DESCRIPTIONS

Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales (ACSSU153)

- identifying a range of common rock types using a key based on observable physical and chemical properties
- recognising that rocks are a collection of different minerals

LESSON PLAN

Activities	Resources
Activity 1: What Are Rocks, Minerals and Ores? Bring any rock to class and ask students the following question as a recap: • What is a rock? *(Rocks are made up of minerals.)* Give out the Rocks, Minerals and Ores worksheet to students. Play the video and ask them to complete Part A. Review the definitions with students when they have completed the task. 10	• Any rock • Photocopies of the Rocks, Minerals and Ores worksheet • ClickView video *Minerals and Ores*
Activity 2: Properties of Rocks Allow students to work in pairs and give them time to research the physical properties used to identify rocks as shown in Part C. Review the answers with students using the presentation. 20	• Rocks, Minerals and Ores worksheet • Presentation: Rocks, Minerals and Ores
Activity 3: Identifying Rocks Divide students into groups of 3-4. Bring in 5 different types of rocks for each group (found on the dichotomous key in Part C) and allow students to identify them with the dichotomous key. Allow students to share their answers when they have completed the task, 30	• Rocks, Minerals and Ores worksheet • For each group of 3-4: 5 different types of Rocks that are found on the dichotomous key in Part C

ANSWERS

Rocks, Minerals and Ores

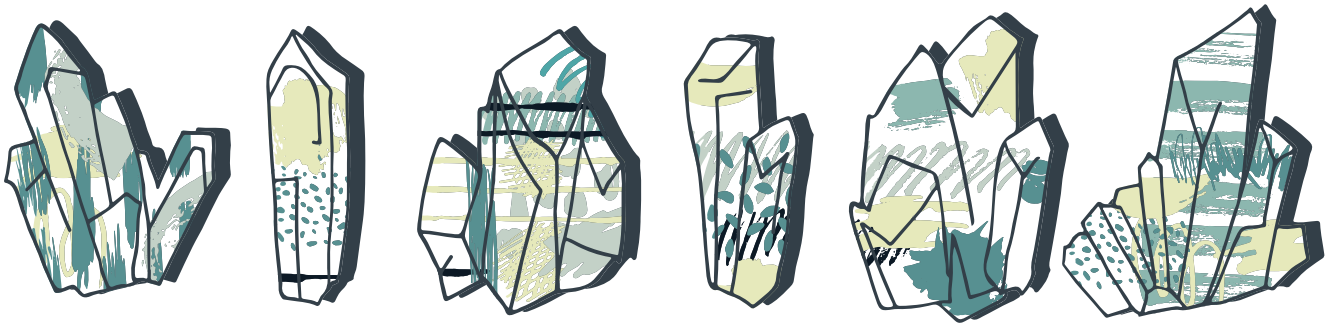
Part A:

Term	Definition
Minerals	Minerals are naturally occurring solid substances found in the Earth's crust.
Ores	Ores are metallic minerals that are extracted through mining. Valuable metals can be extracted from ores.
Rocks	Rocks are naturally occurring solids containing one or more minerals.

Part B:

Possible answers:

Physical property	What is it?	How is it used to identify rocks/ minerals?
Colour	*The colour the mineral in the rock appears*	*Different minerals have different colours and this can be used in their identification.*
Streak	The colour of a mineral in powdered form	The unknown mineral is scraped across an unglazed porcelain plate, leaving a streak of powder on the plate.
Lustre	The way light interacts with the surface of the mineral	Minerals may have a metallic or nonmetallic lustre.
Hardness	The scratchability of a mineral	The Mohs scale is based on ten common minerals. The minerals are arranged in order of increasing hardness. The hardness of a mineral is measured against the scale by finding the hardest material it can scratch.
Cleavage	The tendency of a mineral to break along certain planes of weakness to form smooth, flat surfaces	Different minerals have different types of cleavages which can be identified.
Fracture	The characteristic mark left when a mineral breaks irregularly	Different minerals have distinctive fractures, depending on their crystal structure.



EARTH AND SPACE SCIENCES

Rocks, Minerals and Ores

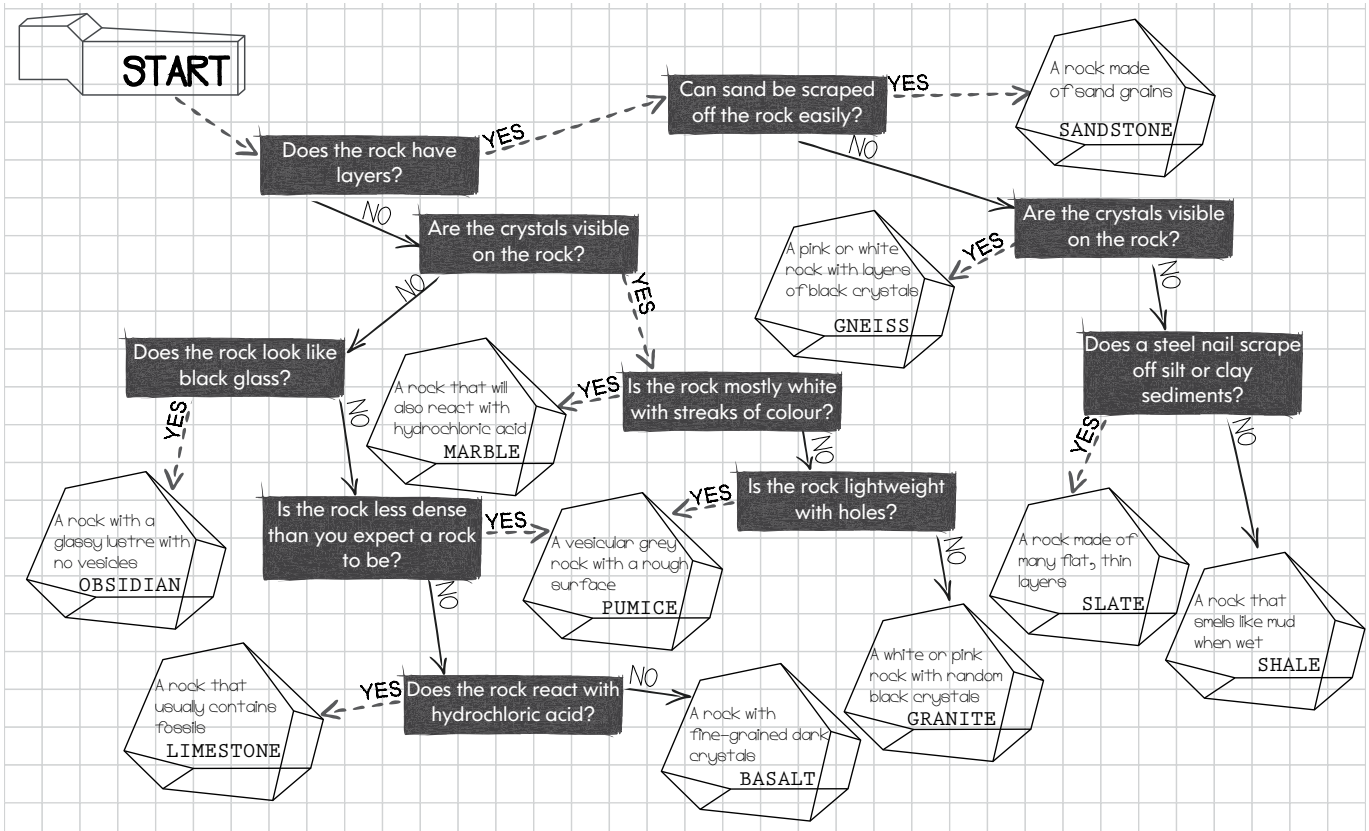
Part A: Write the definition of the terms using the video and your own knowledge.

Term	Definition
Minerals	
Ores	
Rocks	

Part B: A rock's physical characteristics can be used to identify the minerals it contains. Complete the following table with a partner. The first row has been done for you.

Physical property	What is it?	How is it used to identify rocks/minerals?
Colour	*The colour the mineral in the rock appears*	*Different minerals have different colours and this can be used in its identification.*
Streak		
Lustre		
Hardness		
Cleavage		
Fracture		

Part C: Identify the unknown rocks given by your teacher using the rock dichotomous key found below. Highlight the rocks you have identified on the diagram.



Igneous Rocks

LAB LESSON

OBJECTIVES

In this lesson, students will learn about the types and formation of igneous rocks.

ACARA CONTENT DESCRIPTIONS

Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales (ACSSU153)

- representing the stages in the formation of igneous, metamorphic and sedimentary rocks, including indications of timescales involved

Communicating:

Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS148)

- using digital technologies to construct a range of text types to present science ideas

LESSON PLAN

Activities	Resources
Activity 1: Igneous Rocks - True or False? Give out one Igneous Rocks - True or False? worksheet to each pair of students. Play Chapter 1 of the video and ask students to complete the worksheet. Depending on the ability of the students, you may need to play the video more than once. Review answers when they have completed the task. 10	• Photocopies of the Igneous Rocks - True or False? worksheet • ClickView video *Igneous, Sedimentary and Metamorphic Rocks* Chapter 1
Activity 2: Formation of Igneous Rocks Give out the Formation of Igneous Rocks worksheet to students. Allow time for students to read through the instructions. Divide students into groups of 3-4 and distribute the materials required for the task. Walk around to offer guidance. Review the answers with students when they have completed the task. **Safety warning** *Ensure care is taken when handling the hot materials.* 30	• Photocopies of the Formation of Igneous Rocks worksheet • For each group of 3-4: 4 x beakers, 3 x test tubes, Epsom salts, 70°C water, water at room temperature, ice-water
Activity 3: Igneous Rocks and Their Uses Give out the Igneous Rocks and Their Uses worksheet. Ask students to work in pairs and complete the worksheet by researching different types of igneous rocks online. >30	• Photocopies of the Igneous Rocks and their Uses worksheet • Laptops

ANSWERS

Igneous Rocks - True or False?

	Statement	T	F
1	Igneous rocks make up the smallest amount of the volume of the Earth's crust.		✓
2	Igneous rocks form only from the solidification of lava.		✓
3	Magma is made of melted minerals and lava is magma contained beneath the Earth's surface.		✓
4	The cooling and solidification of magma/lava forms igneous rocks.	✓	
5	Volcanic rocks have large-grain crystals due to rapid cooling.		✓
6	The magma that settles beneath the Earth's surface cools slowly.	✓	
7	All igneous rocks have large crystals.		✓
8	Igneous rocks are classified according to their texture and composition.	✓	
9	Igneous rocks are also known as primary rocks and metamorphic and sedimentary rocks are derived from igneous rocks.	✓	

The Formation of Igneous Rocks

1.

Largest size (immediately)	Smallest size (immediately)	Largest size (after 24 hours)	Smallest size (after 24 hours)
D	B	B	D

2.

Type of environment	Beaker
Deep beneath Earth's surface	B
Close to the surface of the Earth	C
Rapid expulsion from a volcano/flowing onto Earth's surface	D

3. Suggested answer:
The longer it takes for the molten rock to cool, the larger the crystals formed. This is because the crystals have more time to grow. Conversely, when the magma cools extrusively, the lower temperatures do not allow crystals to form and grow, resulting in smaller crystal formations.

Igneous Rocks and Their Uses

	Intrusive igneous rock	Extrusive igneous rock
Name of rock	Granite	Basalt
Minerals it contains	Quartz, feldspar, mica, amphiboles	Plagioclase, pyroxene
How is it formed?	It forms when magma cools and solidifies slowly beneath Earth's surface.	It forms when lava cools quickly on the Earth's surface.
Physical characteristics	It is a light-coloured rock with large grains that can be seen with the unaided eye.	It is a dark-coloured rock with fine grains.
Uses	It is used to make many counter tops, tiles, stones and in constructing buildings.	It is used to make roadstones, flooring tiles and railroad ballast.
Famous rock structure	Mount Rushmore in South Dakota	Devils Tower in Wyoming

Igneous Rocks - True or False?

Indicate whether each statement is true or false after watching the video.

	Statement	True	False
1	Igneous rocks make up the smallest amount of the volume of the Earth's crust.		
2	Igneous rocks are only formed from the solidification of lava.		
3	Magma is made of melted minerals and lava is magma contained beneath the Earth's surface.		
4	The cooling and solidification of magma/lava forms igneous rocks.		
5	Volcanic rocks have large-grain crystals due to rapid cooling.		
6	The magma that settles beneath the Earth's surface cools slowly.		
7	All igneous rocks have large crystals.		
8	Igneous rocks are classified according to their texture and composition.		
9	Igneous rocks are also known as primary rocks and metamorphic and sedimentary rocks are derived from igneous rocks.		

Indicate whether each statement is true or false after watching the video

	Statement	True	False
1	Igneous rocks make up the smallest amount of the volume of the Earth's crust.		
2	Igneous rocks are only formed from the solidification of lava.		
3	Magma is made of melted minerals and lava is magma when it is contained beneath the Earth's surface.		
4	The cooling and solidification of magma/lava forms igneous rocks.		
5	Volcanic rocks have large-grain crystals due to rapid cooling.		
6	The magma that settles beneath the Earth's surface cools slowly.		
7	All igneous rocks have large crystals.		
8	Igneous rocks are classified according to their texture and composition.		
9	Igneous rocks are also known as primary rocks and metamorphic and sedimentary rocks are derived from igneous rocks.		

Formation of Igneous Rocks

Doesn't this look like a wave that is frozen in time? Aptly named, the Wave Rock is located 5 km east of the town of Hyden in Western Australia, about 340 km from Perth, in a region known as Australia's 'Golden Outback'. The Wave Rock is 15 m high and approximately 110 m long. This wave-like shape is the result of chemical weathering and erosion. This stone formation is about 2,700 million years old and is made up of mostly granite, which is a type of intrusive igneous rock with large crystals. The size of the crystals in an igneous rock is an important indicator of the conditions in which the rock was formed.
Let us learn more about these conditions!

Materials:

- 250 mL beaker A: 2 tbsp. of Epsom salts with enough water to dissolve the salt crystals
- 3 x test tubes
- 250 mL beaker B: 150 mL of 70°C water
- 250 mL beaker C: 150 mL of water at room temperature
- 250 mL beaker D: 150 mL of ice-water

Instructions:

1. Mix the solution in beaker A until the salt crystals have completely dissolved.
2. Pour the solution in beaker A equally into 3 test tubes.
3. Place one test tube in beaker B, another in beaker C, and the remaining test tube in beaker D.

Questions:

1. Compare the crystals sizes in all three test tubes immediately after the demonstration and then after a minimum of 24 hours. Note the conditions that yielded crystals of the largest size and the smallest size.

	Largest size (immediately)	Smallest size (immediately)	Largest size (after 24 hours)	Smallest size (after 24 hours)
Beaker				

2. The 3 beakers represent the different environments where magma/lava can cool or solidify. Match each beaker to its simulated environment.

Type of environment	Beaker
Deep beneath Earth's surface	
Close to the surface of Earth	
Rapid expulsion from a volcano/flowing onto Earth's surface	

3. What relationship can you derive between the size of the crystals in the different igneous rocks and their rate of cooling?

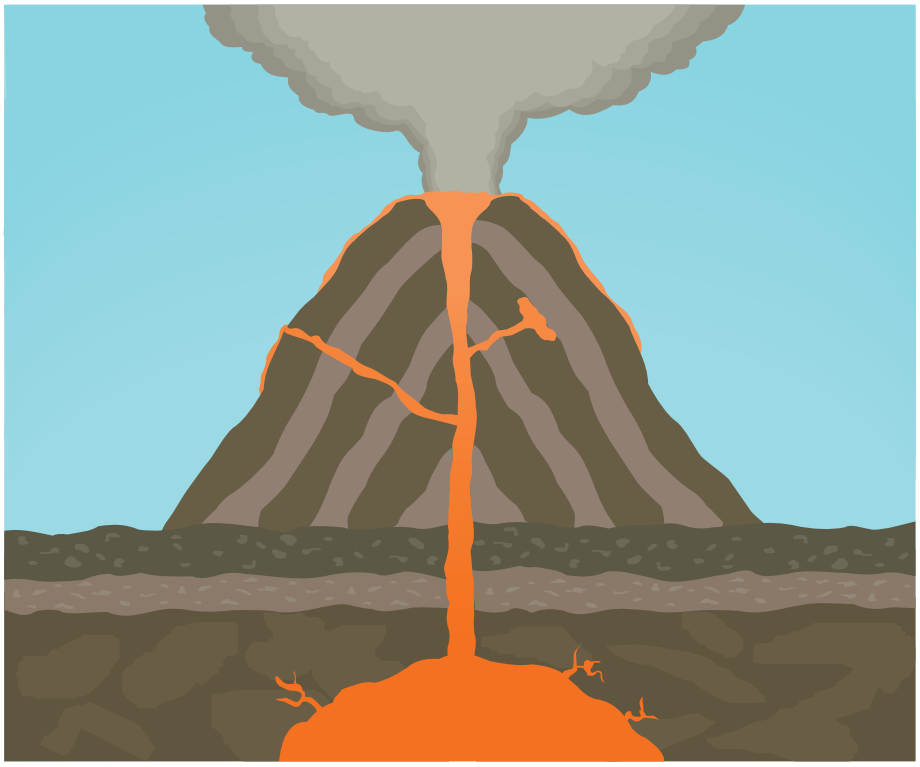
_____

_____

_____

Igneous Rocks and Their Uses

Research two different types of igneous rocks: an extrusive igneous rock and an intrusive igneous rock. Then, complete the table below.



	Intrusive igneous rock	Extrusive igneous rock
Name of rock		
Minerals it contains		
How is it formed?		
Physical characteristics		
Uses		
Name of a famous stone structure made of this rock (if any)		
Indicate on the diagram above where each rock is most likely to form.		

Sedimentary and Metamorphic Rocks

LAB LESSON

OBJECTIVES

In this lesson, students will learn about sedimentary and metamorphic rocks. They will learn about the processes that lead to the formation of these rocks.

ACARA CONTENT DESCRIPTIONS

Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales (ACSSU153)

- representing the stages in the formation of igneous, metamorphic and sedimentary rocks, including indications of timescales involved

Communicating:

Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS148)

- using digital technologies to construct a range of text types to present science ideas

LESSON PLAN

Activities	Resources
Activity 1: Processes of the Earth Give out the Processes of the Earth worksheet to students. Divide the class into pairs and ask them to work on the task set out in the worksheet. 10	• Photocopies of the Processes of the Earth worksheet • For each pair: Sugar cubes, Skittles® lollies, plates, droppers, beakers, tap water
Activity 2: Formation of Sedimentary Rocks Give out the Formation of Sedimentary Rocks worksheet and play Chapter 2 of the video from 0:00-3:43. Ask them to take down notes if required. Allow students to complete Part A and B of the worksheet after watching the video. Depending on the ability of the students, you may need to play the video more than once. 20	• Photocopies of the Formation of Sedimentary Rocks worksheet • ClickView video *Igneous, Sedimentary and Metamorphic Rocks* Chapter 2 (Part 1)
Activity 3: Formation of Metamorphic Rocks Give out the Formation of Metamorphic Rocks worksheet to each pair of students. Ask students to read through the instructions. Play Chapter 2 of the video from 3:43-5:53 and ask students to complete the worksheet as they watch the video. Review the answers when students have completed the task. 30	• Formation of Metamorphic Rocks worksheet • ClickView video *Igneous, Sedimentary and Metamorphic Rocks* Chapter 2 (Part 2)

ANSWERS

Processes of the Earth

1. Task 1: The crushing of the sugar cube by hand
   Task 2: Adding water to the candy
2. Task 1: Blowing on the disintegrated sugar cube
   Task 2: The flowing of the water down the plate
3. It is a weathering process.
4. Possible answers:
   Weathering: water, changes in temperature, crystals left behind from saltwater, plants and animals, carbon dioxide forming acid rain
   Erosion: moving water, wind, gravity, ice, waves

Formation of Sedimentary Rocks

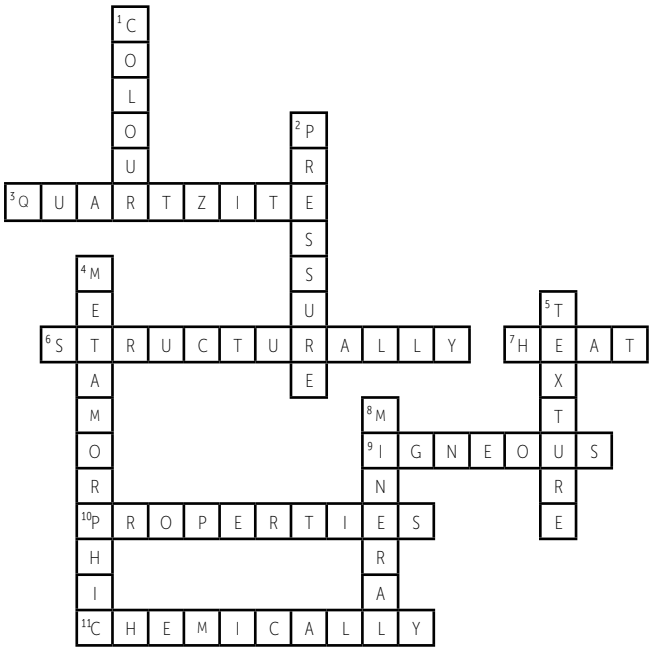
Part A: Students' answers may vary.

Part B:

	Sandstone	Limestone	Coal
Types of sediment	sand	skeletons and shells of marine animals	dead trees and plants
Uses	building materials	building materials	power

Formation of Metamorphic Rocks

In the Earth's crust, constant movements between plates can cause rocks to be deeply buried or tightly squeezed. Because of this, the rocks are subjected to extreme heat *(7 across)* and pressure *(2 down)*. They do not melt, but the minerals they contain are changed chemically *(11 across)* and structurally *(6 across)*, forming metamorphic *(4 down)* rocks. Quartzite and gneiss are two examples of metamorphic rocks which are often used as building materials. Quartzite *(3 across)* is formed from sedimentary rocks while gneiss can be formed from igneous *(9 across)* rocks or sedimentary rocks. Metamorphic rocks have different properties *(10 across)* from their original rocks. Properties that are changed include colour *(1 down)*, hardness, texture *(5 down)* and mineral *(8 down)* composition.

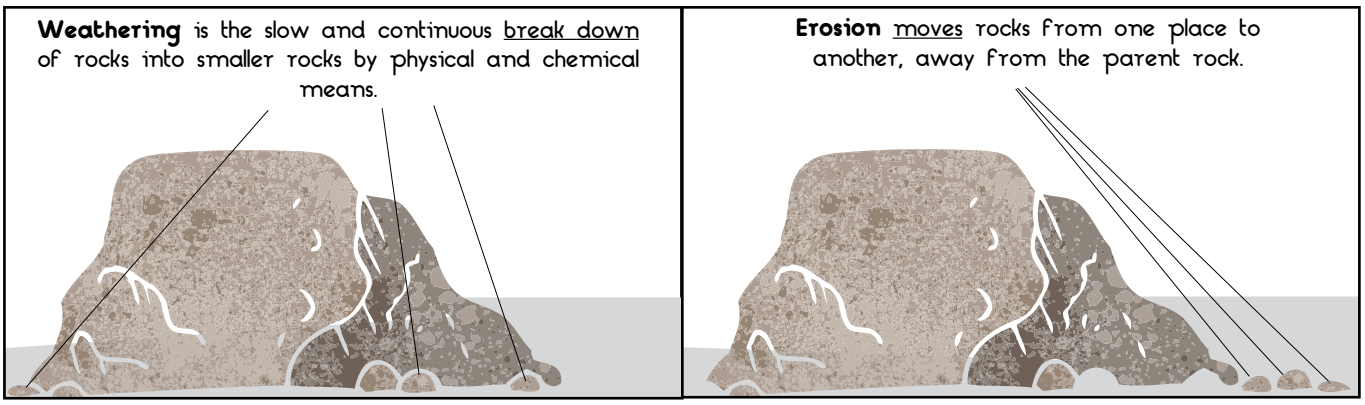


EARTH AND SPACE SCIENCES

Processes of the Earth

Complete the experiment and questions as given below.

WEATHERING vs. EROSION



Materials:

- 1 sugar cube
- 1 Skittles® lolly
- 2 x plates
- dropper
- beaker
- tap water

Instructions:

Task 1:

1. Put the sugar cube on the plate.
2. Apply pressure to the sugar cube until it breaks down.
3. Blow on the sugar cube.

Task 2:

1. Put the Skittles® lolly on the plate.
2. Use the dropper to add a few drops of water to the lolly.

Questions:

1. How was the weathering process simulated in each of the tasks?

   Task 1: _____

   Task 2: _____

2. How was erosion represented in each of the tasks?

   Task 1: _____

   Task 2: _____

3. Acid rain, caused by environmental pollution, is rain that is more acidic than normal. When acid rain falls on limestone, it reacts and breaks down the rock. What process is this an example of?

   _____

4. There are many possible factors that can cause the weathering or erosion of rocks. Research online and write down some of these factors/agents.

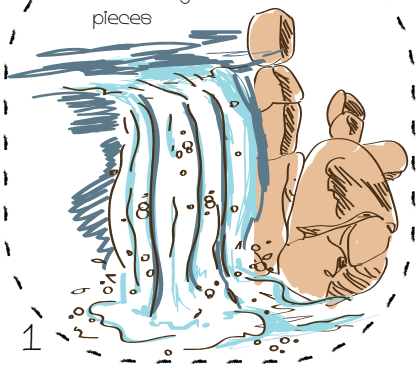
   Weathering: _____

   Erosion: _____

Formation of Sedimentary Rocks

Part A: After watching the video, draw the processes involved in the formation of sedimentary rocks. You may use the words found on the perimeter of each box to help you.

1
Fast flowing water breaks big rocks into smaller pieces



2
air ‖ and ‖ water ‖ rivers ‖ deposition ‖ sediments

3
dead ‖ plants ‖ mix ‖ erosion

4
reach ‖ the ‖ sea ‖ deposition

5
particles ‖ on ‖ top ‖ of ‖ one ‖ another ‖ press ‖ compression

6
change ‖ sedimentary ‖ rocks

7
rocks ‖ pushed ‖ Earth's ‖ plates ‖ millions ‖ of ‖ years

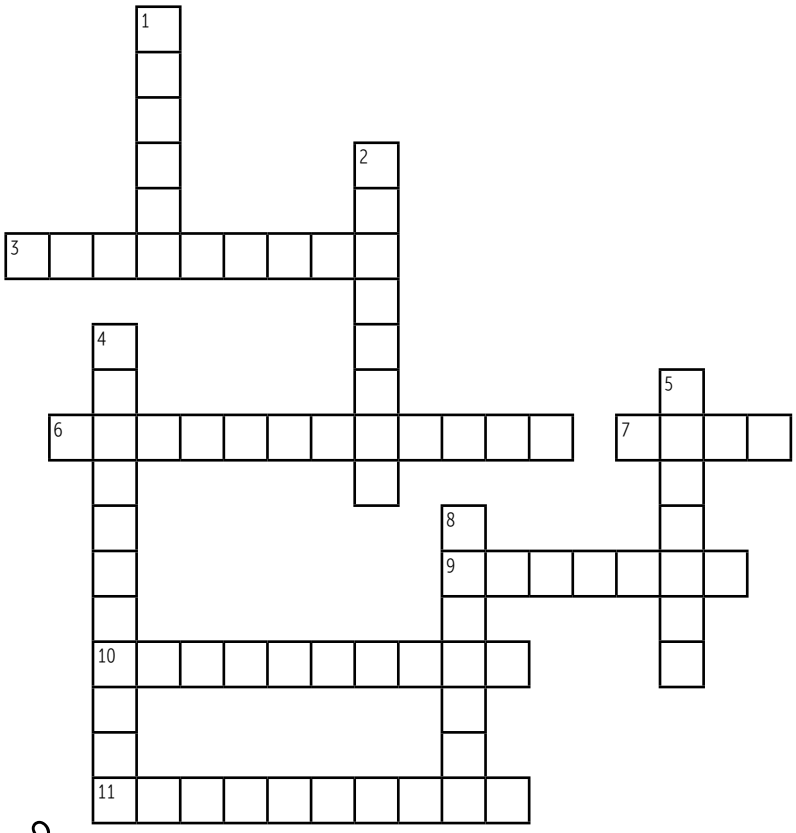
8
sedimentary ‖ rocks

Part B: The type of sedimentary rock formed is dependent on the type of sediments involved. Each type of sedimentary rock also has different uses. Complete the following table with the correct information from the video.

	Sandstone	Limestone	Coal
Types of sediment			
Uses			

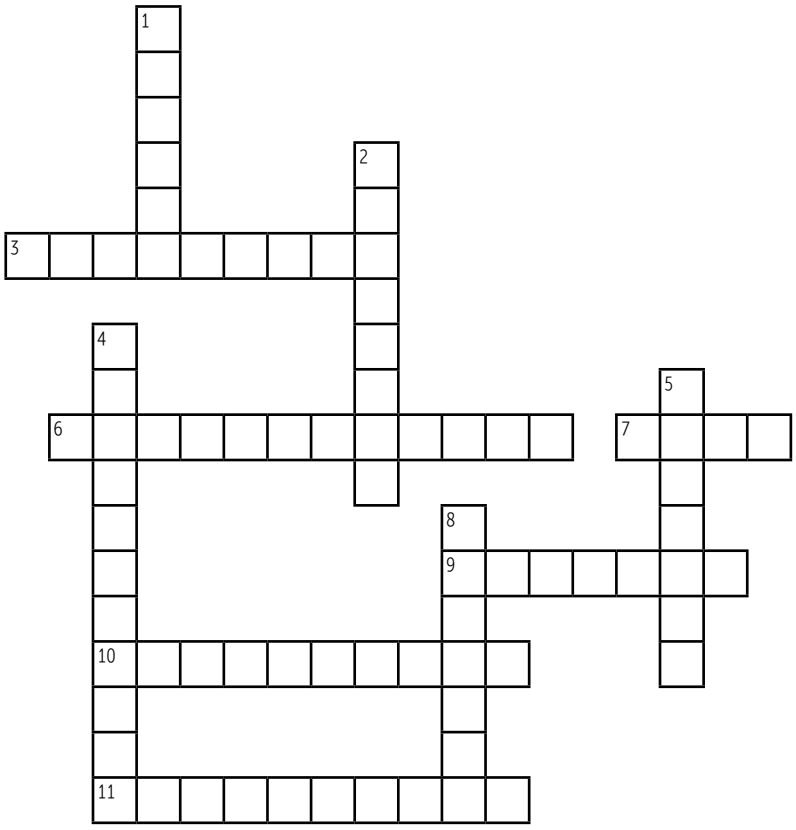
Formation of Metamorphic Rocks

Complete the crossword puzzle using information from the video.



In the Earth's crust, constant movements between plates can cause rocks to be deeply buried or tightly squeezed. Because of this, the rocks are subjected to extreme _____ *(7 across)* and _____ *(2 down)*. They do not melt, but the minerals they contain are changed _____ *(11 across)* and _____ *(6 across)*, forming _____ *(4 down)* rocks. Quartzite and gneiss are two examples of metamorphic rocks which are often used as building materials. _____ *(3 across)* is formed from the sedimentary rock sandstone, while gneiss can be formed from _____ *(9 across)* rocks or sedimentary rocks. Metamorphic rocks have different _____ *(10 across)* from their original rocks. Properties that are changed include _____ *(1 down)*, hardness, _____ *(5 down)* and _____ *(8 down)* composition.

Complete the crossword puzzle using information from the video.



In the Earth's crust, constant movements between plates can cause rocks to be deeply buried or tightly squeezed. Because of this, the rocks are subjected to extreme _____ *(7 across)* and _____ *(2 down)*. They do not melt, but the minerals they contain are changed _____ *(11 across)* and _____ *(6 across)*, forming _____ *(4 down)* rocks. Quartzite and gneiss are two examples of metamorphic rocks which are often used as building materials. _____ *(3 across)* is formed from the sedimentary rock sandstone, while gneiss can be formed from _____ *(9 across)* rocks or sedimentary rocks. Metamorphic rocks have different _____ *(10 across)* from their original rocks. Properties that are changed include _____ *(1 down)*, hardness, _____ *(5 down)* and _____ *(8 down)* composition.

The Two Main Types of Energy

LAB LESSON

OBJECTIVES

In this lesson, students will develop an understanding of potential and kinetic energy. They will investigate these two main types of energy and gain an understanding of energy being the capacity for doing work.

ACARA CONTENT DESCRIPTIONS

Energy appears in different forms, including movement (kinetic energy), heat and potential energy, and energy transformations and transfers cause change within systems (ACSSU155)

- recognising that kinetic energy is the energy possessed by moving bodies
- recognising that potential energy is stored energy

Questioning and Predicting:

Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS139)

- using information and knowledge from their own investigations and secondary sources to predict the expected results from an investigation

Planning and conducting:

Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS140)

- working collaboratively to decide how to best approach an investigation
- taking into consideration all aspects of fair testing, available equipment and safe investigation when planning investigations

LESSON PLAN

Activities	Resources
Activity 1: What Is Energy? Give out the What Is Energy? worksheet. Play Chapters 1-3 of the video and ask students to complete the worksheet. You may need to pause between chapters for students to catch up. Review answers when students are done. 15	• Photocopies of the What Is Energy? worksheet • ClickView video *Forms of Energy* Chapter 1 Chapter 2 Chapter 3
Activity 2: Observing the Effects of Energy Give out the Observing the Effects of Energy worksheet. Divide students into groups of 3-4, and ask them to complete the tasks given. Walk around to guide students when necessary. Review answers when students are done. 30	• Photocopies of the Observing the Effects of Energy worksheet • For each group of 3-4: tennis ball, metre ruler, masking tape
Activity 3: Is It Potential or Kinetic Energy? Give out the Is It Potential or Kinetic Energy? worksheet. Allow time for students to answer the questions independently. When students are finished, open the presentation and review the answers. Allow students to peer mark their work. 15	• Photocopies of the Is It Potential or Kinetic Energy? worksheet • Presentation: The Main Two Types of Energy

ANSWERS

What Is Energy?

1. Possible answers:
   - Energy is the ability to do work.
   - Energy is the reason we and everything exist.
   - Energy drives every change or movement on Earth.
   - Energy is derived from the Sun.
   - Energy is everywhere.
   - Animals access the Sun's energy by using the stored energy either contained in plants or other animals.
2. Kinetic energy is energy moving objects have.
3. transferred
4. Heavier objects have more kinetic energy.
5. Potential energy is stored energy.
6. Higher objects have more potential energy.

Observing the Effects of Energy

Hypothesis and Questions: Students' answers may vary.

Conclusion:

Potential energy: The higher the height at which the ball was released, the greater potential energy the ball possessed, and the higher the ball could bounce.

Kinetic energy: The higher the height at which the ball was released, the greater kinetic energy the ball gained, and the further it travelled.

Is It Potential or Kinetic Energy?

	Example	P.E.	K.E.
1	A moving tractor		✓
2	A bullet loaded in a gun	✓	
3	A torch battery	✓	
4	An opening door		✓
5	A bird in a nest high up in a tree	✓	
6	A stationary roller-coaster on the top of a slope	✓	
7	A stretched rubber band	✓	
8	A basketball thrown through a hoop	✓	✓
9	A fan with blades moving or rotating		✓
10	A bird flying into the sky	✓	✓

What Is Energy?

Complete the following worksheet as you watch Chapters 1-3 of the video.

What is Energy?

1. List three facts about energy mentioned in Chapter 1 of the video.

   1st fact (a definition): _____

   2nd fact: _____

   3rd fact: _____

Kinetic Energy

2. What is kinetic energy?

   _____

3. Complete the following sentence:

   Energy is constantly changing form and is easily t _ _ _ _ _ _ _ _ _ _ from one form to another. This is known as the **LAW OF CONSERVATION OF ENERGY**.

4. Do you think heavier objects have more or less kinetic energy than lighter objects moving at the same speed?

   _____

Potential Energy

5. What is potential energy?

   _____

6. Do you think objects at a higher height have more or less potential energy than objects at a lower height?

   _____

Observing the Effects of Energy

With the given materials, follow the instructions and try to solve the problem posed in each scenario.

Materials:

- masking tape
- metre ruler
- marker pen
- tennis ball

	Scenario 1	Scenario 2
Problem	How can the potential energy of a ball about to be dropped be increased?	How can you increase the kinetic energy of a rolling ball?
Hypothesis	If _____ _____ _____, then the potential energy of a dropped ball can be increased.	If _____ _____ _____, then the kinetic energy of a rolling ball can be increased.
Instructions	1. Measure 1 m vertically from the floor, then lightly stick the masking tape on the wall to represent the measurement. 2. Use the metre ruler to draw lines across the tape at 50 cm, 75 cm, and 100 cm. 3. Hold the ball at the 50 cm mark and drop it. 4. Observe the ball's first bounce. 5. Mark the height of the first bounce on the tape. 6. Measure the height of the first bounce and record it in the data table below. 7. Repeat steps 3-6 for each height for a total of 3 trials per height.	1. Lean the metre ruler against a table so that the ruler is angled approximately 45° from the floor. 2. Release the ball at the 50 cm mark and allow it to roll down the slope. 3. Measure the distance from the ruler to the point where the ball stops rolling. 4. Record your results. 5. Repeat steps 2-4 for a total of 3 trials. 6. Repeat steps 2-5, dropping the ball at 75 cm and 100 cm.

Results	Trial 1	Trial 2	Trial 3	Average	Trial 1	Trial 2	Trial 3	Average
50 cm								
75 cm								
100 cm								

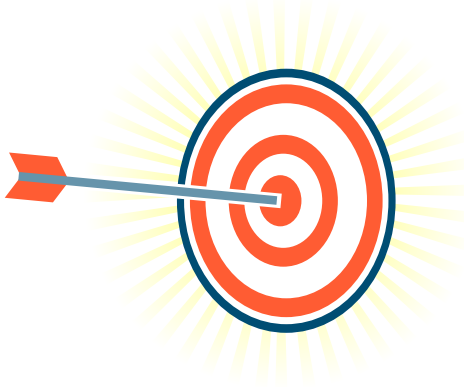
Questions	
	7. From which height did the ball have the most kinetic energy in Scenario 1? Explain.
	8. How did the ball's energy change from potential to kinetic energy in Scenario 2?

What can you conclude about potential/kinetic energy for each scenario?	

Is It Potential or Kinetic Energy?

Identify the type(s) of energy possessed in the following examples.

No.	Example	Potential energy	Kinetic energy	Reason
1	A moving tractor			
2	A bullet loaded in a gun			
3	A torch battery			
4	An opening door			
5	A bird in a nest high up in a tree			
6	A stationary roller-coaster at the top of a slope			
7	A stretched rubber band			
8	A basketball thrown through a hoop			
9	A fan with blades moving or rotating			
10	A bird flying into the sky			



Types of Potential and Kinetic Energy

LAB LESSON

OBJECTIVES

In this lesson, students will develop an understanding of the different types of potential and kinetic energy. They will also investigate the effects different types of energy can bring about.

ACARA CONTENT DESCRIPTIONS

Energy appears in different forms, including movement (kinetic energy), heat and potential energy, and energy transformations and transfers cause change within systems (ACSSU155)

- recognising that kinetic energy is the energy possessed by moving bodies
- recognising that potential energy is stored energy, such as gravitational, chemical and elastic energy
- investigating different forms of energy in terms of the effects they cause, such as gravitational potential causing objects to fall and heat energy transferred between materials that have a different temperature

Planning and conducting:

Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS140)

- working collaboratively to decide how to best approach an investigation
- taking into consideration all aspects of fair testing, available equipment and safe investigation when planning investigations

Processing and analysing data and information:

Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (ACSIS145)

- drawing conclusions based on a range of evidence including primary and secondary sources

LESSON PLAN

Activities	Resources
Before the lesson, set up the materials required for the tasks in Activity 2. Depending on class size, you may need to set up more than one station for each task. Provide enough sets of equipment to accommodate groups of 3-4 (for tasks #1-#4) on the Recording the Effects of Energy worksheet.	• Teacher's demonstration #1: tuning fork, alarm bell, vacuum pump, bell jar • Teacher's demonstration #2: cold water in a glass, microwave oven • #1: Rubber band, measuring tape • #2: Empty beaker, 50°C water • #3: Small light globe (1.5V), dry cell, copper wires with crocodile clips • #4: Tennis ball, metre ruler
Activity 1: The Different Types of Energy Give out the The Different Types of Energy worksheet. Play Chapters 4 and 5 of the video and ask students to complete the worksheet. There are some types of energy in the worksheet that are not shown in the video. Use the presentation to review answers (with the sound turned on). 20	• Photocopies of the The Different Types of Energy worksheet • ClickView video *Forms of Energy* Chapter 4 Chapter 5 • Presentation: Types of Potential and Kinetic Energy
Activity 2: Observing and Recording the Effects of Energy Give out the Observing the Effects of Energy and Recording the Effects of Energy worksheet. Before the students conduct their own experiments, carry out the two teacher demonstrations and have students complete the related questions. Divide students into groups of 3-4 and ask them to complete the tasks given. Groups are to rotate between stations when instructed. Allow about 10 minutes for each station. Review answers when students are finished. >40	• Photocopies of the Observing the Effects of Energy and Recording the Effects of Energy worksheets • Equipment set up beforehand

ANSWERS

The Different Types of Energy

	Form of energy
1	Chemical potential energy
2	Radiant energy
3	Mechanical/kinetic energy
4	Elastic energy
5	Gravitational potential energy
6	Electrical energy
7	Sound energy
8	Thermal energy

Recording the Effects of Energy

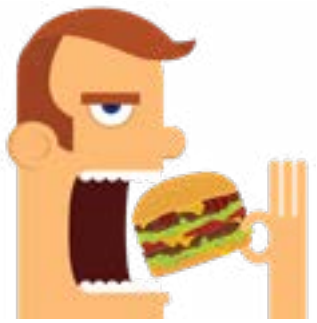
Results: Students' answers may vary.

Questions:

1. Sound is the energy caused by vibrations of air particles. When the tuning fork was struck, it vibrated, and it forced the air particles all around it to vibrate. As the air moved, it carried energy out from the tuning fork in all directions, eventually reaching the air inside the ears.
2. No. As the air was pumped out of the bell jar, it created a vacuum in the jar. A vacuum is a space where matter is absent and hence there is no air to carry the sound.
3. It became hot. Microwave ovens use radio waves to agitate water molecules in food, causing them to move. As the water molecules get agitated, they vibrate and generate heat.
4. It travelled a further distance. There is more elastic potential energy stored in the rubber band when it is stretched completely.
5. The beaker felt warm. Heat energy is transferred from a hotter region to a cooler region. As the beaker is at room temperature, the thermal energy from the water was transferred to the beaker, eventually resulting in a common temperature.
6. The food colouring in the beaker containing 70°C water spread at a quicker rate as compared to the food colouring in room temperature water. The molecules in the hot water move faster, spreading the food colouring more rapidly than the cold water molecules.
7. No, the dry cell has stored chemical energy that is released when connected in a circuit. Electricity is generated from the movement of electrons flowing through the copper wire, reaching the globe and making it light up.
8. It bounced higher at 100 cm as there was a greater gravitational potential energy when it was released from 100 cm.
9. At a faster starting speed, it had more kinetic energy to roll further.

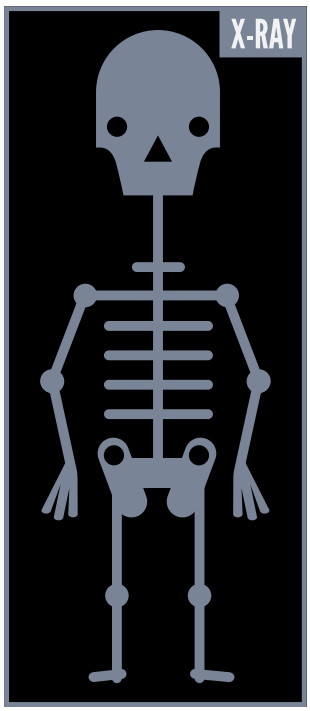
The Different Types of Energy

Using the video and presentation, write down the names of the different types of potential and kinetic energy. Use the images to help you if you are unsure. The first one has been done for you.



1	Chemical potential energy

Energy that is **stored** in a medium and released later into different forms. For example, found in food, batteries



2	

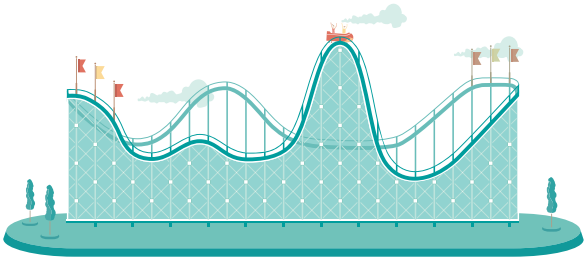
Energy that involves the **movement** or travellling of electromagnetic waves/ particles. For example, light, x-rays and UV rays

3	

Energy of a **moving** object

4	

Energy that is **stored** in elastic materials as a result of being stretched or compressed



5	

Energy **stored** in an object as a result of its position in a gravitational field

6	

Energy that involves the **movement** of atomic particles called electrons

7	

Energy produced by the **vibrations** of air particles, which creates sound waves

8	

Energy derived from heat, from the **movement** of tiny particles such as atoms

Observing the Effects of Energy

In this activity, there are six different tasks (two demonstrations and four experiments). Carry out the tasks and answer the questions on the 'Recording the Effects of Energy' worksheet.

	Teacher's demonstration #1	Teacher's demonstration #2	#1
Materials:	• tuning fork • alarm bell • bell jar • vacuum pump	• cold water in a glass • microwave oven	• rubber band • blank wall • measuring tape
Method:	(A) 1. Strike the tuning fork. (B) 1. Turn on the alarm bell. 2. Cover the bell with the glass jar. 3. Connect the vacuum pump to the glass jar. 4. Turn on the vacuum pump. 5. Wait 2 minutes.	1. Put a glass of cold water into a microwave oven for 30 seconds.	1. Stretch the rubber band halfway. 2. Release it towards a blank wall making sure there are no objects that might be hit. 3. Record the distance travelled by the rubber band. 4. Repeat steps 1-3 three times. 5. Complete the task again with the rubber band stretched completely.
	#2	#3	#4
Materials:	• 2 empty beakers (approx. 200 mL) • 100 mL 70°C water • 100 mL room temperature water • dropper • red food colouring	• small light globe (1.5V) • copper wires with crocodile clips • dry cell	• metre ruler • tennis ball
Method:	(A) 1. Pour 100 mL of the 70°C water into an empty beaker. 2. Wait 30 seconds, then touch the sides of the beaker. (B) 1. Take the beaker filled with heated water from (A) and also the other beaker filled with 100 mL of room temperature water, add 3 drops of red food colouring into each beaker at the same time. 2. Wait 30 seconds, then observe the spread of the food colouring throughout the water.	1. Using the materials given in this station, make a circuit to light up the light globe.	(A) 1. Lean the metre ruler straight up against a wall. 2. Drop the ball from the 50 cm mark. 3. Record the height the ball reached when it bounced. 4. Repeat steps 1-3 from the 100 cm mark. (B) 1. Roll the ball on a flat ground with minimal force. 2. Measure the distance travelled by the ball and record it. 3. Roll the ball again, this time with more force than before. 4. Record the new distance travelled by the ball.

Recording the Effects of Energy

Record your results in the following table.

#1	Rubber band stretched halfway				Rubber band stretched completely			
	Dist. 1	Dist. 2	Dist. 3	Average	Dist. 1	Dist. 2	Dist. 3	Average
#3	Draw a diagram of your circuit.							
#4	(A) Height the ball bounced				(B) Distance the ball rolled			
	50 cm mark		100 cm mark		1st Roll		2nd Roll	

Answer the following questions.

Tasks	Question	Answer
Teacher's Demonstration #1	1. Why were you able to hear sound?	
	2. In (B), were you able to hear the bell's alarm when the vacuum pump was switched on? Why or why not?	
Teacher's Demonstration #2	3. What happened to the water after 30 seconds in the microwave oven? How was this possible?	
#1	4. Did the rubber band travel further when it was stretched completely? Why was this so?	
#2	5. In (A), What happened to the sides of the beaker after 30 seconds? Why was this so?	
	6. In (B), what did you observe in each beaker after 30 seconds? Why was this so?	
#3	7. Were you able to light up the globe without the dry cell? Why or why not?	
#4	8. In (A), did the ball bounce back higher at 50 cm or 100 cm? Why was this so?	
	9. In (B), did the ball roll further when it started with a smaller or greater force? Why was this so?	

Energy Transformations

OBJECTIVES

In this lesson, students will develop an understanding of the law of conservation of energy and understand how energy is transformed from one form to another. They will also learn how to draw energy flow diagrams.

ACARA CONTENT DESCRIPTIONS

Energy appears in different forms, including movement (kinetic energy), heat and potential energy, and energy transformations and transfers cause change within systems (ACSSU155)

- using flow diagrams to illustrate changes between different forms of energy

Processing and analysing data and information:
Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (ACSIS145)

- drawing conclusions based on a range of evidence including primary and secondary sources

Communicating:
Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS148)

- selecting and using appropriate language and representations to communicate science ideas within a specified text type and for a specified audience

LESSON PLAN

Activities	Resources
Activity 1: What Happens to Pengy? Give out the What Happens to Pengy? worksheet to each pair of students. Open the presentation to the first 2 slides and ask students to complete the worksheet while watching the presentation. Review the answers when students are done. 10	• Photocopies of the What Happens to Pengy? worksheet • Presentation: Energy Transformations
Activity 2: Learning about Energy Transformations Give out the Learning about Energy Transformations worksheet. Play Chapter 6 of the video and ask students to complete the worksheet as they watch the video. You may need to pause the video at example 1 and example 2 and give students time to finish the question. Review answers with slides 9-11 of the presentation. Give time to students to make their own energy flow diagrams. Allow students to share the energy flow diagrams they have created with the class. 20	• Photocopies of the Learning about Energy Transformations worksheet • ClickView video: *Forms of Energy* Chapter 6 • Presentation: Energy Transformations
Activity 3: All about Energy Flow Diagrams Give out the All about Energy Flow Diagrams worksheet to each pair of students. Open the presentation to the last slide and have students choose the numbers on the slide to uncover questions related to energy flow diagrams. Ask students to write their answers in the boxes. When students are finished, allow them to exchange their answers and peer mark. 25	• Photocopies of the All about Energy Flow Diagrams worksheet • Presentation: Energy Transformations

ANSWERS

What Happens to Pengy?

Possible answers:

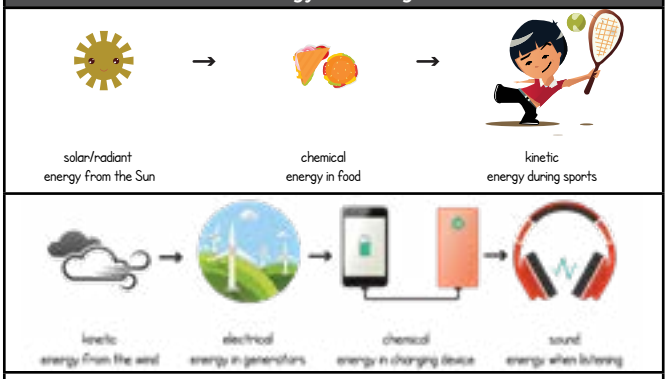
At the top of the hill:
Pengy possesses gravitational potential energy as he is at the highest point from the ground.

At the bottom of the hill:
Pengy possesses maximum kinetic energy because he is moving at maximum speed.

Learning about Energy Transformations

Law of Conservation of Energy:
Energy does not magically appear or disappear.
It is always transferred from one form to another.

An energy flow diagram



Students' answers may vary.

All about Energy Flow Diagrams

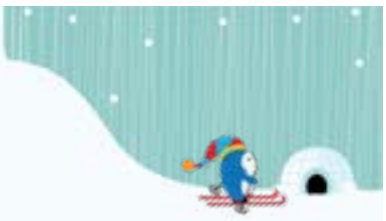
Possible answers:

electrical energy → kinetic energy of the blades	• Heater • Hair dryer • Toaster • Hair straightener • Electric stove	chemical energy → kinetic energy → sound + heat energy	chemical energy → heat energy
• Rubbing your hands together	• Computer • Mobile phone • Television	• Compressing a spring	chemical energy → kinetic energy
electrical energy → heat energy	• Car • Fireworks	electrical energy → kinetic energy of the blades	• Solar energy converted into electrical energy converted to treadmill moving

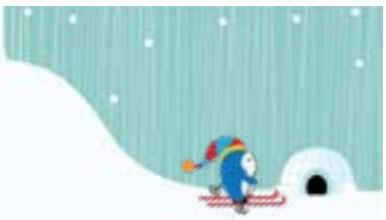
PHYSICAL SCIENCES

What Happens to Pengy?

In your own words, describe what kind of energy Pengy possesses at each location.

At the top of the hill 	
At the bottom of the hill 	

In your own words, describe what kind of energy Pengy possesses at each location.

At the top of the hill 	
At the bottom of the hill 	

Learning about Energy Transformations

As you watch the video, complete the questions about energy transformations.

LAW OF CONSERVATION OF ENERGY

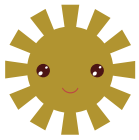
Energy does not magically _____ or _____.

It is always _____ from one form to another.

An energy _____ diagram

It shows how energy is transformed from one form to another.

Example 1:



_ _ _ _ _/_ _ _ _ _ _ _

energy from the Sun

_ _ _ _ _ _ _ _

energy in food

_ _ _ _ _ _ _

energy during sports

Example 2:

Draw your *longest* energy flow diagram here!

PHYSICAL SCIENCES

All about Energy Flow Diagrams

Follow the instructions as shown on the presentation about energy flow diagrams.

1	2	3	4
5	6	7	8
9	10	11	12

Follow the instructions as shown on the presentation about energy flow diagrams.

1	2	3	4
5	6	7	8
9	10	11	12

Waste Energy and Efficiency

LAB LESSON

OBJECTIVES

In this lesson, students will develop an understanding of the law of conservation of energy. They will discover that energy is transformed from one form to another.

ACARA CONTENT DESCRIPTIONS

Energy appears in different forms, including movement (kinetic energy), heat and potential energy, and energy transformations and transfers cause change within systems (ACSSU155)

- recognising that heat energy is often produced as a by-product of energy transfer, such as brakes on a car and light globes

Use and influence of science:

Solutions to contemporary issues that are found using science and technology, may impact on other areas of society and may involve ethical considerations (ACSHE135)

- investigating how energy efficiency can reduce energy consumption

LESSON PLAN

Activities	Resources
Activity 1: Law of Conservation of Energy Play Chapter 4 of the video. Pause at 05:51 and 06:00 and ask students to write down the energy transformations involved in: • The box falling to the ground *(potential energy to kinetic energy to sound energy)* • Bungee jumping *(gravitational potential energy to kinetic energy to elastic potential energy to gravitational potential energy to kinetic energy)* Allow students to share their answers. Use the video to review answers. 15	• ClickView video *Energy Rules: The Conservation of Energy* Chapter 4 • Notebook/paper
Activity 2: Heat Energy - the Waste Energy Give out the Heat Energy and Efficiency worksheet to students. Open the presentation to the first slide to review the law of conservation of energy. Ask students to complete Part A of the worksheet. Review the answers with the second slide. By the end of the slide, students should realise the heat energy is sometimes produced as an unwanted by-product (waste energy). Use the animation in the next slide to show that applying brakes in cars involves the production of heat as waste energy. Ask students if they can think of any other examples in their daily life. The last slide provides some possible answers. 20	• Photocopies of the Heat Energy and Efficiency worksheet • Presentation: Waste Energy and Efficiency
Activity 3: Energy Efficiency This activity is carried out as a teacher-led demonstration as there is usually mercury in fluorescent light globes, which can be hazardous if broken. Conduct the investigation and have students complete questions 1-5 in Part B of the worksheet. Give students time to research online for the answers to questions 6 and 7. Allow students to share their answers with the class. 25	• Heat Energy and Efficiency worksheet • Lamp, 25W incandescent light globe, 25W fluorescent light globe, thermometer • Access to the Internet

ANSWERS

Heat Energy and Efficiency

Part A:

1. Energy cannot be created or destroyed. It can only be transformed from one form to another.
2. It is unwanted energy.
3. Possible answers:
   Application of car brakes
   Heat energy released from burning fuel in factories and power plants
   Heat from the usage of electronic devices
   The heat our bodies produce after a lot of physical activity

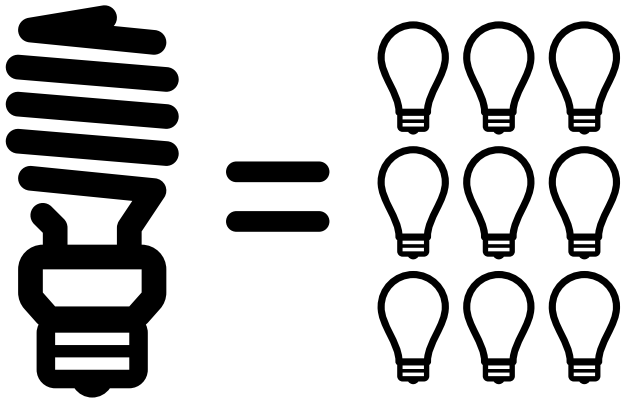
Part B:

1. Students' answers may vary.
2. The incandescent light globe produced more heat after 1 minute.
3. No, the fluorescent light globe was brighter even though it produced less heat.
4. Yes, they are both 25W globes.
5. The fluorescent light globe is more efficient as less electrical energy is lost as heat energy.
6. Possible answers:

• cheap • not poisonous	• more efficient • saves energy • lasts longer • emits less heat

7. Possible answers:

• not efficient • wastes energy • do not last long • emits more heat	• more expensive • contains mercury (toxic)



PHYSICAL SCIENCES

Heat Energy and Efficiency

Part A: Answer the following questions with information from the video and your own knowledge.

ELECTRICAL ENERGY ⟶ LIGHT ENERGY + HEAT ENERGY

1. What is the law of conservation of energy?

2. Is the heat energy produced in a light bulb wanted or unwanted?

3. What other examples can you think of whereby heat energy is a by-product (unwanted)?

Part B: Which light globe is more energy efficient?

Answer the questions below after you observe your teacher conduct the following investigation.

Materials:

- lamp
- 25W fluorescent light globe
- 25W incandescent light globe
- thermometer

Instructions:

1. Put the 25W incandescent light globe into the lamp and turn it on
2. Hold the thermometer 10 cm from the light globe for 1 minute. Record the temperature.
3. Turn off the lamp and let the globe cool.
4. Remove the globe from the lamp.
5. Repeat steps 1-3 using the 25W fluorescent light globe.

V.S.

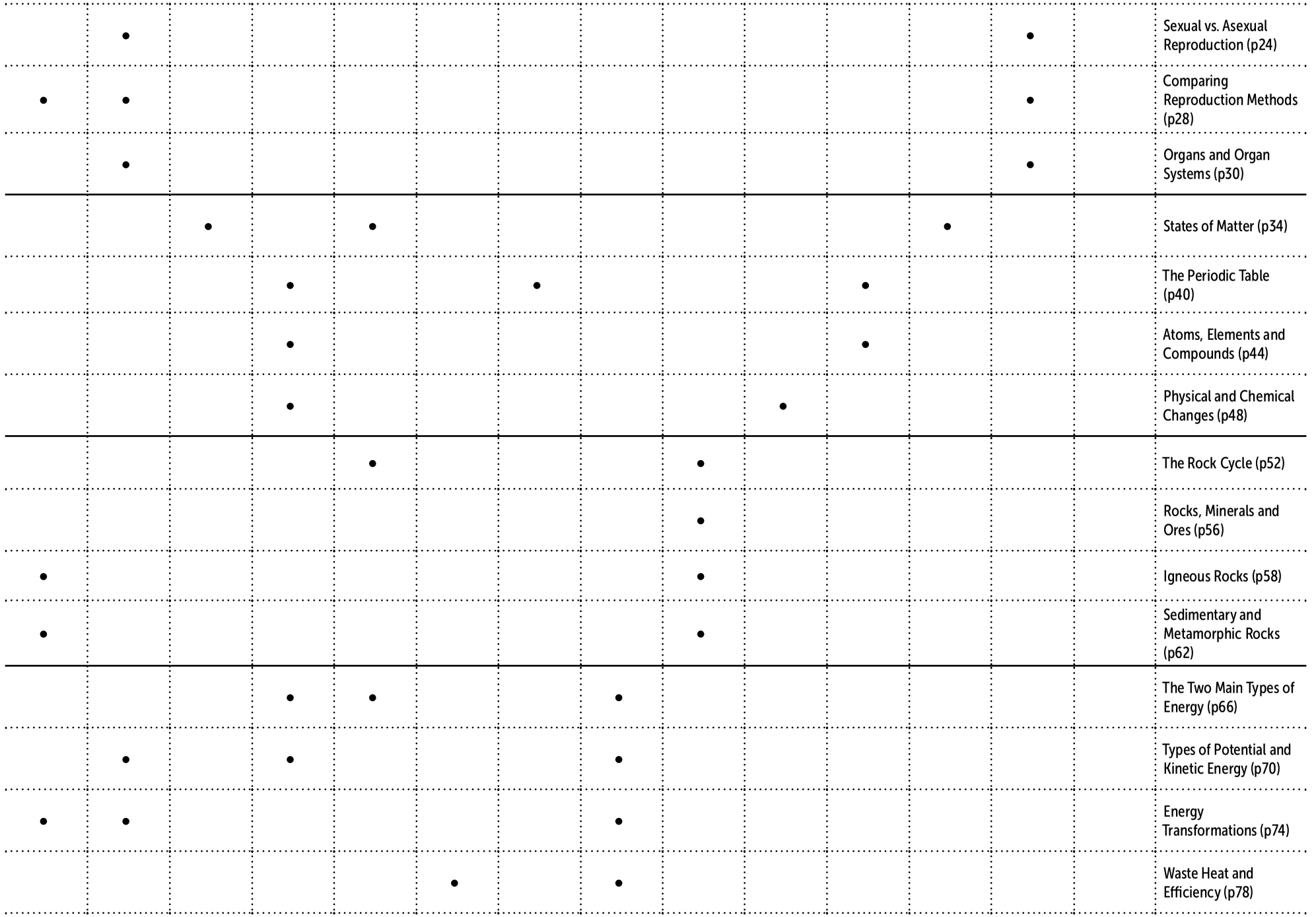
1. What temperature did the thermometer show after 1 minute?		
2. Which globe produced more heat energy after 1 minute?		
3. Is more heat produced from the brighter globe?		
4. Do both globes consume the same amount of energy?		
5. Which globe is more efficient? Why?		

Research online to find answers to the following two questions.

6. List two advantages of using this globe.	• •	• •
7. List two disadvantages of using this globe.	• •	• •

CURRICULUM MAPPING GRID

Strand	Substrand	Content Description	An Introduction to Cells (p6)	An Introduction to Microscopes (p10)	Unicellular Organisms (p14)	The Cell Cycle (p16)	An Introduction to Reproduction (p20)
Understanding	Biological sciences	Cells are the basic units of living things; they have specialised structures and functions (ACSSU149)	•	•	•	•	
		Multi-cellular organisms contain systems of organs carrying out specialised functions that enable them to survive and reproduce (ACSSU150)					•
	Chemical sciences	Properties of the different states of matter can be explained in terms of the motion and arrangement of particles (ACSSU151)					
		Differences between elements, compounds and mixtures can be described at a particle level (ACSSU152)					
		Chemical change involves substances reacting to form new substances (ACSSU225)					
	Earth and space sciences	Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales (ACSSU153)					
	Physical sciences	Energy appears in different forms, including movement (kinetic energy), heat and potential energy, and energy transformations and transfers cause change within systems (ACSSU155)					
Human Endeavour	Nature and development of science	Scientific knowledge has changed peoples' understanding of the world and is refined as new evidence becomes available (ACSHE134)					
	Use and influence of science	Solutions to contemporary issues that are found using science and technology, may impact on other areas of society and may involve ethical considerations (ACSHE135)					
Inquiry Skills	Questioning and predicting	Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS139)					
	Planning and conducting	Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS140)					
	Processing and analysing data and information	Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships in data using digital technologies as appropriate (ACSIS144)					
		Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (ACSIS145)				•	•
	Communicating	Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS148)	•		•		


Sexual vs. Asexual Reproduction (p24)
Comparing Reproduction Methods (p28)
Organs and Organ Systems (p30)
States of Matter (p34)
The Periodic Table (p40)
Atoms, Elements and Compounds (p44)
Physical and Chemical Changes (p48)
The Rock Cycle (p52)
Rocks, Minerals and Ores (p56)
Igneous Rocks (p58)
Sedimentary and Metamorphic Rocks (p62)
The Two Main Types of Energy (p66)
Types of Potential and Kinetic Energy (p70)
Energy Transformations (p74)
Waste Heat and Efficiency (p78)

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