

Question 1 (9 marks)

Many people around the world are developing new types of vehicles to reduce environmental pollution. For example, e-scooters have been introduced in many cities as a method of transportation and have become very popular with young people. E-scooters reduce the volume of traffic on the roads, help reduce pollution and improve air-quality.

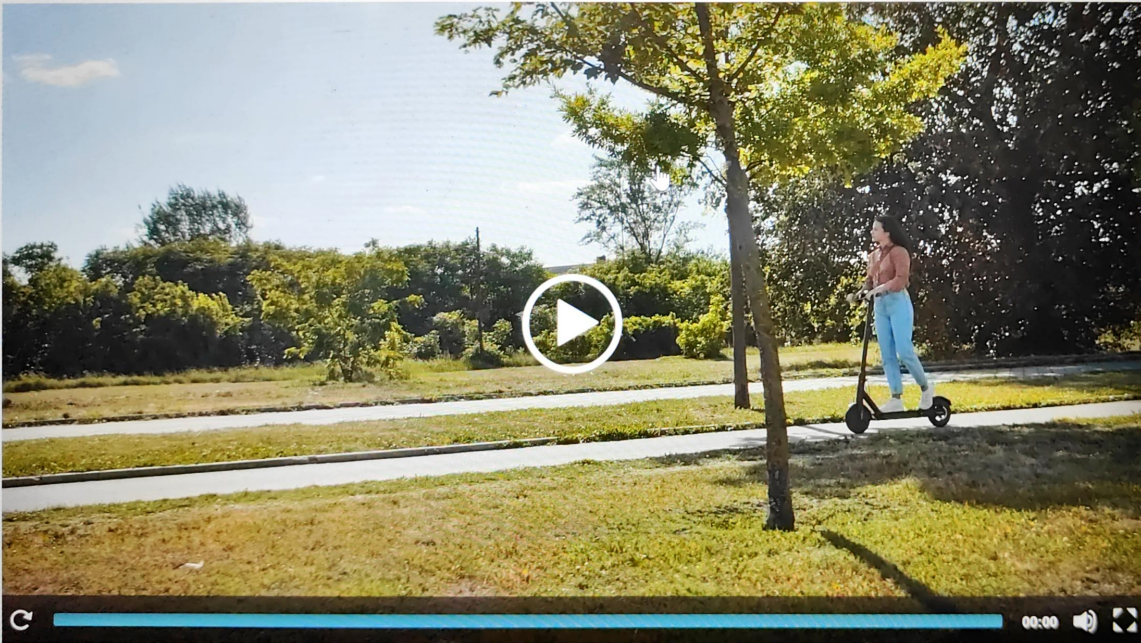
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- 1 (9 marks) ^
- Question 1a
- Question 1b
- Question 1c
- 2 (8 marks) v
- 3 (9 marks) v
- 4 (10 marks) v
- 5 (19 marks) v
- 6 (19 marks) v
- 7 (11 marks) v
- 8 (15 marks) v

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- 1 (9 marks) ^
- Question 1a
- Question 1b
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- 5 (19 marks) v
- 6 (19 marks) v
- 7 (11 marks) v
- 8 (15 marks)

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Question 1a (2 marks)

A battery is a device that stores chemical energy and converts it to electrical energy. The chemical reactions in a lithium-ion battery provide an electric current that can be used to move an e-scooter.

The Sankey diagram below shows the energy flow in an e-scooter. **Select** the correct location for each type of energy in the diagram.

Draggable items:

Sound Kinetic Heat



Scroll down to continue

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- Question 1a
- Question 1b
- Question 1c
- 2 (8 marks) v
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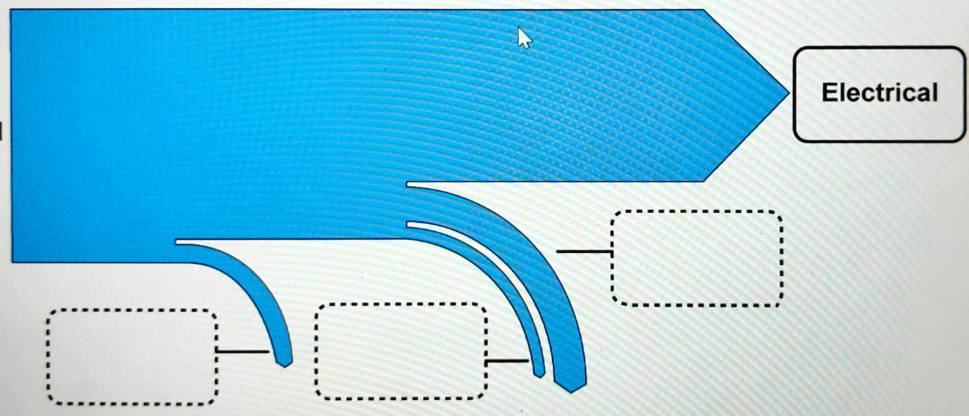
Draggable items:

Sound

Kinetic

Heat

Chemical



- 1 (9 marks) ^
 - Question 1a
 - Question 1b
 - Question 1c
- 2 (8 marks) v
- 3 (9 marks) v
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Question 1c (5 marks)

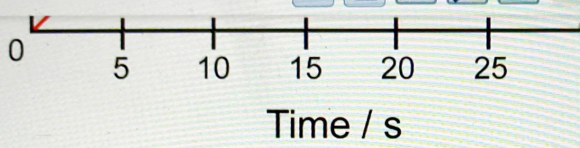
An e-scooter is moving at 30 ms^{-1} . Just as the scooter passes a parked car, the car starts to move. The graph below shows the motion of the e-scooter and the car.



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- Question 1a
- Question 1b
- Question 1c
- 2 (8 marks)
- 3 (9 marks)
- 4 (10 marks)
- 5 (19 marks)
- 6 (19 marks)
- 7 (11 marks)
- 8 (15 marks)

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Use the graph to **calculate** which vehicle has travelled the greatest distance after 25



Use data from the graph to **calculate** which vehicle has travelled the greatest distance after 25 seconds. You should include your working in your answer.

B I | ← → | x₂ x² | \int \sum | Ω Σ | Styles |

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- 1 (9 marks) ^
- Question 1a
- Question 1b
- Question 1c
- 2 (8 marks) v
- 3 (9 marks) v
- 4 (10 marks) v
- 5 (19 marks) v
- 6 (19 marks) v
- 7 (11 marks) v
- 8 (15 marks)

Question 2 (8 marks)

Many people across the world celebrate special events with firework displays. The bright, colourful part of the display is caused by different chemical reactions when the fireworks explode.

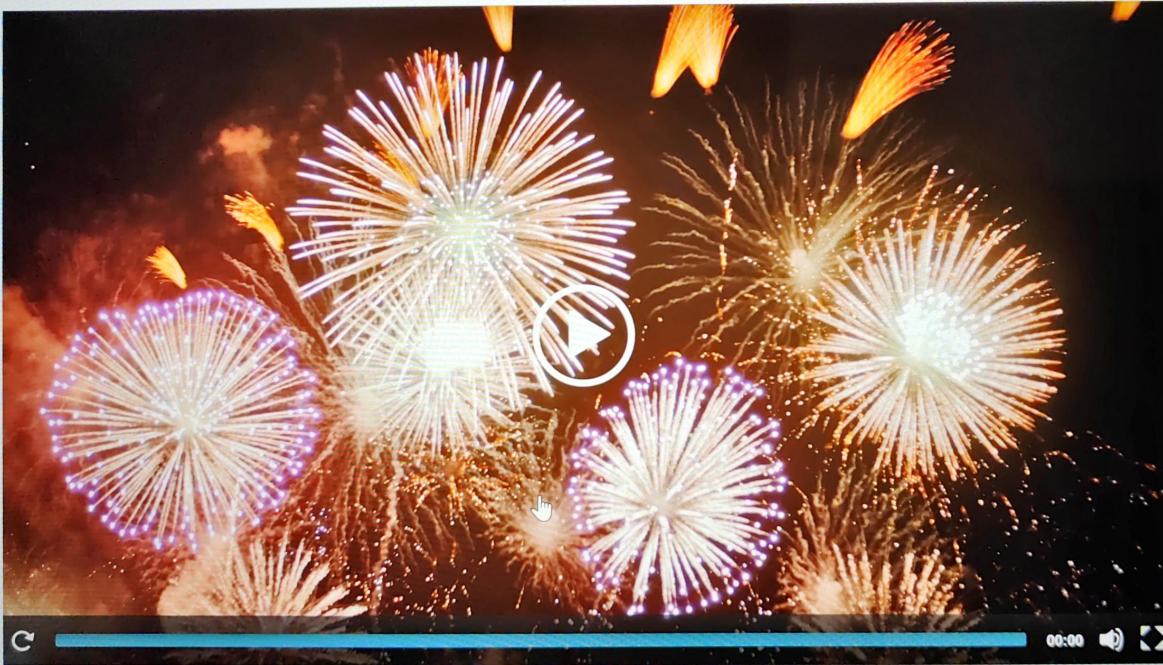
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 - Question 2a
 - Question 2b
 - Question 2c
 - Question 2d
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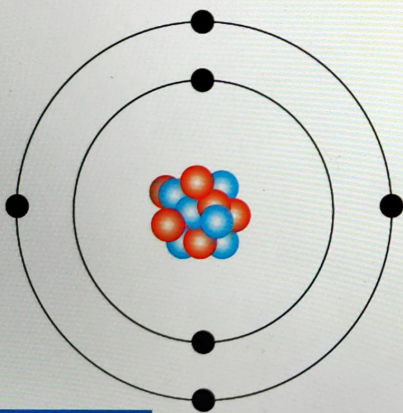
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- 8 (15 marks) ▾

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Question 2a (1 mark)

Protons, neutrons and electrons are the particles inside an atom as shown in the diagram below. **Select** the electrical charge of each type of particle.



Proton

Neutron

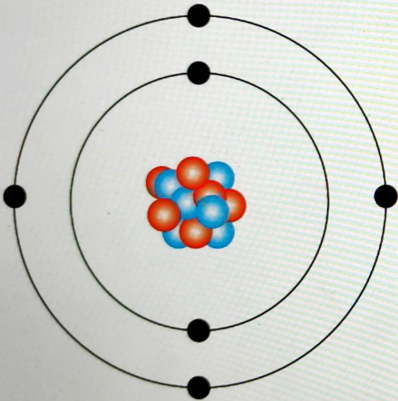
Electron



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- Question 2d
- 3 (9 marks) ▾
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- 6 (19 marks) ▾
- 7 (11 marks) ▾
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Protons, neutrons and electrons are the particles inside an atom as shown in the diagram below. Select the electrical charge of each type of particle.



Proton

Neutron

Electron

- Select
- Negative
- Neutral
- Positive

- 1 (9 marks)
- 2 (8 marks)
 - Question 2a
 - Question 2b
 - Question 2c
 - Question 2d
- 3 (9 marks)
- 4 (10 marks)
- 5 (19 marks)
- 6 (19 marks)
- 7 (11 marks)
- 8 (15 marks)

Question 2b (2 marks)

Compounds of certain metals are used in fireworks due to their high reactivity. Metals commonly used in fireworks are sodium, potassium, copper, barium and calcium. Use the periodic table to **write down** the electronic configuration of sodium and potassium.

Sodium

Rich text editor toolbar with buttons for Bold (B), Italic (I), Underline (U), subscript (x₂), superscript (x²), bulleted list, numbered list, link (Ω), and unlink (Σ). Below the toolbar is a 'Styles' dropdown menu and a 'Send to mobile' icon.

Potassium

Rich text editor toolbar with buttons for Bold (B), Italic (I), Underline (U), subscript (x₂), superscript (x²), bulleted list, numbered list, link (Ω), and unlink (Σ). Below the toolbar is a 'Styles' dropdown menu and a 'Send to mobile' icon.

- 1 (9 marks) ▾
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 - Question 2a
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 - Question 2c
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- 3 (9 marks) ▾
- 4 (10 marks) ▾
- 5 (19 marks) ▾
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾

Question 2d (2 marks)

Fireworks give joy and pleasure to millions of people every year, but they have to be treated with caution as they are extremely dangerous. **Suggest** two safety precautions when using fireworks.

Suggestion 1

Rich text editor toolbar with icons for Bold (B), Italic (I), Undo, Redo, Underline (U), Subscript (x₂), Superscript (x²), Bulleted List, Numbered List, Link, Unlink, Styles, and a document icon. The text area below is empty.

Suggestion 2

Rich text editor toolbar with icons for Bold (B), Italic (I), Undo, Redo, Underline (U), Subscript (x₂), Superscript (x²), Bulleted List, Numbered List, Link, Unlink, Styles, and a document icon. The text area below is empty.

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 - Question 2b
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- 3 (9 marks) ▾
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- 6 (19 marks) ▾
- 7 (11 marks) ▾
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Question 3 (9 marks)


Organ systems are made up of organs that work together to perform a specific function for the whole body.


Question 3a (1 mark)

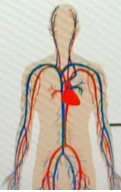
Identify the main functions of the following organ systems in the human body.
Drag and drop the functions to match alongside each system.


Draggable items:

- Body movement and protection
- Breaks down food and absorbs nutrients
- Transports oxygen and nutrients throughout the body
- Co-ordinates the activities of other systems









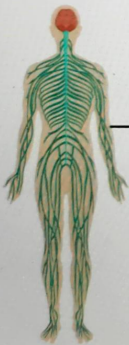
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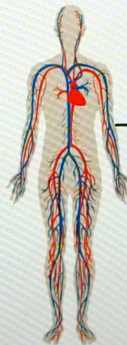
Question 3a (1 mark)

Identify the main functions of the following organ systems in the human body.
Drag and drop the functions to match alongside each system.

- Draggable items:
- Body movement and protection
 - Breaks down food and absorbs nutrients
 - Transports oxygen and nutrients throughout the body
 - Co-ordinates the activities of other systems



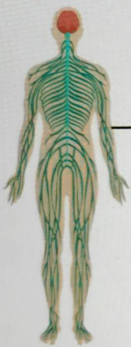
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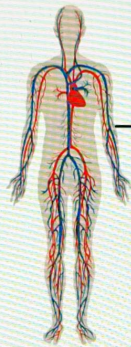
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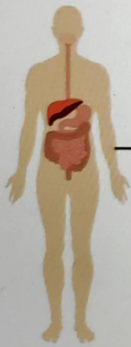
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- 8 (15 marks)



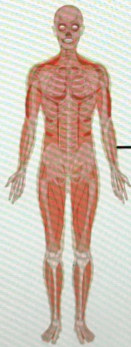
Empty dashed rectangular box for labeling the skeletal system.



Empty dashed rectangular box for labeling the circulatory system.



Empty dashed rectangular box for labeling the digestive system.



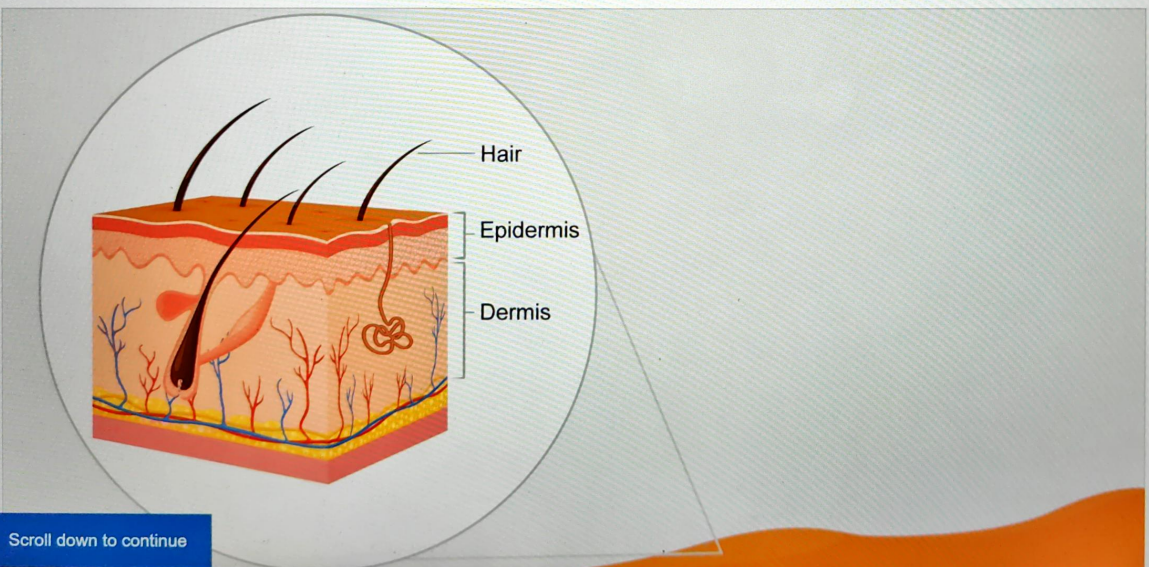
Empty dashed rectangular box for labeling the muscular system.

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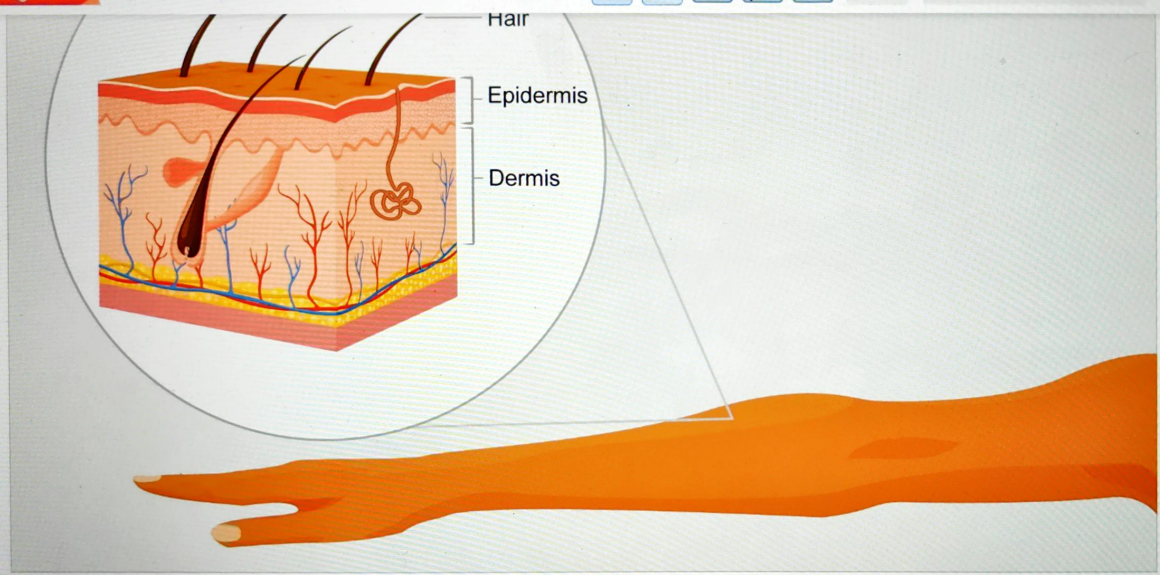
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Question 3b (1 mark)

The skin is part of another large organ system of the body. One of the main functions of the skin is protection. It protects the body from external factors such as bacteria and chemicals. The diagram below shows the structure of the skin.



- 1 (9 marks) ▾
- 2 (8 marks) ▾
- 3 (9 marks) ▾
 - Question 3a
 - Question 3b
 - Question 3c
 - Question 3d
 - Question 3e
- 4 (10 marks) ▾
- 5 (19 marks) ▾
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾



State how the structure of the epidermis protects the body.

B I ← → x₂ x² ∑ Ω Σ Styles 📄

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- 2 (8 marks) ▾
- 3 (9 marks) ▹
 - Question 3a
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 - Question 3e
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- 6 (19 marks) ▾
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- 8 (15 marks) ▾

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Question 3c (3 marks)

The hairs in the diagram in part (b) can help to keep a person warm in a cold environment. Describe how hairs can keep a person warm. You should use scientific terminology in your answer.

B I ← → U x_n x^2 Ω Σ Styles

- 1 (9 marks) ▾
- 2 (8 marks) ▾
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 - Question 3a
 - Question 3b
 - Question 3c
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 - Question 3e
- 4 (10 marks) ▾
- 5 (19 marks) ▾
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾

Scroll down to continue

Question 3d (2 marks)

Old or damaged skin cells are replaced through mitosis. **Outline** the characteristics of cells produced by mitosis.

B I | ← → | **U** x_2 x^e | $\frac{1}{2}$ $\frac{3}{4}$ | Ω Σ | Styles |

Question 3e (2 marks)

Scroll down to continue

... to the sun may cause skin ageing or skin cancer. Skin cancer is an important

- 1 (9 marks)
- 2 (8 marks)
- 3 (9 marks)
- Question 3a
- Question 3b
- Question 3c
- Question 3d
- Question 3e
- 4 (10 marks)
- 5 (19 marks)
- 6 (19 marks)
- 7 (11 marks)
- 8 (15 marks)

Question 3e (2 marks)

Constant exposure to the sun may cause skin ageing or skin cancer. Skin cancer is an important public health concern. The United Nations Environment Programme has estimated that over 2 million cases of skin cancer occur globally each year. **Suggest** two ways to reduce the risk of developing skin cancer.

Suggestion 1

B I | ← → | x₂ x² | Ω Σ | Styles | ↕

Suggestion 2

Scroll down to continue

- 1 (9 marks) ▾
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- 3 (9 marks) ▴
 - Question 3a
 - Question 3b
 - Question 3c
 - Question 3d
 - Question 3e
- 4 (10 marks) ▾
- 5 (19 marks) ▾
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾

Question 4 (10 marks)

Farmers use fertilizers to increase plant growth.

Some students decide to study the effects of fertilizer on the growth of maize. The students model the effects in a laboratory using the equipment below. They use small maize plants in their model.

Diagram not to scale



Initial mass
143 g



Initial mass
130 g



Initial mass
146 g



Initial mass
150 g



Initial mass
139 g



Initial mass
136 g



Scroll down to continue

- 1 (9 marks) ▾
- 2 (8 marks) ▾
- 3 (9 marks) ▾
- 4 (10 marks) ▾
- Question 4a ▾
- Question 4b ▾
- Question 4c ▾
- Question 4d ▾
- 5 (19 marks) ▾
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾



Initial mass
143 g



Initial mass
130 g



Initial mass
146 g



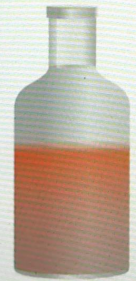
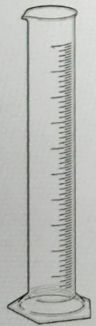
Initial mass
150 g



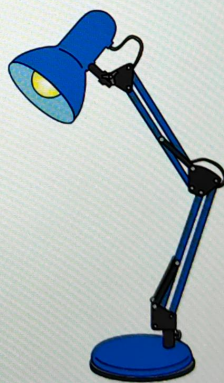
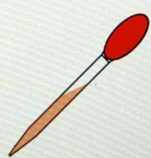
Initial mass
139 g



Initial mass
136 g



Liquid fertilizer
solution



- 1 (9 marks) ▾
- 2 (8 marks) ▾
- 3 (9 marks) ▾
- 4 (10 marks) ▴
 - Question 4a
 - Question 4b
 - Question 4c
 - Question 4d
- 5 (19 marks) ▾
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾

Question 4a (2 marks)

Suggest two reasons why the students choose to model the effect of fertilizer on the growth of maize plants in the laboratory instead of taking measurements in the farmer's field.

Reason 1

B I U x_2 x^e Ω Σ

Styles

Reason 2

B I U x_2 x^e Ω Σ

Styles

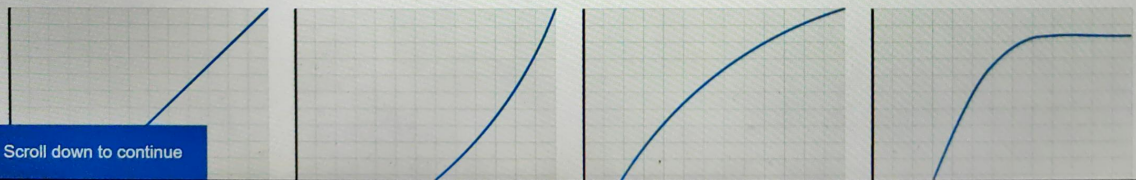
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- 4 (10 marks)
- Question 4a
- Question 4b
- Question 4c
- Question 4d
- 5 (19 marks)
- 6 (19 marks)
- 7 (11 marks)
- 8 (15 marks)

Question 4b (1 mark)

The lamp was placed at equal distance to all the plants. A different volume of fertilizer was added to each plant. Growth was measured by weighing each plant 5 days after the addition of fertilizer and calculating the change in mass. The students' data is shown in the table below.

Volume of fertilizer solution / cm ³	Initial mass / g	Final mass / g	Increase in mass / g
10	143	145	2
20	130	168	38
30	146	236	90
40	150	253	103
50	139	241	102
60	136	239	103

Select the image that shows the best representation of the trend in the students' investigation.

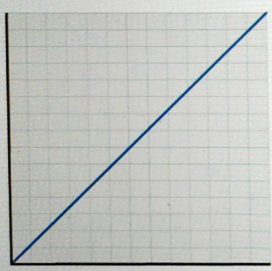


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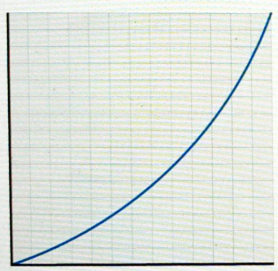
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30	146	236	90
40	150	253	103
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60	136	239	103

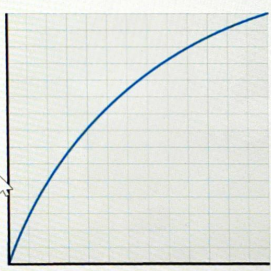
Select the image that shows the best representation of the trend in the students' investigation.



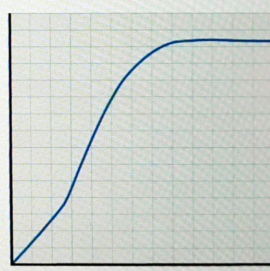
A



B



C



D

Select

- 1 (9 marks)
- 2 (8 marks)
- 3 (9 marks)
- 4 (10 marks)
- Question 4a
- Question 4b
- Question 4c
- Question 4d
- 5 (19 marks)
- 6 (19 marks)
- 7 (11 marks)
- 8 (15 marks)

Question 4c (3 marks)

At the start of the experiment the students made the following prediction.

A larger volume of fertilizer will always cause a larger increase in plant growth as measured by the increase in mass.

The data only partially support the prediction. Use the data and your scientific knowledge to **explain** why the prediction is only partially valid.

- 1 (9 marks) ▾
- 2 (8 marks) ▾
- 3 (9 marks) ▾
- 4 (10 marks) ▾
- Question 4a
- Question 4b
- Question 4c
- Question 4d
- 5 (19 marks) ▾
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾

Question 4d (4 marks)

Suggest two improvements that could be made to this experiment. **Justify** your answers.

Improvement 1

Styles

Justification 1

Improvement 2

Styles

Justification 2

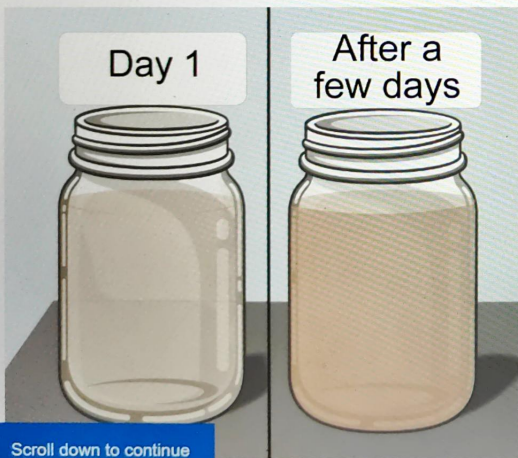
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- Question 4a
- Question 4b
- Question 4c
- Question 4d
- 5 (19 marks) ▾
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾

Scroll down to continue

Question 5 (19 marks)

Algae are the main producers in bodies of water such as ponds, rivers and oceans. Algae provide aquatic organisms with the oxygen they need to live.

Question 5a (1 mark)



A group of students visited their school pond. They collected a jar of pond water to look at in science class. They left the sealed jar of pond water on the window of the science laboratory. After a few days they noticed that they could no longer see through the pond water.

Suggest why the students could not see through the pond water after a few days

- 1 (9 marks) ▾
- 2 (8 marks) ▾
- 3 (9 marks) ▾
- 4 (10 marks) ▾
- 5 (19 marks) ▾
- Question 5a
- Question 5b
- Question 5c
- Question 5d
- Question 5e
- Question 5f
- Question 5g
- Question 5h
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾

Scroll down to continue



Question 5b (1 mark)

Using fertilizers on farms can have some negative effects on the organisms in nearby bodies of water. Algae sometimes receive excess nutrients from fertilizers that wash from fields into rivers. This is called "run off".



Video

Transcript

Farmers add fertilizers to increase plant growth on farms.

When rain falls these nutrients can be washed into bodies of water.

The nutrients from the fertilizer help algae to multiply and grow.

Algae can multiply so much that light from the sun can no longer reach the bottom of the water.

- 1 (9 marks) ▾
- 2 (8 marks) ▾
- 3 (9 marks) ▾
- 4 (10 marks) ▾
- 5 (19 marks) ▲
 - Question 5a
 - Question 5b
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 - Question 5g
 - Question 5h
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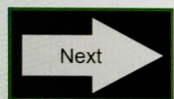


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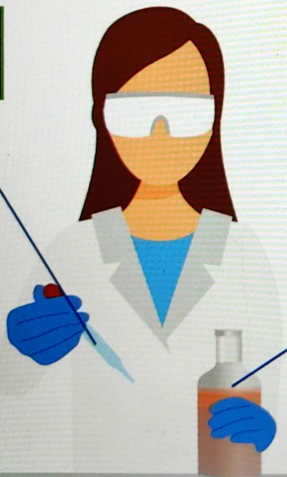
One of the students now wanted to investigate the effect of increasing fertilizer amounts on the growth of algae in pond water.

Click on the arrow to move through the student's experiment.

This media is interactive

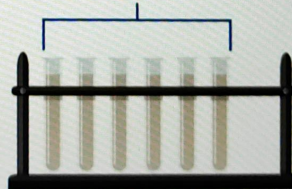


Dropper



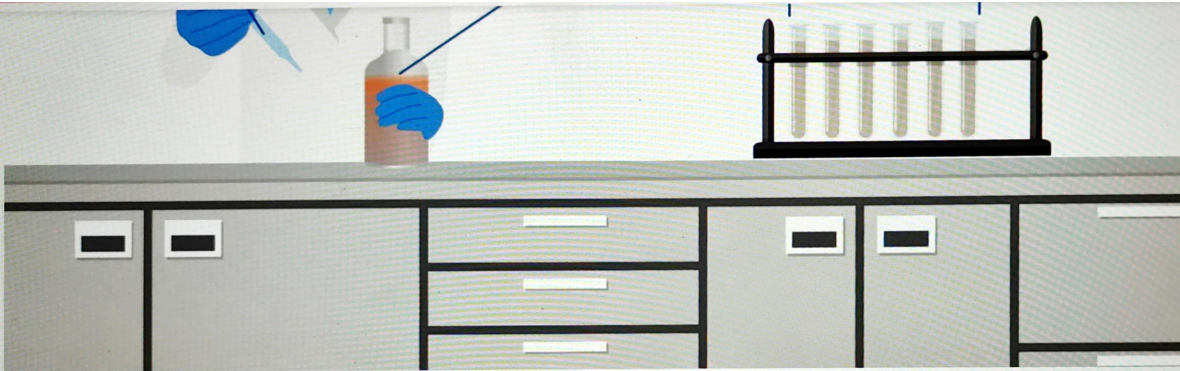
Fertilizer solution

Pond water samples



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- Question 5a
- Question 5b
- Question 5c
- Question 5d
- Question 5e
- Question 5f
- Question 5g
- Question 5h
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾



Suggest a research question for the student's experiment.

B *I* | ← → | U x_2 x^e | $\frac{1}{2}$ $\frac{3}{4}$ | Ω Σ | Styles |

- 1 (9 marks) ▾
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 - Question 5a
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 - Question 5e
 - Question 5f
 - Question 5g
 - Question 5h
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾



Question 5c (4 marks)

State two control variables. For each variable, **suggest** what would happen if each variable were not controlled.



Control variable 1

I

What would happen if this variable is not

Control variable 2

What would happen if this variable is not controlled

Scroll down to continue

- 1 (9 marks) ▾
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- 3 (9 marks) ▾
- 4 (10 marks) ▾
- 5 (19 marks) ▴
- Question 5a
- Question 5b
- Question 5c
- Question 5d
- Question 5e
- Question 5f
- Question 5g
- Question 5h
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾

[Empty text box for question 5a]

What would happen if this variable is not controlled

I

[Empty text box for question 5b]

[Empty text box for question 5c]

What would happen if this variable is not controlled

[Empty text box for question 5d]

- 1 (9 marks) ▾
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- 3 (9 marks) ▾
- 4 (10 marks) ▾
- 5 (19 marks) ▴
 - Question 5a
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 - Question 5f
 - Question 5g
 - Question 5h
- 6 (19 marks) ▾
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- 8 (15 marks)

Question 5d (1 mark)

State why the sample containing 0 drops of fertilizer is important.

B I | x_2 x^2 | Ω Σ | Styles |

I

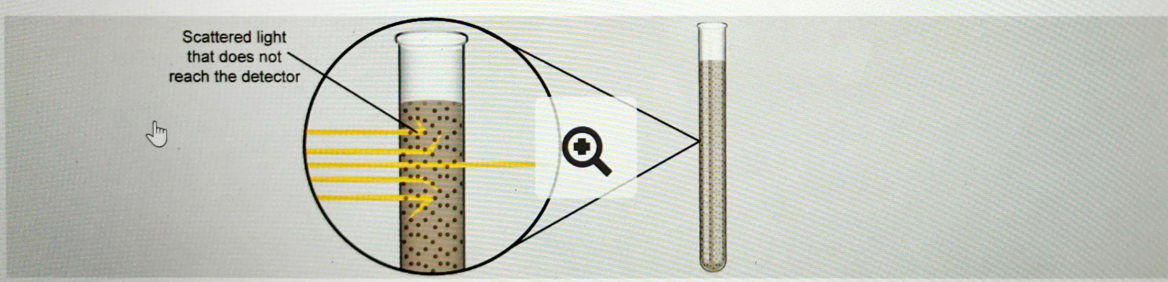
Question 5e (3 marks)

Scroll down to continue the samples for 10 days before collecting her data. She measured the growth of

- 1 (9 marks)
- 2 (8 marks)
- 3 (9 marks)
- 4 (10 marks)
- 5 (19 marks)
- 6 (19 marks)
- 7 (11 marks)
- 8 (15 marks)

Question 5e (3 marks)

The student left the samples for 10 days before collecting her data. She measured the growth of the algae by placing the different samples in a device that measures the amount of light that passes through the sample. The diagram below shows what happens to light as it passes through water containing algae.



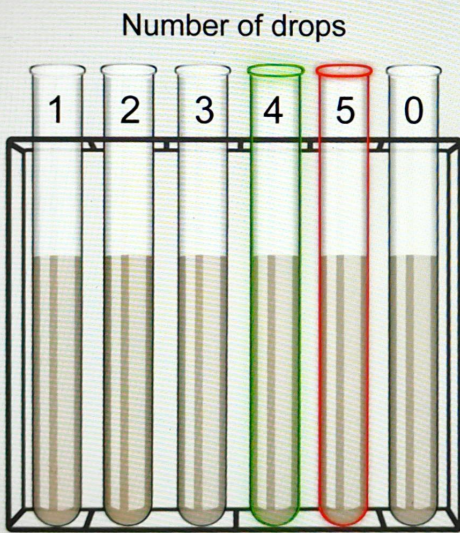
Use the interactive simulation below to **measure** the percentages of light passing through the samples and add your data to the table below. **Calculate** the missing average values.

Click on the pond water samples to start the interactive simulation.

This media is interactive

Scroll down to continue

- 1 (9 marks) ▾
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- 3 (9 marks) ▾
- 4 (10 marks) ▾
- 5 (19 marks) ▴
- Question 5a
- Question 5b
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- Question 5g
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- 7 (11 marks) ▾
- 8 (15 marks) ▾



- 1 (9 marks) ▾
- 2 (8 marks) ▾
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- 4 (10 marks) ▾
- 5 (19 marks) ▴
- Question 5a
- Question 5b
- Question 5c
- Question 5d
- Question 5e
- Question 5f
- Question 5g
- Question 5h
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾

Number of drops of fertilizer	Light passing through the sample / %			Average
	Trial 1	Trial 2	Trial 3	
0	86	84	87	
1	72	74	73	73
2	64	65	64	

Scroll down to continue



Number of drops of fertilizer	Light passing through the sample / %			
	Trial 1	Trial 2	Trial 3	Average
0	86	84	87	
1	72	74	73	73
2	61	65	64	
3	40	43	39	41
4	29	31		31
5	14	13		13

Reset

Question 5f (3 marks)

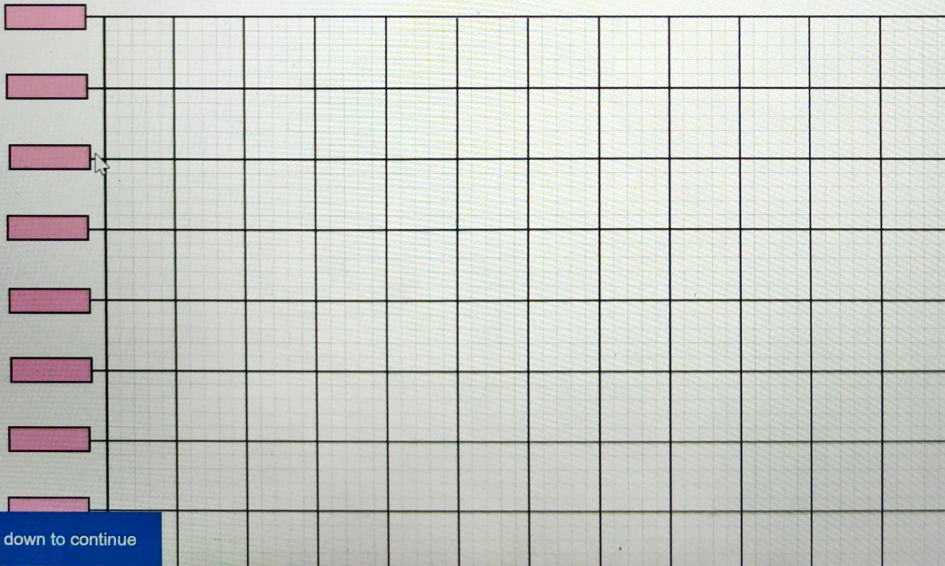
Plot the average percentages in part (e) on the axes below. You should **label** the y axis and add

Scroll down to continue

- 1 (9 marks) ▾
- 2 (8 marks) ▾
- 3 (9 marks) ▾
- 4 (10 marks) ▾
- 5 (19 marks) ▴
 - Question 5a
 - Question 5b
 - Question 5c
 - Question 5d
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 - Question 5f
 - Question 5g
 - Question 5h
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾

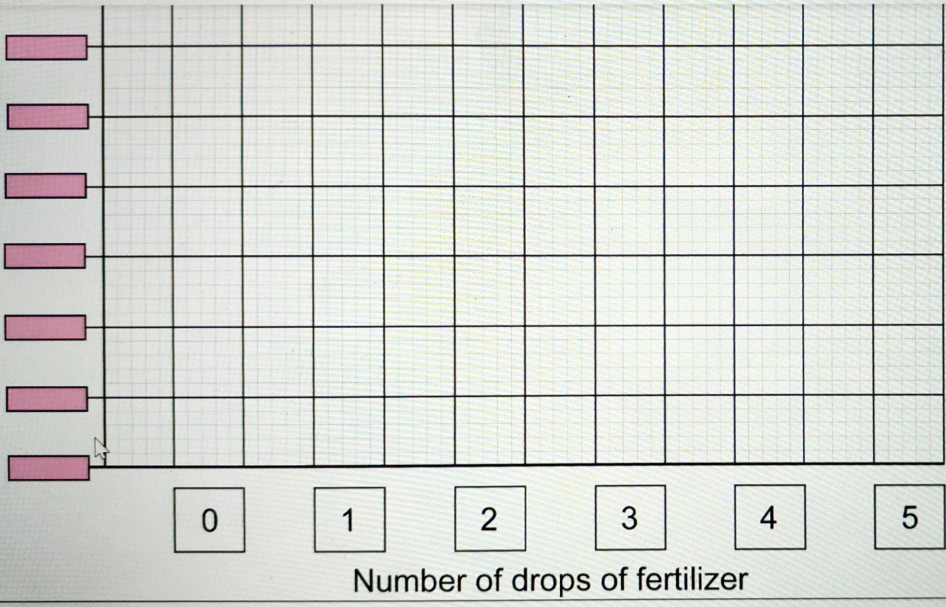
Question 5f (3 marks)

Plot the average percentages in part (e) on the axes below. You should label the y axis and add a scale.



Scroll down to continue

- 1 (9 marks) ▾
- 2 (8 marks) ▾
- 3 (9 marks) ▾
- 4 (10 marks) ▾
- 5 (19 marks) ▴
- Question 5a
- Question 5b
- Question 5c
- Question 5d
- Question 5e
- Question 5f
- Question 5g
- Question 5h
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾



y axis label:

- 1 (9 marks) ▾
- 2 (8 marks) ▾
- 3 (9 marks) ▾
- 4 (10 marks) ▾
- 5 (19 marks) ▴
- Question 5a
- Question 5b
- Question 5c
- Question 5d
- Question 5e
- Question 5f
- Question 5g
- Question 5h
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾

y axis label:

Question 5g (3 marks)

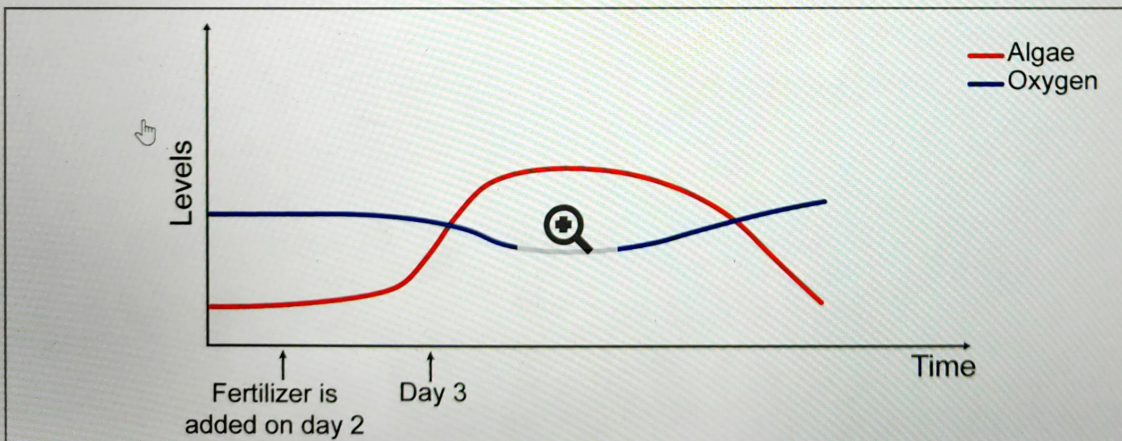
The student concludes that as more drops of fertilizer are added, less light passes through the sample. Use scientific reasoning to **explain** this conclusion.

B *I* U x_2 x^e Ω Σ Styles

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- 4 (10 marks) ▾
- 5 (19 marks) ▲
- Question 5a
- Question 5b
- Question 5c
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- Question 5h
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾

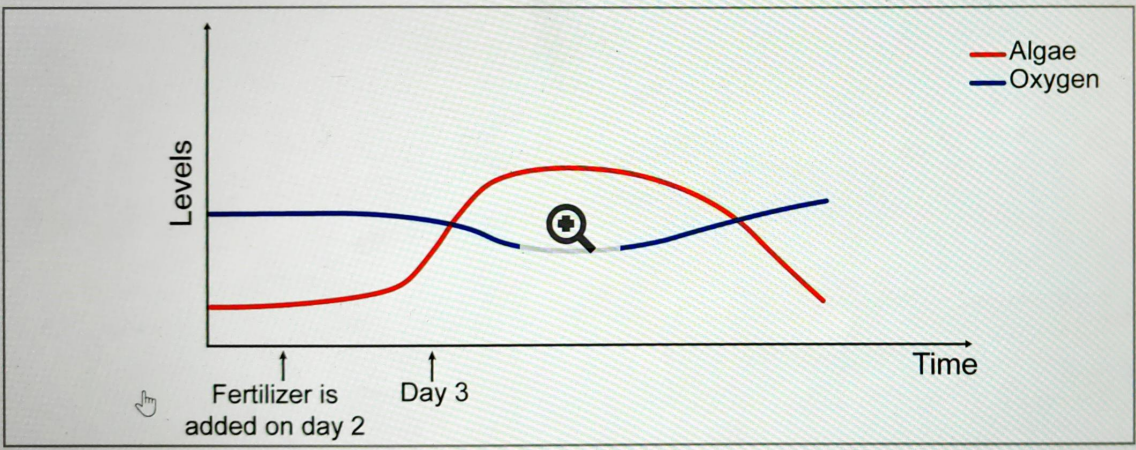
Question 5h (3 marks)

Scientists want to study the effect of fertilizer washed from farmland into ponds. They are concerned about the effects of the fertilizer on the pond's ecosystem, both biotic and abiotic factors. The graph below shows the changing levels of algae and oxygen in a pond over several days. On day 2, there is heavy rain and fertilizer is washed into the pond water.



- 1 (9 marks) ▾
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- 4 (10 marks) ▾
- 5 (19 marks) ▾
- Question 5a
- Question 5b
- Question 5c
- Question 5d
- Question 5e
- Question 5f
- Question 5g
- Question 5h
- 6 (19 marks) ▾
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- 8 (15 marks) ▾

Scroll down to continue select the correct options to complete the sentences below



Using the graph, **select** the correct options to complete the sentences below

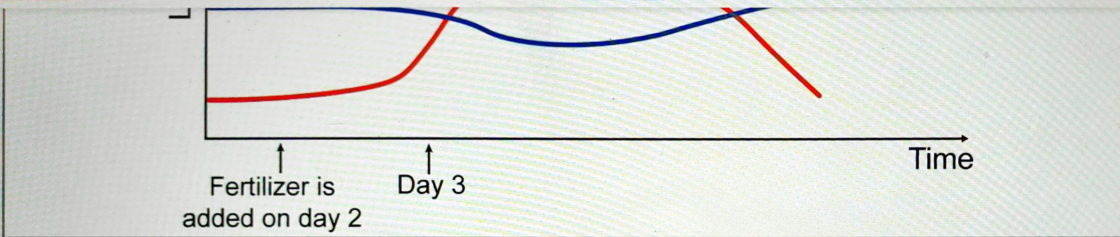
Fertilizer enters the pond on day 2.

On day 3, the algae multiply and the population

Initially, oxygen levels as oxygen is needed for

When the algae population is at its maximum, the oxygen levels as a result of

- 1 (9 marks) ▾
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- 3 (9 marks) ▾
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- 5 (19 marks) ▴
- Question 5a
- Question 5b
- Question 5c
- Question 5d
- Question 5e
- Question 5f
- Question 5g
- Question 5h
- 6 (19 marks) ▾
- 7 (11 marks) ▾
- 8 (15 marks) ▾



Using the graph, **select** the correct options to complete the sentences below

Fertilizer enters the pond on day 2.

On day 3, the algae multiply and the population

Initially, oxygen levels as oxygen is needed for

When the algae population is at its maximum, the oxygen levels as a result of

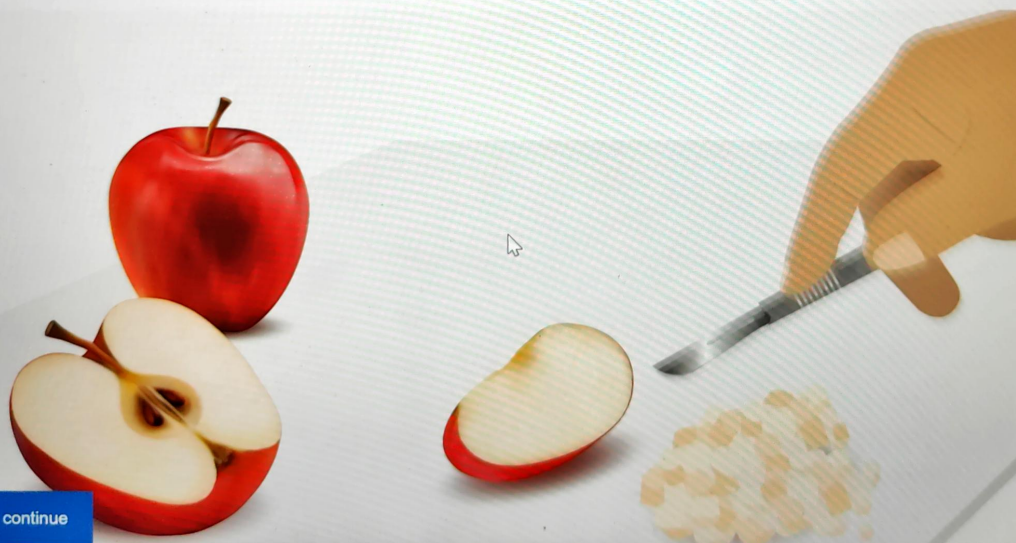
- Select
- Select
- cellular respiration.
- digestion.
- photosynthesis.

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<input type="radio"/>	5 (19 marks)	▲
Question 5a		
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Question 5h		
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<input type="radio"/>	7 (11 marks)	▼
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Question 6 (19 marks)

Apples can be stored for many months before they are eaten. If they are not stored correctly, the apples can dry out and become less juicy.

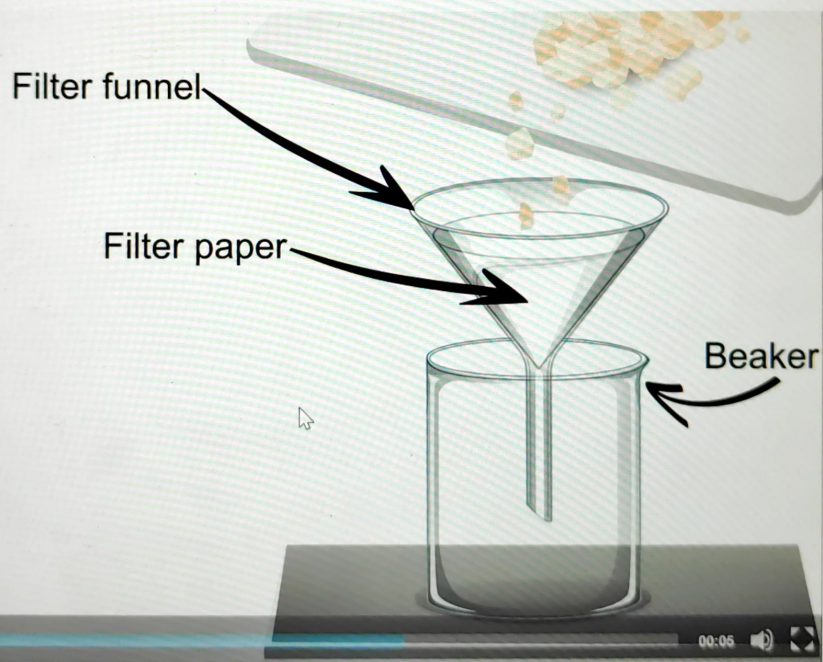
Some students are carrying out an experiment to investigate the temperature at which apples should be stored to remain juicy. The apples are stored for 7 days in different temperature environments and the amount of juice remaining is released using an enzyme.



☰ Scroll down to continue

- 1 (9 marks) ▾
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- 3 (9 marks) ▾
- 4 (10 marks) ▾
- 5 (19 marks) ▾
- 6 (19 marks) ▴
- Question 6a
- Question 6b
- 7 (11 marks) ▾
- 8 (15 marks) ▾

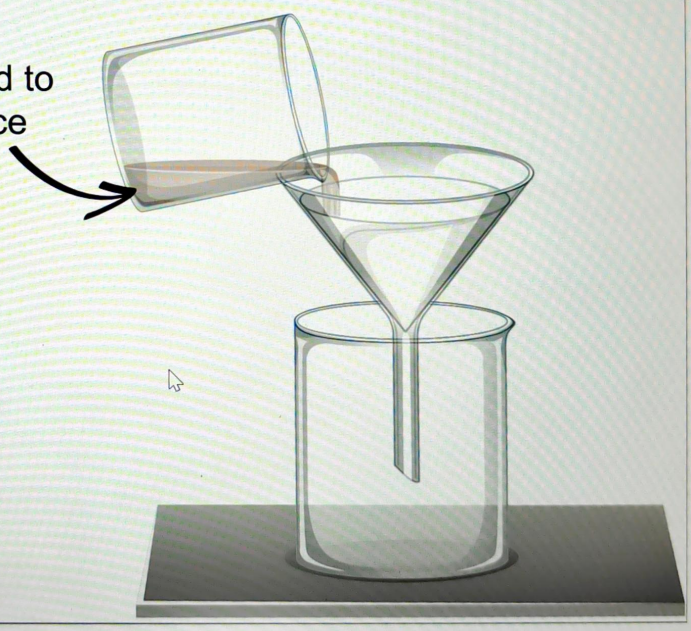
Some students are carrying out an experiment to investigate the temperature at which apples should be stored to remain juicy. The apples are stored for 7 days in different temperature environments and the amount of juice remaining is released using an enzyme.



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- Question 6a
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- 7 (11 marks) ▾
- 8 (15 marks) ▾

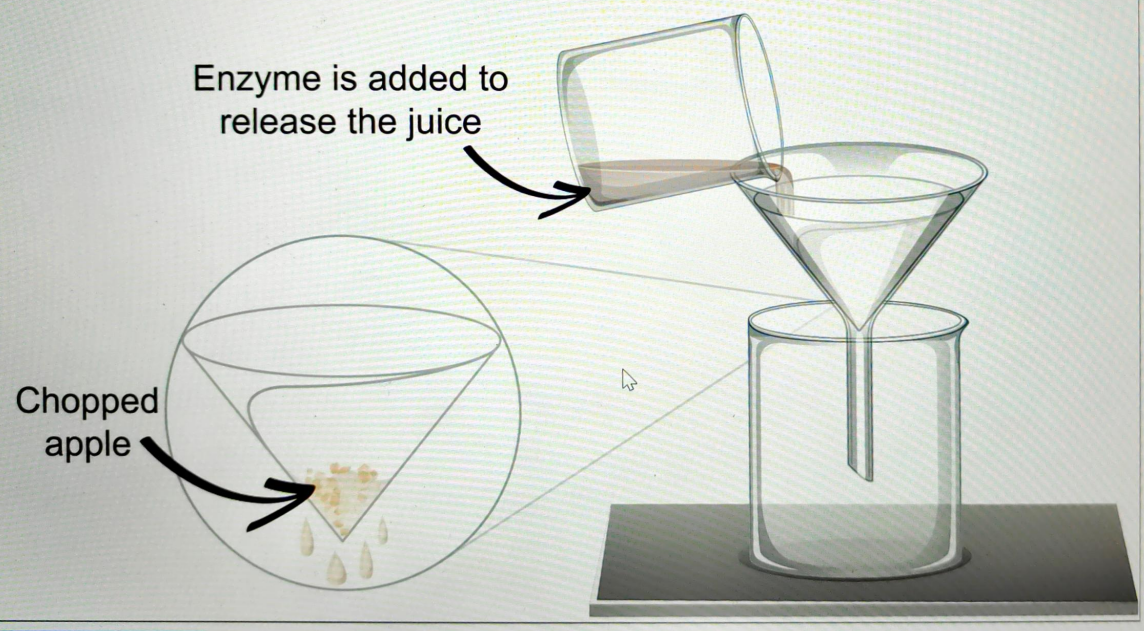
Some students are carrying out an experiment to investigate the temperature at which apples should be stored to remain juicy. The apples are stored for 7 days in different temperature environments and the amount of juice remaining is released using an enzyme.

Enzyme is added to release the juice



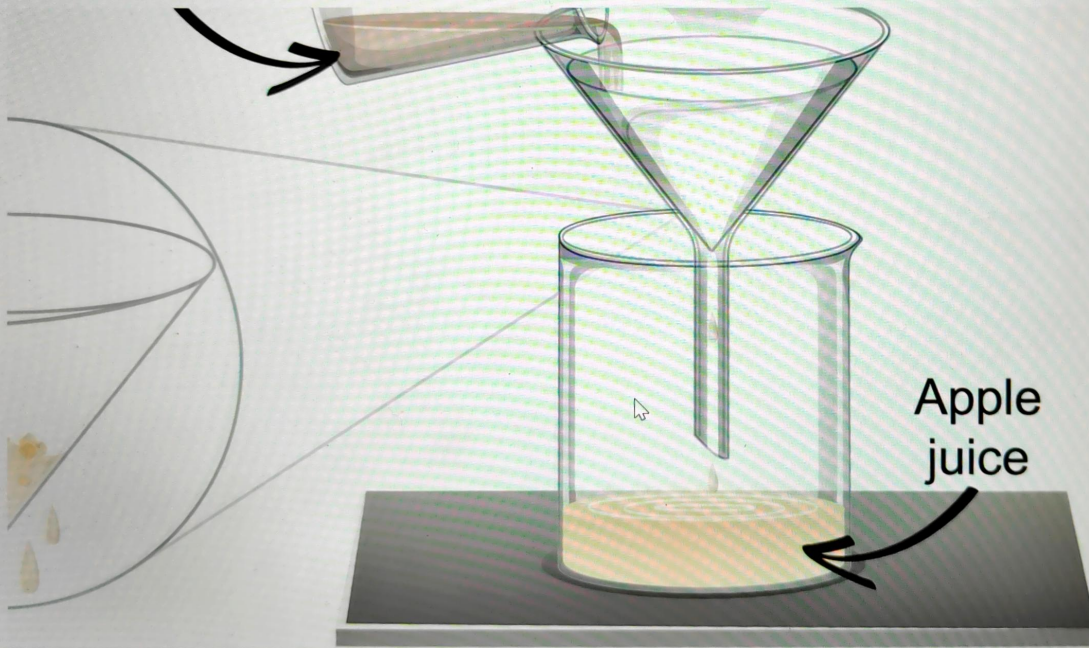
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- 6 (19 marks) ▴
- Question 6a
- Question 6b
- 7 (11 marks) ▾
- 8 (15 marks) ▾

Some students are carrying out an experiment to investigate the temperature at which apples should be stored to remain juicy. The apples are stored for 7 days in different temperature environments and the amount of juice remaining is released using an enzyme.



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- Question 6a
- Question 6b
- 7 (11 marks) ▾
- 8 (15 marks) ▾

Some students are carrying out an experiment to investigate the temperature at which apples should be stored to remain juicy. The apples are stored for 7 days in different temperature environments and the amount of juice remaining is released using an enzyme.



- 1 (9 marks) ▾
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- 4 (10 marks) ▾
- 5 (19 marks) ▾
- 6 (19 marks) ▴
- Question 6a
- Question 6b
- 7 (11 marks) ▾
- 8 (15 marks)

Question 6a (1 mark)

The enzyme used to release the apple juice is called pectinase. The image below shows a bottle of pectinase. **Select** the meaning of the hazard symbol.



- Select
- Select
- Flammable
- Irritant
- Radioactive
- Toxic

<input type="radio"/>	1 (9 marks)	▼
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<input type="radio"/>	3 (9 marks)	▼
<input type="radio"/>	4 (10 marks)	▼
<input type="radio"/>	5 (19 marks)	▼
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	Question 6a	
	Question 6b	
<input type="radio"/>	7 (11 marks)	▼
<input type="radio"/>	8 (15 marks)	▼

Question 6b (18 marks)

Design a method to investigate the effect of storage temperature on the amount of juice in an apple. In your answer you should include:

- your research question
- the independent, dependent and control variables
- a list of equipment you will use
- a description of the method you will use to collect sufficient data and make suitable measurements
- a statement of how you will make sure your method is safe.

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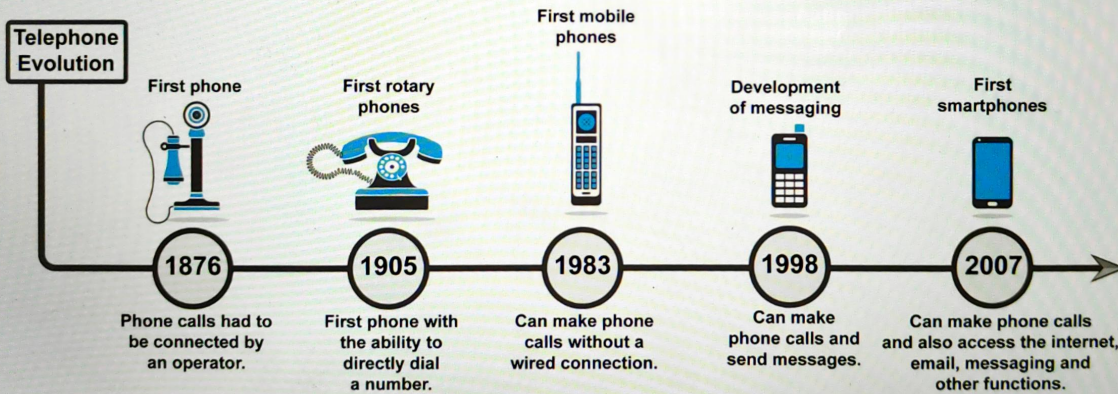
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	Question 6a	
	Question 6b	
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Question 7 (11 marks)


Sometimes it seems the world has become addicted to smartphones. In a recent poll in the US, over 84 % of people said they could not survive a day without their smartphone. Telephones have changed a lot over the past few decades.

This media is interactive



Scroll down to continue

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 - 8 (15 marks)
- Question 7a
- Question 7b
- Question 7c
- Question 7d

 **Question 7a** (2 marks)

A vital metal in smartphone batteries is cobalt. 40 % of cobalt currently used for smartphones comes from the Democratic Republic of the Congo. Cobalt is usually mined out of the ground, often using traditional mining methods. Most metals are not found in their pure form but are instead found as part of an ore. The pure metal must be separated from other elements, some of which may be toxic.


Video **Transcript**

Traditional cobalt miners are not usually officially employed by the mining company. Instead they work on the company land independently. They supply their own equipment and usually mine by hand.

Some mines are on the surface, while others involve going deep underground in small tunnels.

world's mining workforce are traditional miners

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- 6 (19 marks) ▾
- 7 (11 marks) ▴
- Question 7a
- Question 7b
- Question 7c
- Question 7d
- 8 (15 marks)

 Scroll down to continue

Video Transcript

Traditional cobalt miners are not usually officially employed by the mining company.

Instead they work on the company land independently. They supply their own equipment and usually mine by hand.

Some mines are on the surface, while others involve going deep underground in small tunnels.

Over 90 % of the world's mining workforce are traditional miners.

The amount the miners are paid depends on the amount of useful ore they obtain each day.



Most miners make between US\$2 and 3 a day. They can sell the ore they mine for up to 80 cents per kilogramme, depending on the purity of the ore.



The payment these miners receive does not allow for a decent lifestyle. One of the sustainable development goals is to "promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all".

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- 7 (11 marks) ▴
 - Question 7a
 - Question 7b
 - Question 7c
 - Question 7d
- 8 (15 marks)

Suggest two reasons why traditional mining may be more common in certain countries compared to others.



Reason 1



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



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Reason 2

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- 5 (19 marks) 
- 6 (19 marks) 
- 7 (11 marks) 
- Question 7a
- Question 7b
- Question 7c
- Question 7d
- 8 (15 marks) 

Question 7b (1 mark)

Around 3 billion people in the world use smartphones, which is around 35 % of the world population. Approximately 1.5 billion new smartphones are sold each year. The average smartphone contains over 60 different metals. There are two main ways of obtaining the metals needed for smartphones:

1. extracted from the ores
2. recycling metals from old phones.

Click on the elements below to see how and where they are obtained.

This media is interactive



Scroll down to continue

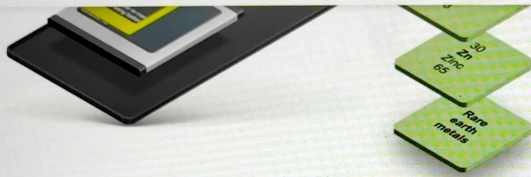
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- 7 (11 marks)
- Question 7a
- Question 7b
- Question 7c
- Question 7d
- 8 (15 marks)



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- 6 (19 marks) ▾
- 7 (11 marks) ▾
- Question 7a
- Question 7b
- Question 7c
- Question 7d
- 8 (15 marks)

Scroll down to continue

change their smartphones every two years and only 10% of old smartphones are left in cupboards or drawers in people's homes or they are thrown away.



Many people change their smartphones every two years and only 10 % of old smartphones are recycled. The rest are left in cupboards or drawers in people's homes or they are thrown away. Smartphones that are not recycled often end up in landfills. Smartphones make up less than 1 % of waste in landfills but make up over 50 % of the toxic waste found there. As a smartphone breaks down it releases toxic metal ions into the ground.

Suggest why most people choose not to recycle their smartphones.

B I ← → **U** \times_2 \times^e \int \sum Ω Σ Styles

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- 6 (19 marks) ▾
- 7 (11 marks) ▾
 - Question 7a
 - Question 7b
 - Question 7c
 - Question 7d
- 8 (15 marks)

Question 7c (2 marks)

There are three ways to recycle an unwanted smartphone:

1. Smelting – melting the phone and separating out all the metals while they are in liquid form.
2. Dismantling – breaking up a smartphone by hand and separating out the individual metals; often burning the parts which cannot be recycled.
3. Refurbishing – if the phone is still working it can be re-sold after deleting data and updating the software.

Suggest why dismantling smartphones may result in health issues for workers in recycling centres. **Justify** your answer.

Rich text editor toolbar with icons for Bold (B), Italic (I), Undo (Ctrl+Z), Underline (U), Text color (x), Background color (x^e), Bulleted list, Numbered list, Link (Ω), Unlink (Σ), Styles, and a document icon.

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- 8 (15 marks)

Question 7a

Question 7b

Question 7c

Question 7d



Question 8 (15 marks)

Smartphones use many different metals. Whether these are mined or obtained from recycling, there is a large negative impact on the environment and human health. A group of environmentalists has presented the following proposal to the United Nations.

Proposal: The only way to protect lives and the environment is to ban all production of smartphones for at least the next 10 years. This should give society time to find safe, alternative methods of obtaining the metal needed in smartphones.

Using the information provided and knowledge from your MYP studies, **discuss** and **evaluate** the proposal to ban all production of new smartphones for the next 10 years. In your answer you should include:

- a summary of the issues in obtaining metals needed in smartphones
- a discussion of the effects on the lifestyle of an individual
- a discussion of the effects on the environment
- an outline of the difficulties of implementing this proposal
- a conclusion with justification.

B I U \times_2 \times^2 Ω Σ Styles

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