



SCIENCE
Year 9 Scholarship Practice Paper
60 minutes

Write your name in the space provided.

CANDIDATE NAME:

SCORE:

Instructions

Read all questions carefully before you answer.

Answer all questions in the booklet

There are 56 marks for this paper and you have 60 minutes to complete it in.

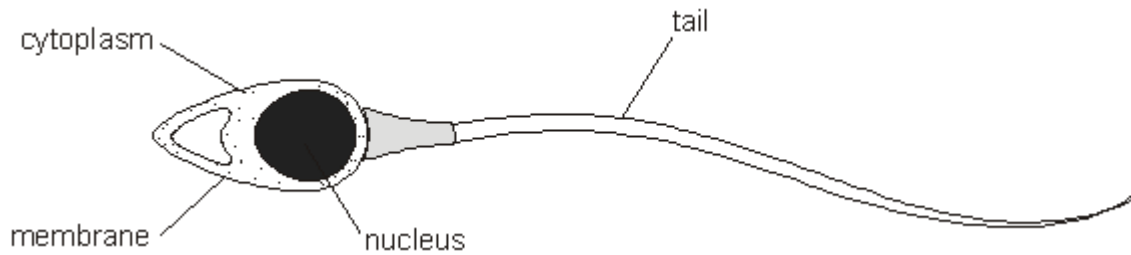
Please answer in pen (except for diagrams and graph lines which can be pencil)

You may use a calculator and you will also need a ruler and pencil.

Biology

Q1.

- (a) The diagram shows a sperm cell. Sperm cells are adapted for fertilisation.

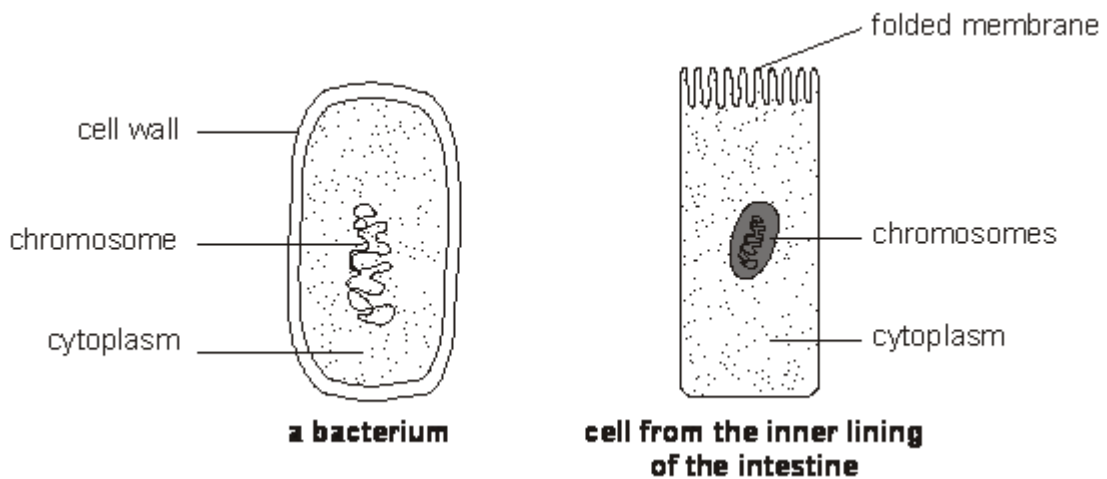


Sperm cells use their tails to swim towards an ovum (egg).
Give **one** other way the sperm cell is adapted for fertilisation.

.....
.....

1 mark

- (b) The diagrams below show two other cells.



not to scale

- (i) Look at the diagrams above.

What is the difference between the location of the genetic material in the bacterium and in the cell from the lining of the intestine?

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.....

1 mark

(ii) What is the function of the genetic material in a cell?

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.....

1 mark

(c) Cells in the lining of the intestine are adapted to absorb digested food.

How does the folded membrane of these cells enable them to absorb the maximum amount of digested food?

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1 mark

(d) A group of cells in the lining of the intestine is a tissue.

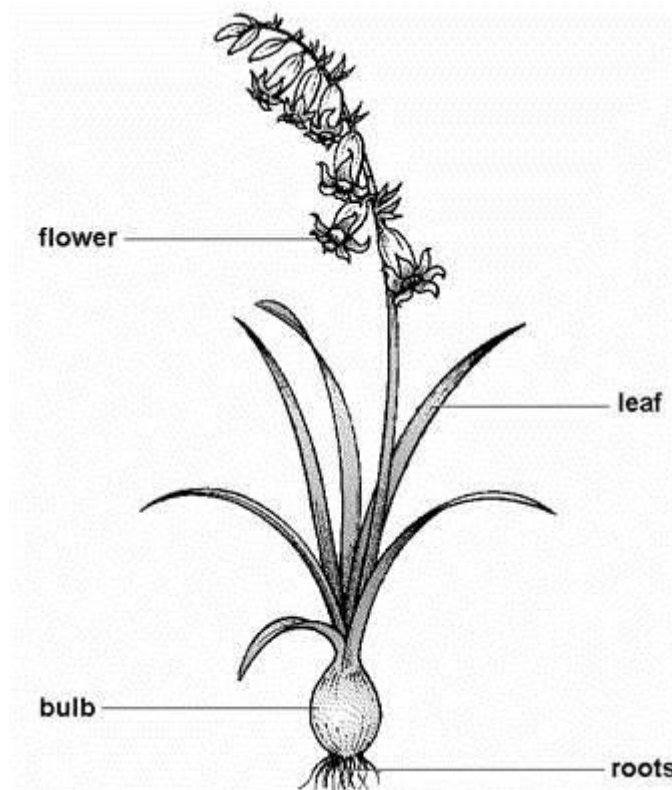
Why is a number of sperm cells **not** a tissue?

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1 mark
maximum 5 marks

Q2.

The drawing shows a bluebell plant. The plant grows from an underground stem called a bulb. Each year new leaves and flowers grow from the bulb.



(a) Describe the process by which glucose is made in the leaves.

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3 marks

(b) Many plants make starch from glucose.
What group of nutrients do both glucose and starch belong to?

.....

1 mark

(c) In the sixteenth century bluebell bulbs were dug up to obtain a starch-like substance that was used to make collars stiff.



(i) Digging up bluebell bulbs has caused a decrease in the number of bluebells growing in Britain.
It is now against the law to dig up bluebells.

Suggest **one** other environmental reason why the number of bluebell plants has decreased in Britain.

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.....

1 mark

(ii) Every 10 years the trees and bushes in some bluebell woods are cut down to ground level.

What effect does this have on the number of bluebells in the woods?
Explain your answer.

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1 mark
Maximum 6 marks

Q3.

New-born mammals produce an enzyme called rennin which clots the protein in milk. New-born mammals can only digest the protein after it clots.

(a) Pat investigated how pH affects the time for rennin to clot the protein in milk.

She put 2 cm³ of milk into each of four test-tubes, A, B, C and D.
She put these test-tubes and a test-tube of rennin into a water-bath at 35°C.

After a few minutes, Pat transferred 4 drops of the rennin into test-tubes A, B and C. She varied the pH by adding the chemicals shown in the table. To test-tube D she added 2 drops of hydrochloric acid only.

The table below shows the results of Pat's experiment.

	test-tube A	test-tube B	test-tube C	test-tube D
	2 cm ³ milk 4 drops rennin	2 cm ³ milk 4 drops rennin	2 cm ³ milk 4 drops rennin	2 cm ³ milk no rennin
chemical added	2 drops sodium hydroxide	2 drops distilled water	2 drops hydrochloric acid	2 drops hydrochloric acid
time for the milk to clot, in seconds	no clotting	34	10	200

(i) Use the results of test-tubes C and D to state the function of the enzyme in the clotting process.

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.....

1 mark

(ii) Use Pat's results to explain why rennin clots milk quickly in the stomach.

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.....

1 mark

(iii) Suggest what happens to the activity of rennin as it passes from the stomach into the small intestine. Explain your answer.

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2 marks

- (b) Pat then investigated how temperature affects the time for rennin to clot milk. She prepared four water-baths, at 0°C, 25°C, 35°C and 60°C.

Into each water-bath she put a test-tube containing 2 cm³ of milk and a test-tube containing rennin plus a chemical to give the correct pH.

In each water-bath, she transferred four drops of the rennin into the test-tube of milk and timed how long it took for the milk to clot. The table shows her results.

temperature of water-bath, in °C	time for milk to clot, in seconds
0	no clotting
25	23
35	10
60	no clotting

- (i) Explain why **no clotting** occurred in the test-tube at 60°C.

.....
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1 mark

- (ii) Pat took the test-tube out of the water-bath at 0°C and put it into the water-bath at 35°C. The milk clotted. Why was clotting still possible in this test-tube?

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.....

1 mark

- (iii) Raising the temperature from 25°C to 35°C made the milk clot more quickly. How could Pat change her experiment to show more precisely how temperature affects the time it takes for milk to clot?

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1 mark

- (c) After rennin clots milk protein, a different enzyme helps to digest the protein. What are the products of protein digestion?

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1 mark
Maximum 8 marks

Chemistry

Q4.

- (a) The fire extinguisher below contains a compound called sodium hydrogencarbonate.



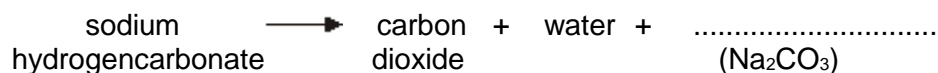
contains sodium
hydrogencarbonate
powder

The formula for sodium hydrogencarbonate is NaHCO_3 .

When sodium hydrogencarbonate is heated it breaks down to produce carbon dioxide, water and a compound with the formula Na_2CO_3 .

This is shown in the equation below.

- (i) Complete the word equation below.



1 mark

- (ii) Complete the table below to show the mass of water produced when 168 g of sodium hydrogencarbonate breaks down completely.

compound	reactant or product	mass (g)
sodium hydrogencarbonate	reactant	168
carbon dioxide	product	44
water	product	
Na_2CO_3	product	106

1 mark

- (iii) How much carbon dioxide is produced when 336 g of sodium hydrogencarbonate breaks down completely?

..... g

1 mark

(b) The diagram below shows two other types of fire extinguisher.



contains carbon dioxide gas



contains water

To put out a fire, you have to do one or more of the following:

- keep oxygen away from the fire
- take the heat away from the fire
- take the fuel away from the fire.

The density of carbon dioxide is about 1.8 g per 1000 cm³.

The density of air is about 1.2 g per 1000 cm³.

(i) Use the information above to explain why carbon dioxide is used to put out fires.

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2 marks

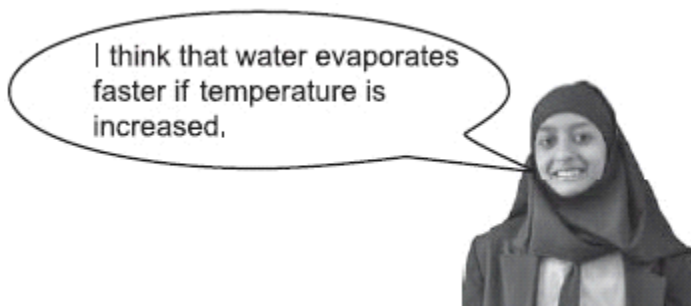
(ii) When water from the fire extinguisher is sprayed over a fire, the water evaporates.

Why does evaporation cool the fire down?

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1 mark
maximum 6 marks

Q5. Amena described her idea about the evaporation of water.



Amena

(a) Write a plan for an investigation you could carry out in the school laboratory to test Amena’s idea.

Assume you have access to all the usual laboratory equipment.

In your plan you must write:

- the one factor you would change as you carry out your investigation (the independent variable)
- the effect you would observe or measure as you carry out your investigation (the dependent variable)
- one factor you would keep the same to help make your test fair.

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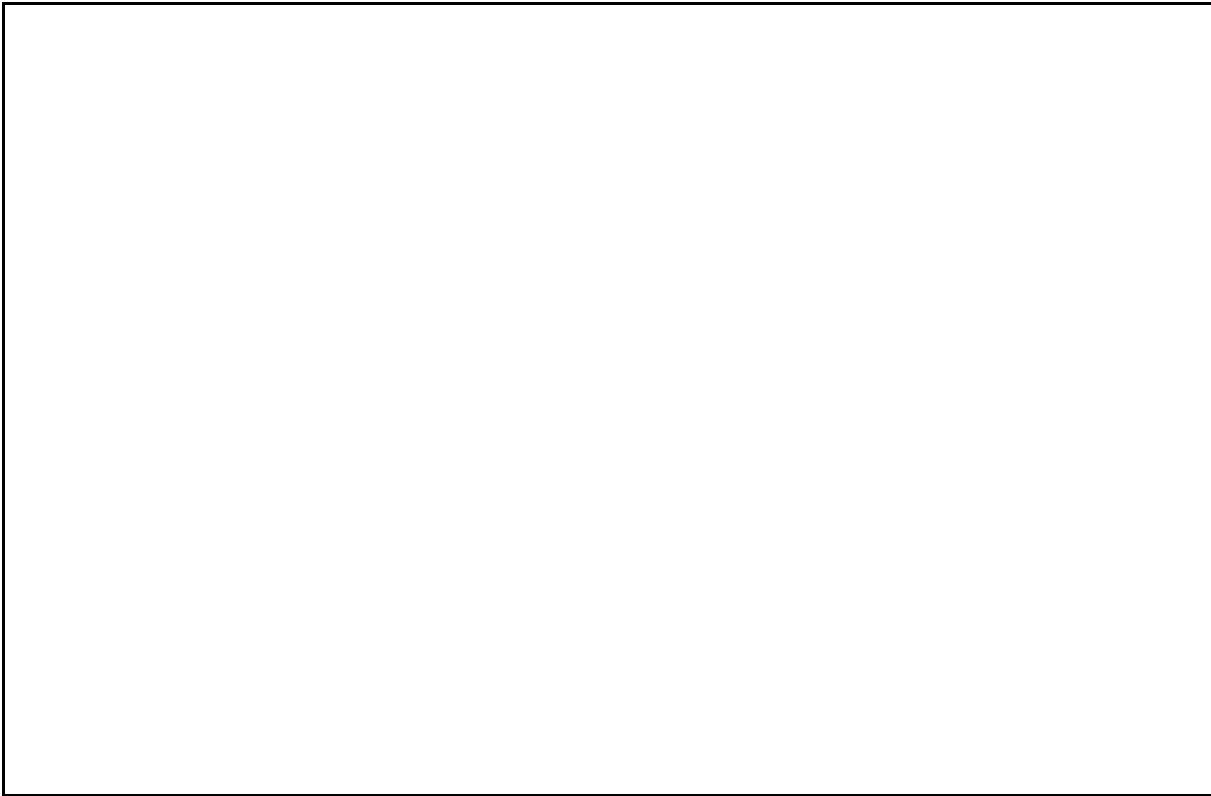
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3 marks

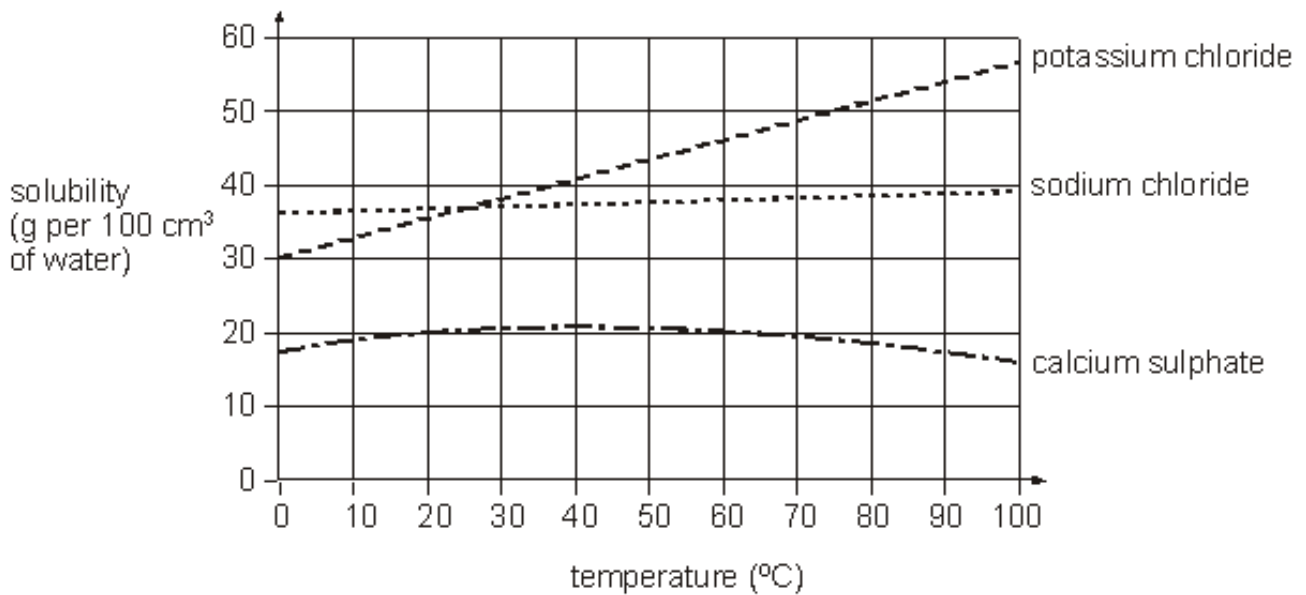
(b) In the box below, draw and label a table that you could use to record your results.



1 mark
maximum 4 marks

Q6.

The graph below shows how the solubility of three salts, sodium chloride, potassium chloride and calcium sulphate, changes as the temperature changes.



- (a) (i) Use the graph above to compare the solubility of sodium chloride and potassium chloride in the temperature range 10°C to 90°C.

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.....

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2 marks

- (ii) Ken had a beaker containing 54 g of potassium chloride dissolved in 100 cm³ of water at 90°C.

He cooled the solution to 40°C.

What would he see in the beaker as the solution cooled to 40°C?

Use the graph to help you.

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1 mark

Explain your answer.

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1 mark

Q7.

The names and formulae of five compounds are listed in the table below.

name of compound	formula of compound
ammonia	NH ₃
ammonium chloride	NH ₄ Cl
ammonium sulphate	(NH ₄) ₂ SO ₄
sodium hydroxide	NaOH
sodium sulphate	Na ₂ SO ₄

- (a) Complete and balance the symbol equation for the reaction between sodium hydroxide and sulphuric acid.



3 marks

- (b) The formula for ammonia is NH_3 .
One atom of nitrogen weighs fourteen times as much as one atom of hydrogen.
What is the total mass of hydrogen in 17 g of ammonia?

..... g

1 mark

(Physics questions start on the next page)

Physics

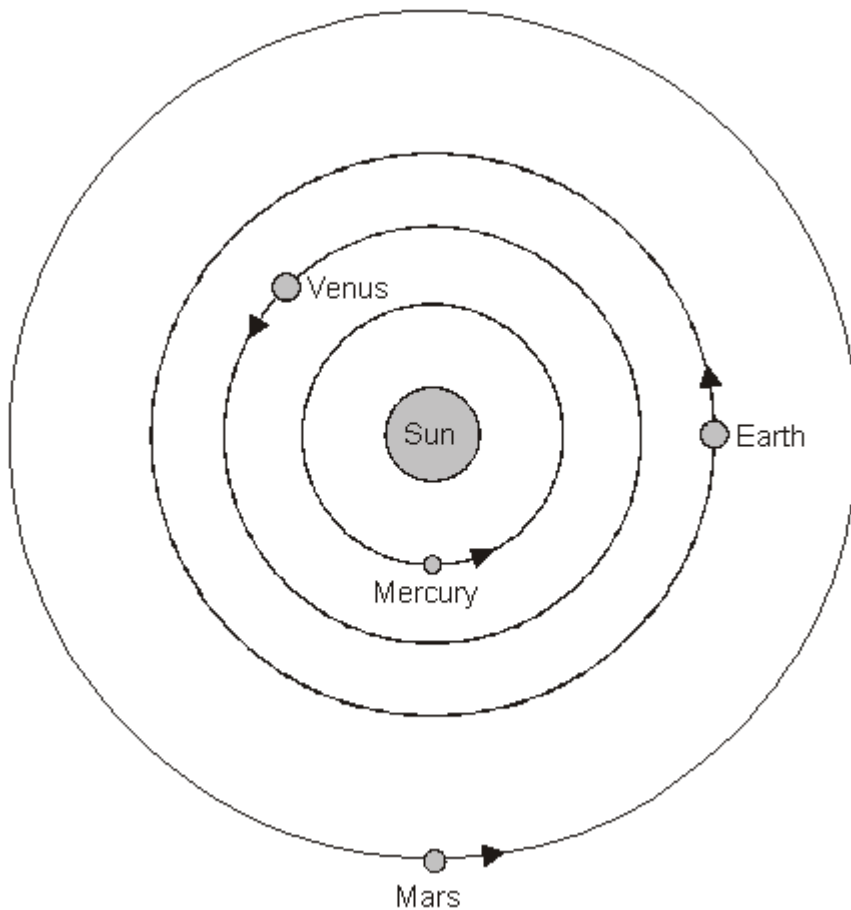
Q8.

The table below shows information about four planets.

planet	time taken to orbit the Sun (Earth years)	distance from the Sun (million km)
Mercury	0.25	60
Venus	0.5	108
Earth	1.0	150
Mars	2.0	228

The diagram below shows the orbits of the Earth, Mercury, Venus and Mars, and their position at one particular time.

The arrows show the direction in which the planets move.



not to scale

- (a) Show the position of each planet six months later by drawing a letter X on the orbit of each planet.

2 marks

(b) Use the information in the table to calculate the largest and smallest distance between the Earth and Venus.

closest million km

1 mark

furthest million km

1 mark

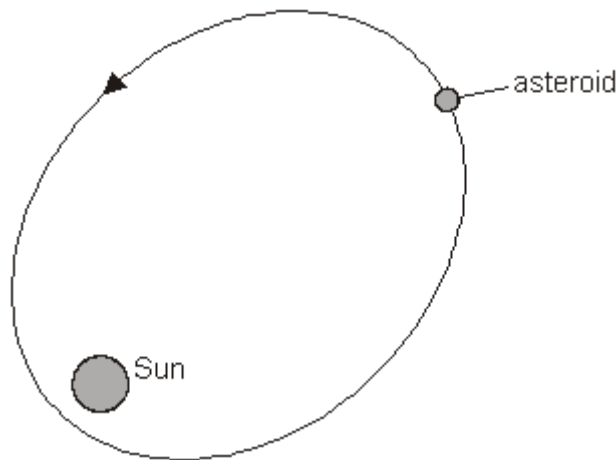
(c) The speed of light is 300 000 km/second.
Calculate how long light takes to reach the Earth from the Sun.

.....

..... s

1 mark

(d) The diagram below shows the path of an asteroid around the Sun.



not to scale

(i) **On the path of the asteroid**, draw a letter S to show the position where the asteroid is travelling the slowest.

On the path of the asteroid, draw a letter F to show the position where the asteroid is travelling the fastest.

1 mark

(ii) Explain why the speed of the asteroid changes.

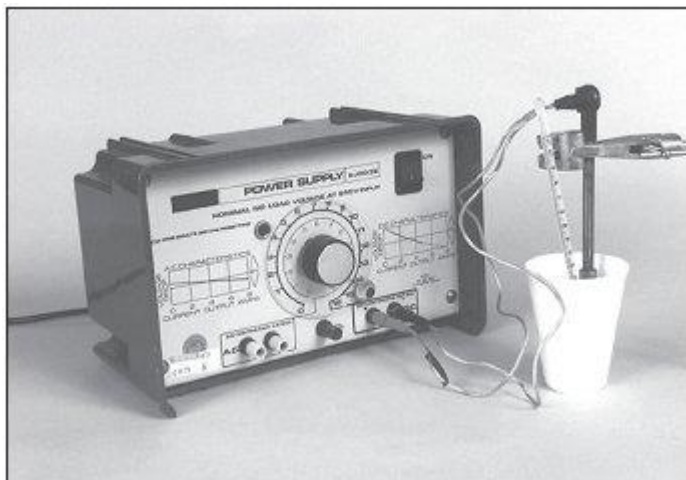
.....

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1 mark
maximum 7 marks

Q9.

John used an electrical heater to heat a cup of water. He kept stirring the water. When the temperature reached 20°C, he started his stopwatch and measured the temperature of the water every half minute.

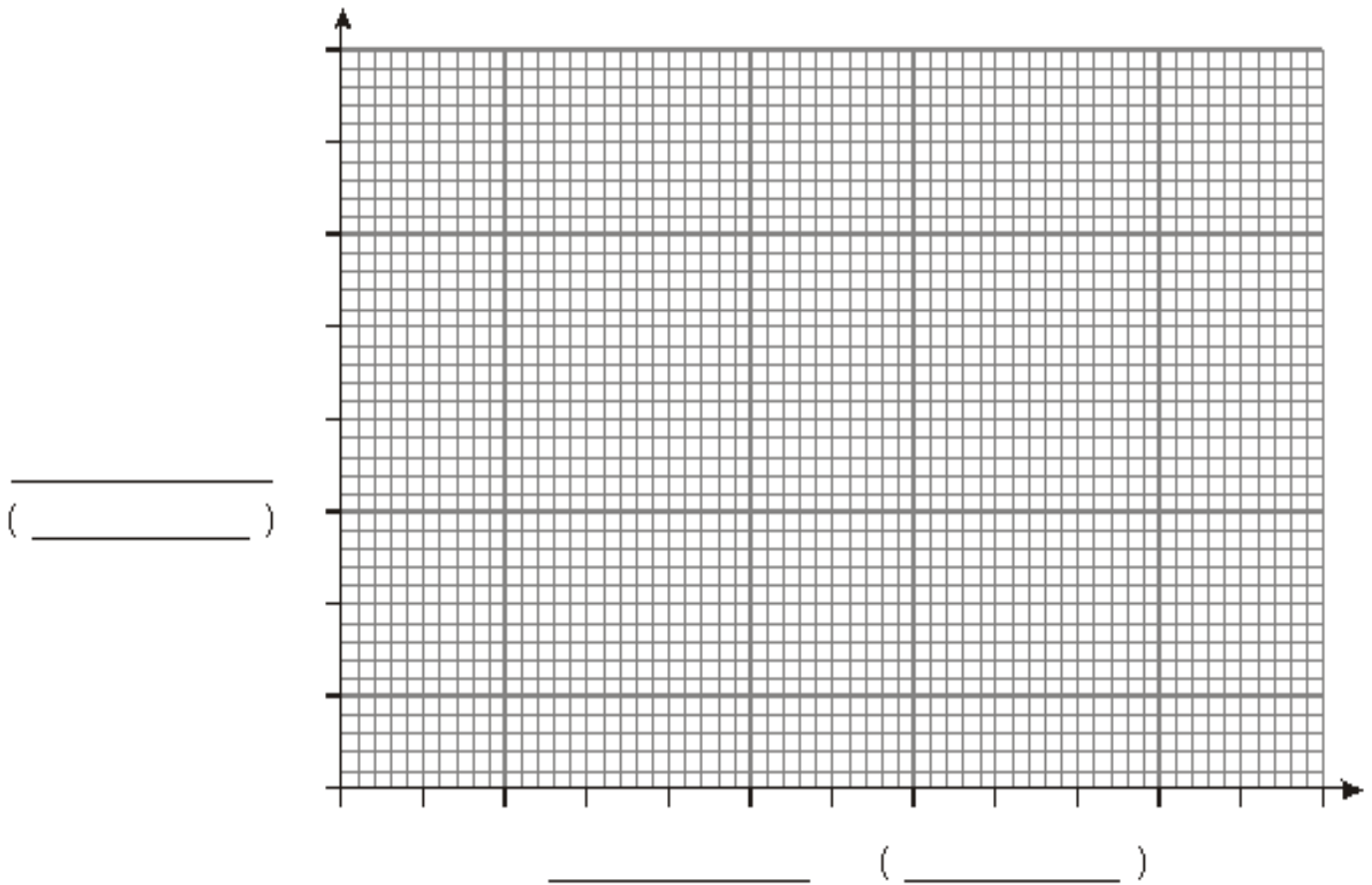


He switched off the heater after 4 minutes, but continued to record the temperature. His results are shown in the table.

One measurement is missing and another appears to be wrong.

Time (minutes)	Temperature (°C)
0.0	20
0.5	26
1.0	31
1.5	36
2.0	41
2.5	46
3.0	
3.5	57
4.0	56
4.5	58
5.0	59
5.5	59

(a) Use the results in the table to draw a graph on the grid.



4 marks

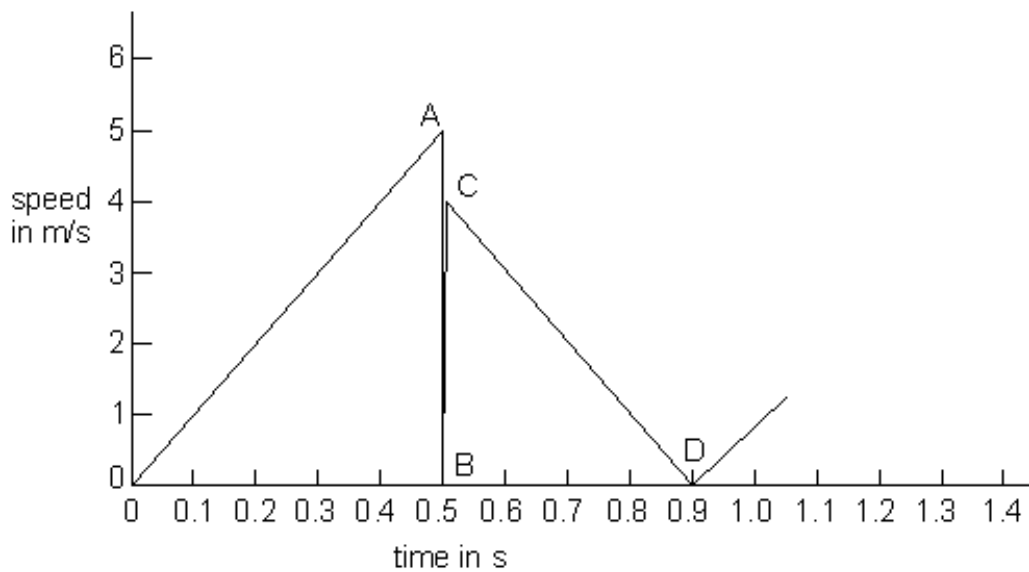
(b) From your curve, estimate the temperature of the water after **three** minutes.

.....°C

1 mark
maximum 5 marks

Q10.

The graph shows the speed of a ball as it falls from a height and bounces from the floor.



- (a) The ball starts to fall and speeds up until it hits the floor.
- (i) For how many seconds does the ball fall before it first hits the floor?
.....
1 mark
- (ii) Calculate the average speed of the ball during its fall.
.....
.....
1 mark
- (iii) Calculate the height above the floor from which the ball was dropped.
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1 mark
- (b) (i) What is happening to the ball in the time between points A and C on the graph?
.....
.....
1 mark
- (ii) In which direction is the ball moving between points C and D?
.....
1 mark
- (c) Calculate how high the ball bounces back up from the floor.
.....
.....
1 mark
- (d) How long after the ball was dropped would you expect it to hit the floor for the second bounce?
.....
.....
1 mark

