A

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

GCSE

COMBINED SCIENCE: SYNERGY

F

Foundation Tier Paper 1 Life and environmental sciences

8465/1F

Tuesday 15 May 2018 Afternoon

Time allowed: 1 hour 45 minutes

For this paper you must have:
- **a ruler**
- **a scientific calculator**
- **the periodic table (enclosed)**
- **the Physics Equations Sheet (enclosed).**

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

J U N 1 8 8 4 6 5 1 F 0 1

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INSTRUCTIONS

- **Use black ink or black ball-point pen.**
- **Answer ALL questions in the spaces provided. Do not write on blank pages.**
- **Do all rough work in this book. Cross through any work you do not want to be marked.**
- **In all calculations, show clearly how you work out your answer.**

INFORMATION

- **The maximum mark for this paper is 100.**
- **The marks for questions are shown in brackets.**
- **You are expected to use a calculator where appropriate.**
- **You are reminded of the need for good English and clear presentation in your answers.**

DO NOT TURN OVER UNTIL TOLD TO DO SO

0 1 **Sperm cells and egg cells carry genetic information.**

0 1 . 1 **What is the name of the chemical that carries genetic information? [1 mark]**

_____

_____

0 1 . 2 **What are sperm cells and egg cells? [1 mark]**

Tick ONE box.

- ☐ **Gametes**
- ☐ **Genes**
- ☐ **Homozygous**
- ☐ **Phenotype**

0 1 . 3 **Which process produces sperm cells? [1 mark]**

Tick ONE box.

- ☐ **Fertilisation**
- ☐ **Homeostasis**
- ☐ **Meiosis**
- ☐ **Respiration**

0 1 . 4 **Mice have 40 chromosomes in each body cell.**

How many chromosomes will be in each sperm cell? [1 mark]

Tick ONE box.

- ☐ **10**
- ☐ **20**
- ☐ **40**
- ☐ **80**

A mouse will always have black fur if one OR two black fur alleles are inherited.

0 1 . 5 **What word describes the black fur allele?**
[1 mark]

Tick ONE box.

- ☐ **Dominant**
- ☐ **Recessive**
- ☐ **Heterozygous**
- ☐ **Homozygous**

[Turn over]

Two black mice both have one black fur allele (B) and one brown fur allele (b).

0 1 . 6 Complete the genetic diagram in FIGURE 1 to show the possible offspring of these mice. [1 mark]

FIGURE 1

		PARENT 1	
		B	**b**
PARENT 2	**B**	**BB**	**Bb**
	b		**bb**

0 1 . 7 On FIGURE 1 draw a ring around ONE offspring with brown fur. [1 mark]

0 1 . 8 What is the chance of the offspring from the two black mice being brown? [1 mark]

_____

_____

_____

8

0 2 **TABLE 1 shows the relative mass and charge of the particles in an atom.**

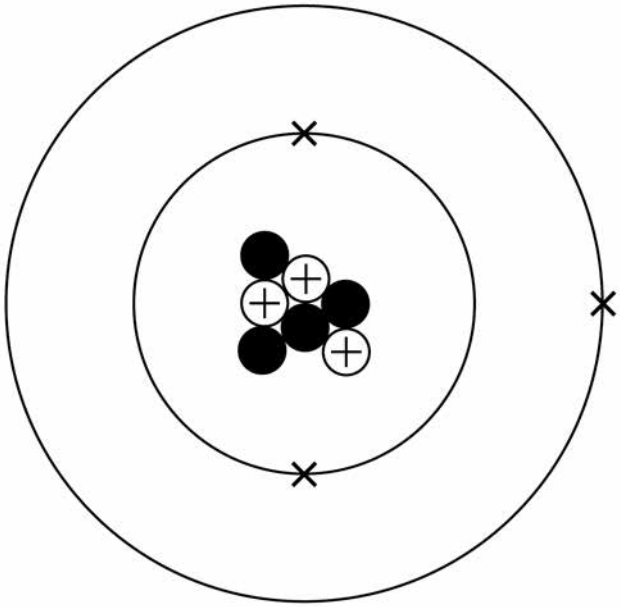
TABLE 1

Name of particle	Relative mass	Charge
proton	1	+1
neutron		
electron	very small	

0 2 . 1 **Complete TABLE 1. [3 marks]**

0 2 . 2 **FIGURE 2 represents a lithium atom.**

FIGURE 2



Give the number of protons, neutrons and electrons in the lithium atom shown in FIGURE 2. [3 marks]

Number of protons _____

Number of neutrons _____

Number of electrons _____

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0 2 . 3 **Scientific models of the atom have changed over time.**

Draw ONE line from each description of the atomic model to the stage in the development of the atomic model. [2 marks]

Description of atomic model	Stage in the development of the atomic model
	Dalton atoms
A ball of positive charge with electrons embedded in it	Neutrons discovered
Spherical atoms	Nucleus of atoms discovered
	Plum pudding model

8

0 3 **This question is about gases in the air.**

FIGURE 3 represents a molecule found in air.

FIGURE 3

0 3 . 1 **What is the formula of the molecule shown in FIGURE 3? [1 mark]**

Tick ONE box.

- ☐ **Co2**
- ☐ **2CO**
- ☐ **CO_2**
- ☐ **CO^2**

0 3 . 2 **What is the name of the molecule shown in FIGURE 3 on page 12?**

You may use the periodic table to help you.
[1 mark]

_____

_____

0 3 . 3 **The percentage of oxygen in air is 21%.**

The mass of air in a classroom was 220 kg

Calculate the mass of oxygen in the classroom.
[1 mark]

_____

_____

_____

Mass of oxygen = _____ **kg**

[Turn over]

Carbon monoxide is an air pollutant.

0 3 . 4 **Describe how carbon monoxide is produced from fuels. [2 marks]**

0 3 . 5 **Carbon monoxide can decrease the concentration of oxygen in the blood.**

Which part of the blood would be most affected by carbon monoxide? [1 mark]

Tick ONE box

- ☐ **Red blood cells**
- ☐ **Plasma**
- ☐ **Platelets**
- ☐ **White blood cells**

[Turn over]

0 3 . 6 **What TWO effects could a decreased concentration of oxygen in the blood have on body cells? [2 marks]**

Tick TWO boxes

- ☐ **Cell death**
- ☐ **Decreased respiration rate**
- ☐ **Faster cell division**
- ☐ **Faster cell growth**
- ☐ **More energy released**

0 3 . 7 **Some air pollutants cause acid rain.**

Give ONE problem caused by acid rain.
[1 mark]

_____

_____

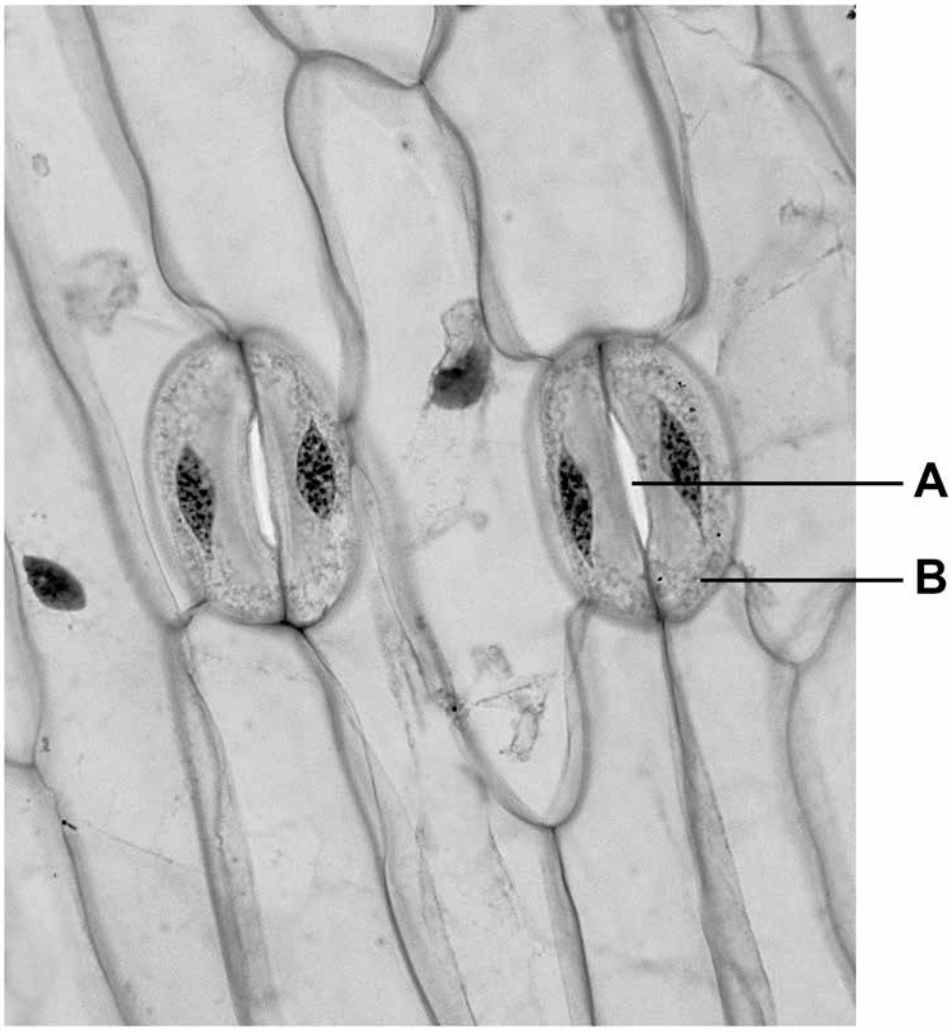
_____

9

[Turn over]

0 4 **FIGURE 4 shows the lower surface of a leaf magnified 800 times.**

FIGURE 4



0 4 . 1 **Name hole A in the leaf surface. [1 mark]**

_____

_____

0 4 . 2 **Name cell B. [1 mark]**

_____

_____

0 4 . 3 **Cell B can lose or gain water.**

Complete the sentences.

Choose answers from the list below. [2 marks]

- **active transport**
- **condensation**
- **osmosis**
- **photosynthesis**
- **transpiration**

Cell B can gain water by

_____.

Water vapour can escape from the leaf through hole A by _____.

0 4 . 4 **Which factors increase the rate of water loss from hole A? [2 marks]**

Tick TWO boxes

- ☐ **Increasing acidity**
- ☐ **Increasing nitrogen concentration**
- ☐ **Increasing oxygen concentration**
- ☐ **Increasing temperature**
- ☐ **Increasing wind speed**

0 4 . 5 **Give ONE reason why the movement of water in a plant is important. [1 mark]**

0 4 . 6 **The African Baobab tree has no leaves for up to 9 months of the year.**

Suggest how this helps the tree to survive in an area where there is not much rain. [1 mark]

_____

_____

_____

[Turn over]

0 4 . 7 **FIGURE 4 on page 18 is a photograph taken through a microscope.**

The image is magnified 800 times.

One of the cells in the image has a width of 12 mm

Calculate the real width of this cell in micrometres.

Complete the following steps. [3 marks]

Use the equation to work out the real width of the cell in millimetres.

$$\text{real width of object} = \frac{\text{width of image}}{\text{magnification}}$$

Real width of cell = _____ millimetres

Convert the real width of the cell from millimetres to micrometres.

1 millimetre = 1000 micrometres.

Real width of cell = _____ micrometres

11

0 5 **The concentration of glucose in the blood is controlled by homeostasis.**

0 5 . 1 **Give ONE other example of an internal condition controlled by homeostasis. [1 mark]**

_____

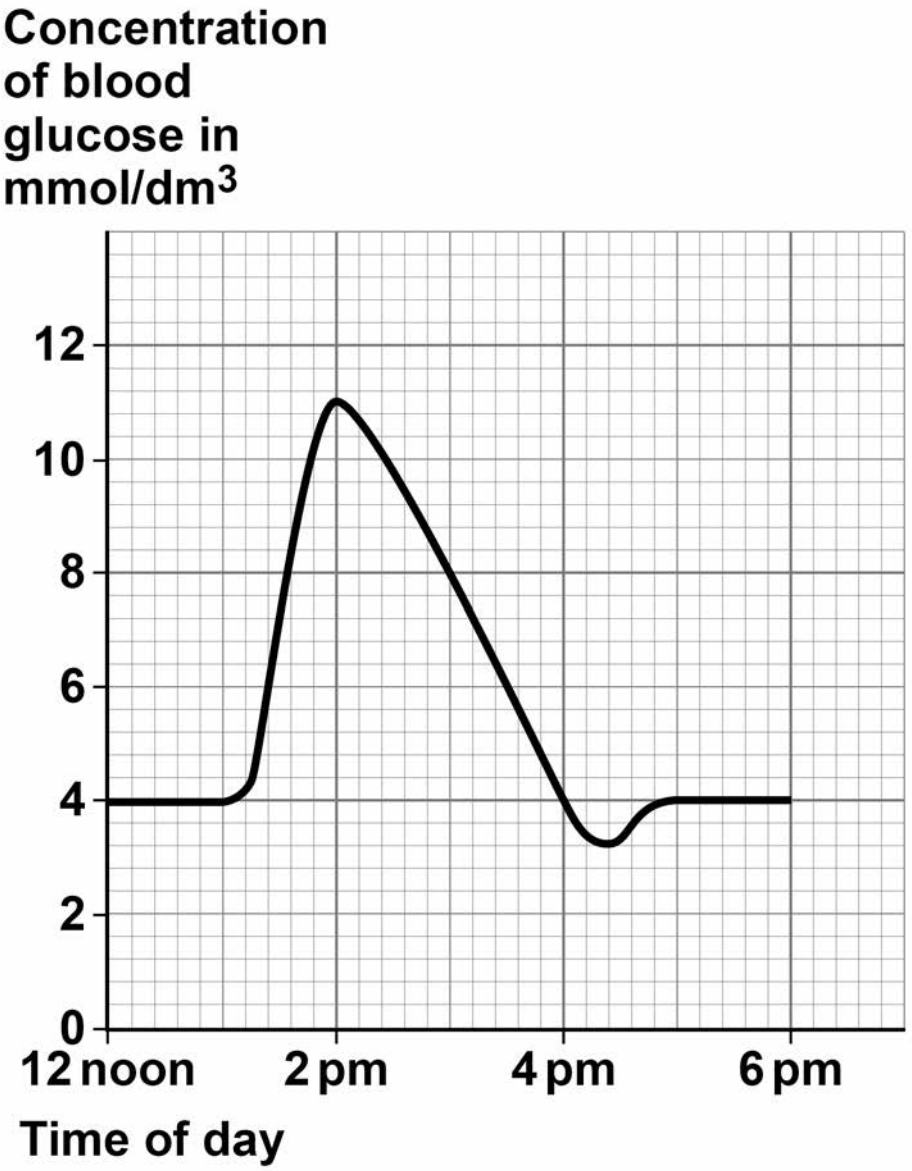
_____

_____

[Turn over]

FIGURE 5 shows the change in glucose concentration in the blood of a person with Type 1 diabetes.

FIGURE 5



0 5 . 2 **Calculate the increase in blood glucose concentration between 1 pm and 2 pm. [1 mark]**

Increase in blood glucose =

_____ mmol/dm^3

0 5 . 3 **Suggest at what time the person ate lunch.**

Use FIGURE 5 on page 24. [1 mark]

0 5 . 4 **Name the hormone the person injected that caused the blood glucose concentration to decrease. [1 mark]**

[Turn over]

0 5 . 5 **Explain the decrease in blood glucose concentration after the hormone was injected.**

Use all the words in the list below in your explanation. [2 marks]

- **blood**
- **cells**
- **glucose**
- **glycogen**

0 5 . 6 **Normal blood glucose concentration is approximately 4 mmol/dm^3**

What could be the reason for the blood glucose concentration falling below normal at 4 pm? [1 mark]

Tick ONE box.

- ☐ **The food contained too much glucose**
- ☐ **The person ate another meal**
- ☐ **The person injected too much hormone**
- ☐ **The person fell asleep**

[Turn over]

0 5 . 7 **Explain what would happen to the blood glucose concentration if the person went for a run at 6 pm. [2 marks]**

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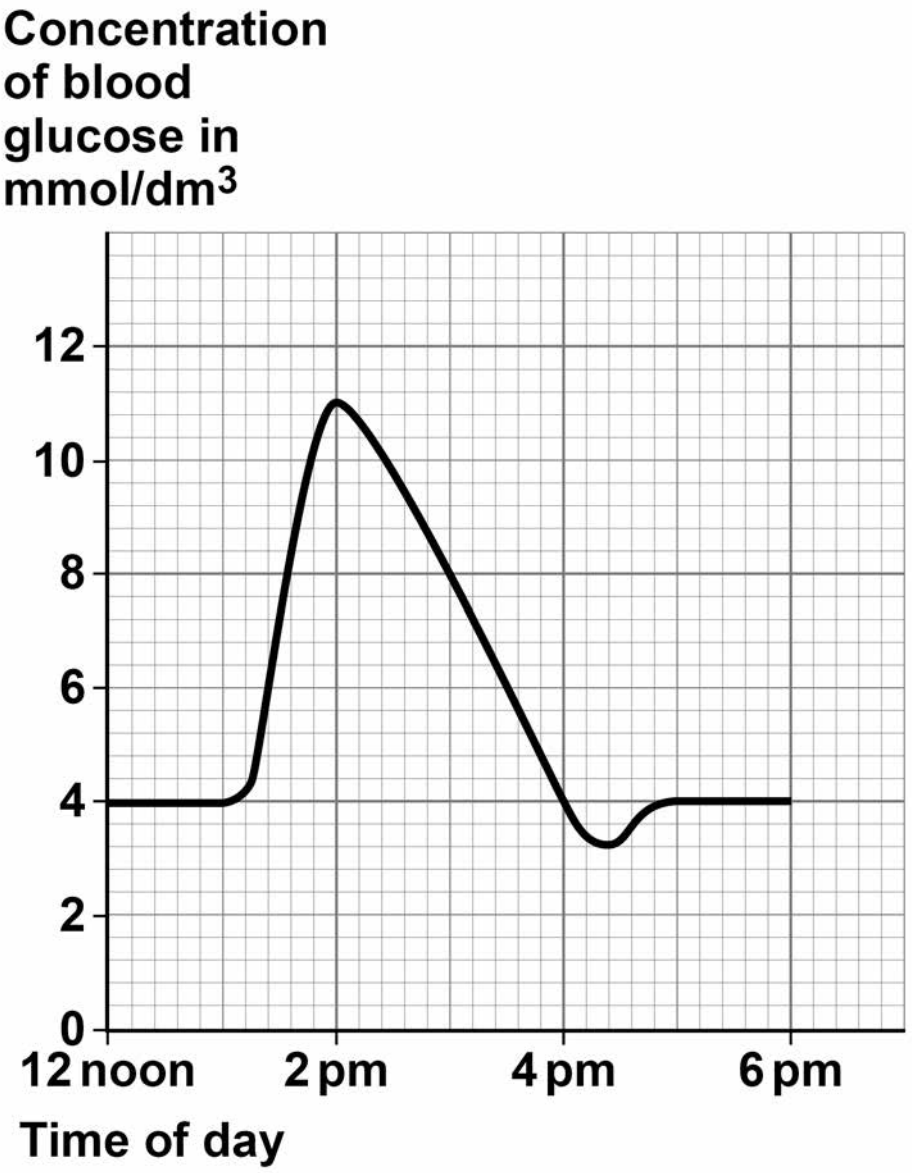
[Turn over]

Repeat of FIGURE 5



0 5 . 8 **Look at FIGURE 5 on page 30.**

Suggest ONE way that the graph would be different for a person who does NOT have diabetes. [1 mark]

_____

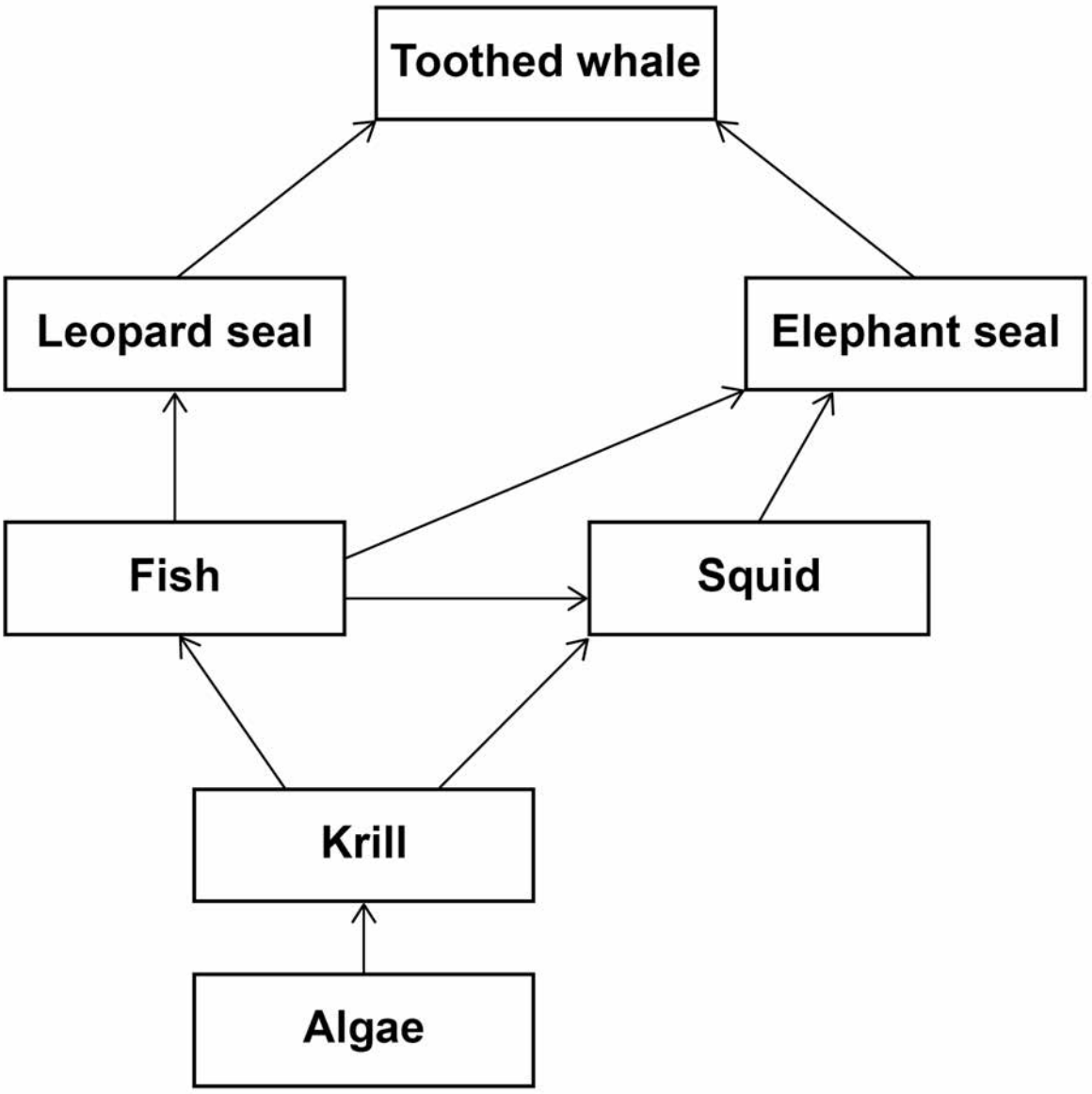
_____

_____

10

0 6 **FIGURE 6 shows a food web.**

FIGURE 6



0 6 . 1 **What name is given to all the organisms together in an ecosystem? [1 mark]**

Tick ONE box.

- ☐ **Community**
- ☐ **Environment**
- ☐ **Habitat**
- ☐ **Population**

0 6 . 2 **Give the name of ONE secondary consumer shown in FIGURE 6 on page 32. [1 mark]**

_____

_____

[Turn over]

Algae can photosynthesise.

0 6 . 3 Which word describes the algae in this food web? [1 mark]

Tick ONE box.

- ☐ Consumer
- ☐ Predator
- ☐ Prey
- ☐ Producer

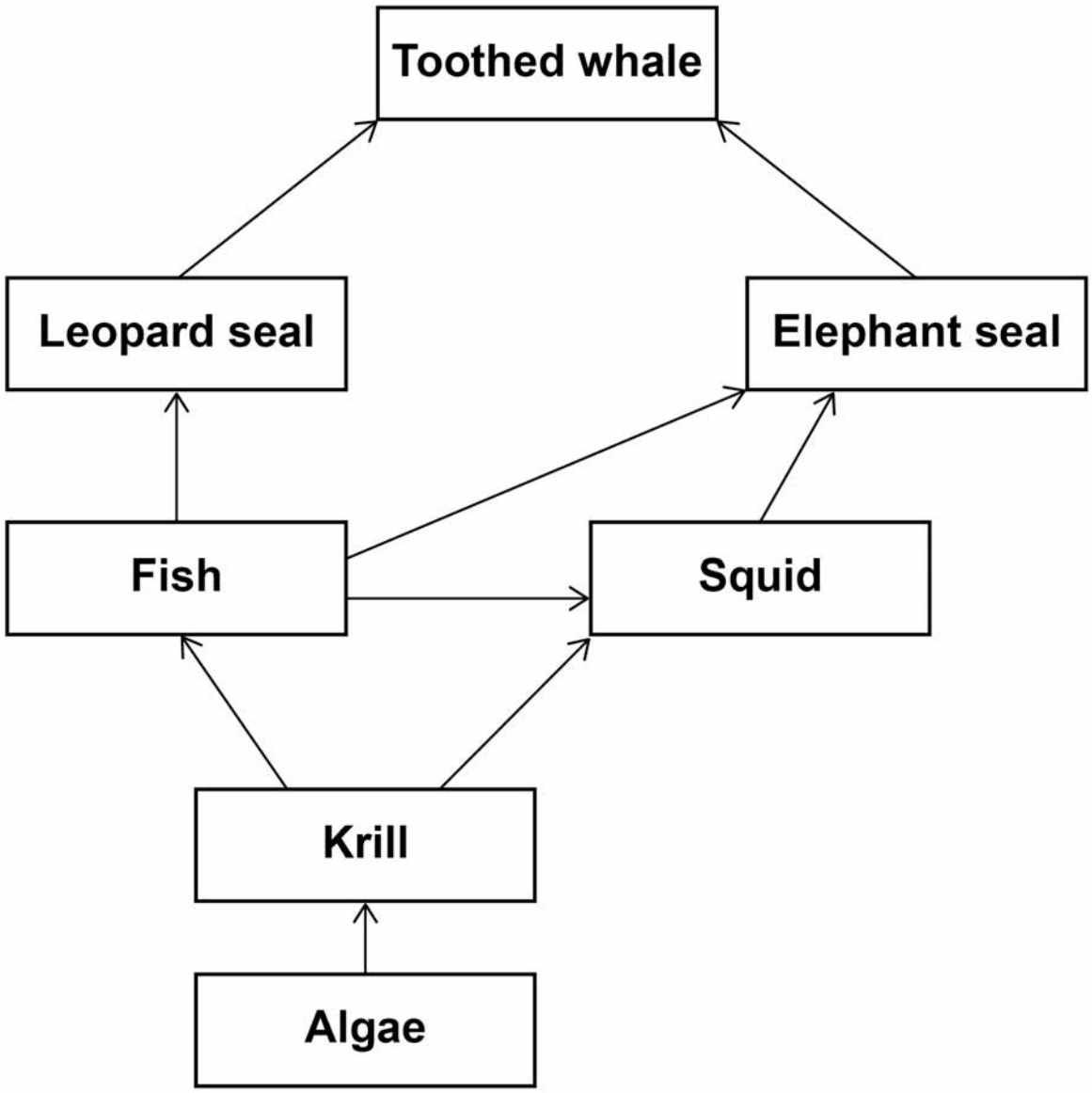
0 6 . 4 **Explain why most algae are found near the surface of the sea, and not at greater depths. [2 marks]**

0 6 . 5 **Toothed whales will compete with each other for food.**

Suggest what else toothed whales might compete for. [1 mark]

[Turn over]

Repeat of FIGURE 6



0 6 . 6 **Look at FIGURE 6 on page 36.**

The population of leopard seals decreases if there are fewer elephant seals.

Explain why. [2 marks]

_____

_____

_____

_____

_____

_____

8

0 7 **Gamma radiation is emitted from the nuclei of some atoms.**

0 7 . 1 **What is a gamma ray? [1 mark]**

Tick ONE box.

- ☐ **A helium nucleus**
- ☐ **A high speed electron**
- ☐ **A neutron**
- ☐ **A type of electromagnetic radiation**

0 7 . 2 **Which would be the best absorber of gamma radiation? [1 mark]**

Tick ONE box.

- ☐ **A few mm of air**
- ☐ **A thick sheet of cardboard**
- ☐ **A thick sheet of lead**
- ☐ **A thin sheet of paper**

[Turn over]

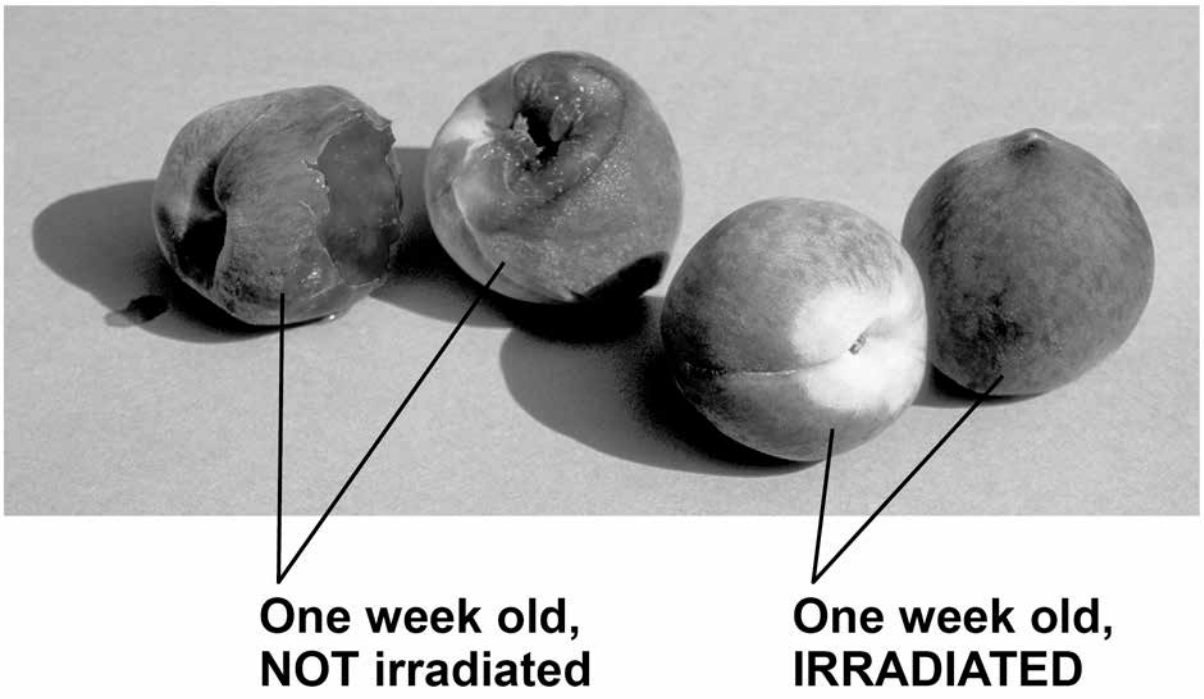
Food can be irradiated with gamma rays to kill bacteria.

FIGURE 7 shows a photograph of peaches.

Two of the peaches were irradiated.

The photograph was taken one week after irradiation.

FIGURE 7



0 7 . 3 **Why do food producers need to kill bacteria on food? [2 marks]**

Tick TWO boxes

- ☐ **To change the colour of the food**
- ☐ **To decrease the rate of decay of the food**
- ☐ **To decrease the shelf life of the food**
- ☐ **To prevent food poisoning**
- ☐ **To remove dirt from food**

[Turn over]

0 7 . 4 **How do gamma rays kill bacteria? [1 mark]**

Tick ONE box.

- ☐ **Gamma rays cause meiosis to occur**
- ☐ **Gamma rays cause mutations**
- ☐ **Gamma rays decrease the size of bacterial cells**
- ☐ **Gamma rays destroy the food source for bacteria**

0 7 . 5 **Food producers can irradiate food by passing it close to a radioactive source.**

How can food producers increase the level of radiation that the food is exposed to?
[2 marks]

Tick TWO boxes

- ☐ **Boil the food before passing it close to the radioactive source**
- ☐ **Decrease the distance between the food and the radioactive source**
- ☐ **Increase the time for which the food is close to the radioactive source**
- ☐ **Put the radioactive source in a box**
- ☐ **Reduce the temperature of the radioactive source**

[Turn over]

0 7 . 6 **A student said: 'The irradiated food would become radioactive.'**

Give ONE reason why the student is NOT correct. [1 mark]

_____

_____

_____

8

0 8 **Some students tested a red cabbage leaf for starch.**

This is the method used.

1. **Boil the leaf in ethanol.**

2. **Rinse the leaf in water.**

3. **Add the reagent to test the leaf for starch.**

0 8 . 1 **Give ONE safety precaution the students should take in this test. [1 mark]**

_____

_____

_____

[Turn over]

0 8 . 2 **Which reagent is used to test the boiled leaf for starch? [1 mark]**

Tick ONE box.

- ☐ **Benedict's solution**
- ☐ **Biuret solution**
- ☐ **Iodine solution**
- ☐ **Sodium chloride solution**

0 8 . 3 **What colour will be seen if the test for starch is positive? [1 mark]**

Tick ONE box.

- ☐ **Blue-black**
- ☐ **Pale pink**
- ☐ **Orange**
- ☐ **Red**

The students then used paper chromatography to investigate the coloured pigments in a red cabbage leaf.

0 8 . 4 Complete the sentences.

Choose answers from the list below. [2 marks]

- **distil**
- **evaporate**
- **filter**
- **mobile**
- **separate**
- **solid**

Chromatography can be used to

_____ mixtures.

In paper chromatography, the paper is part of

the stationary phase.

The solvent is called the

_____ phase.

[Turn over]

TABLE 2 shows the students' results.

The distance each pigment moved was measured from the start line.

TABLE 2

	Distance moved in mm	R_f value
Yellow-green pigment	17	X
Yellow pigment	46	0.42
Orange pigment	100	0.91

The R_f value is calculated using the equation:

$$R_f \text{ value} = \frac{\text{distance moved by pigment}}{\text{distance moved by solvent}}$$

0 8 . 5 **The solvent moved 110 mm from the start line.**

Calculate R_f value X in TABLE 2 on page 48.

Give your answer to 2 significant figures.
[2 marks]

R_f value X = _____

[Turn over]

0 8 . 6 **The known ranges of R_f values of some pigments are shown in TABLE 3.**

TABLE 3

Pigment	R_f value range
Carotene	0.89 to 0.98
Chlorophyll a	0.24 to 0.30
Chlorophyll b	0.20 to 0.26
Xanthophyll	0.04 to 0.28

The R_f value for the orange pigment in red cabbage leaves is 0.91

What is this orange pigment most likely to be? [1 mark]

Tick ONE box.

- ☐ **Carotene**
- ☐ **Chlorophyll a**
- ☐ **Chlorophyll b**
- ☐ **Xanthophyll**

8

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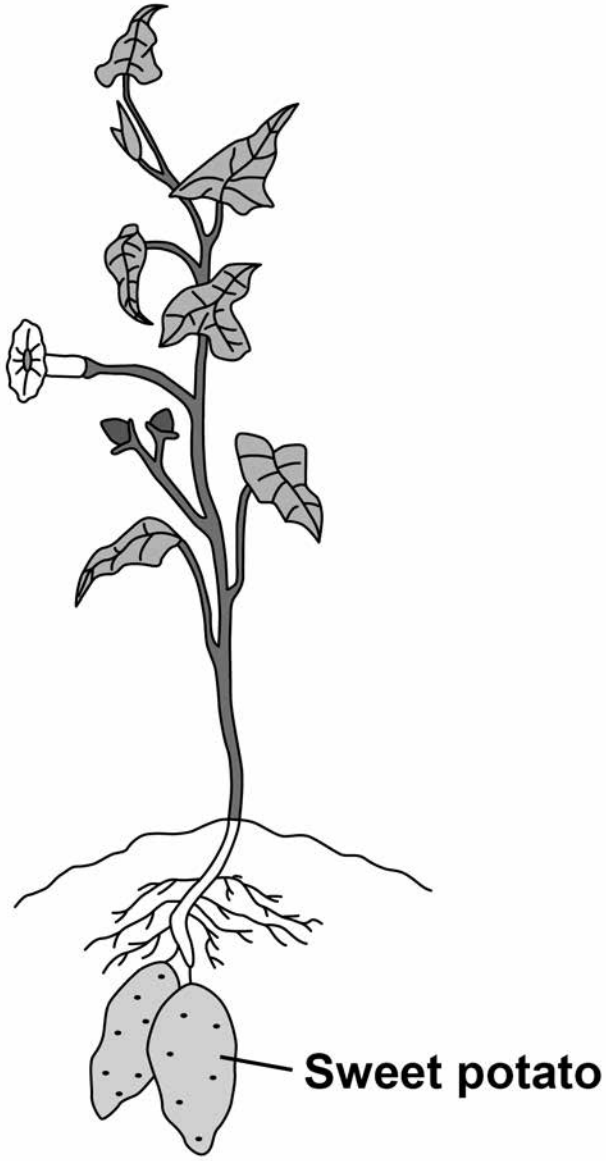
0 9 **FIGURE 8 shows a sweet potato plant.**

The sweet potatoes grow underground and can be cooked and eaten.

FIGURE 8



[Turn over]

TABLE 4 shows some of the nutrients in cooked sweet potato.

TABLE 4

Nutrient	Mass in grams per 100 grams of cooked sweet potato
Water	73.83
Protein	2.01
Fat	0.15
Total carbohydrate	20.71
of which sugars	6.55
Fibre	3.30

0 9 . 1 After cooked sweet potato is digested, sugars (including glucose) pass into the blood.

Give TWO other soluble molecules that would pass into the blood after cooked sweet potato is digested. [2 marks]

1 _____

_____

2 _____

_____

0 9 . 2 Calculate the mass of sugars in 180 g of cooked sweet potato.

Use the information from TABLE 4 on page 54. [1 mark]

_____

_____

_____

Mass of sugars = _____ g

[Turn over]

0 9 . 3 **The sweet potatoes found underground contain starch.**

Explain how starch in the sweet potato is produced from carbon dioxide in the air.
[6 marks]

9

[Turn over]

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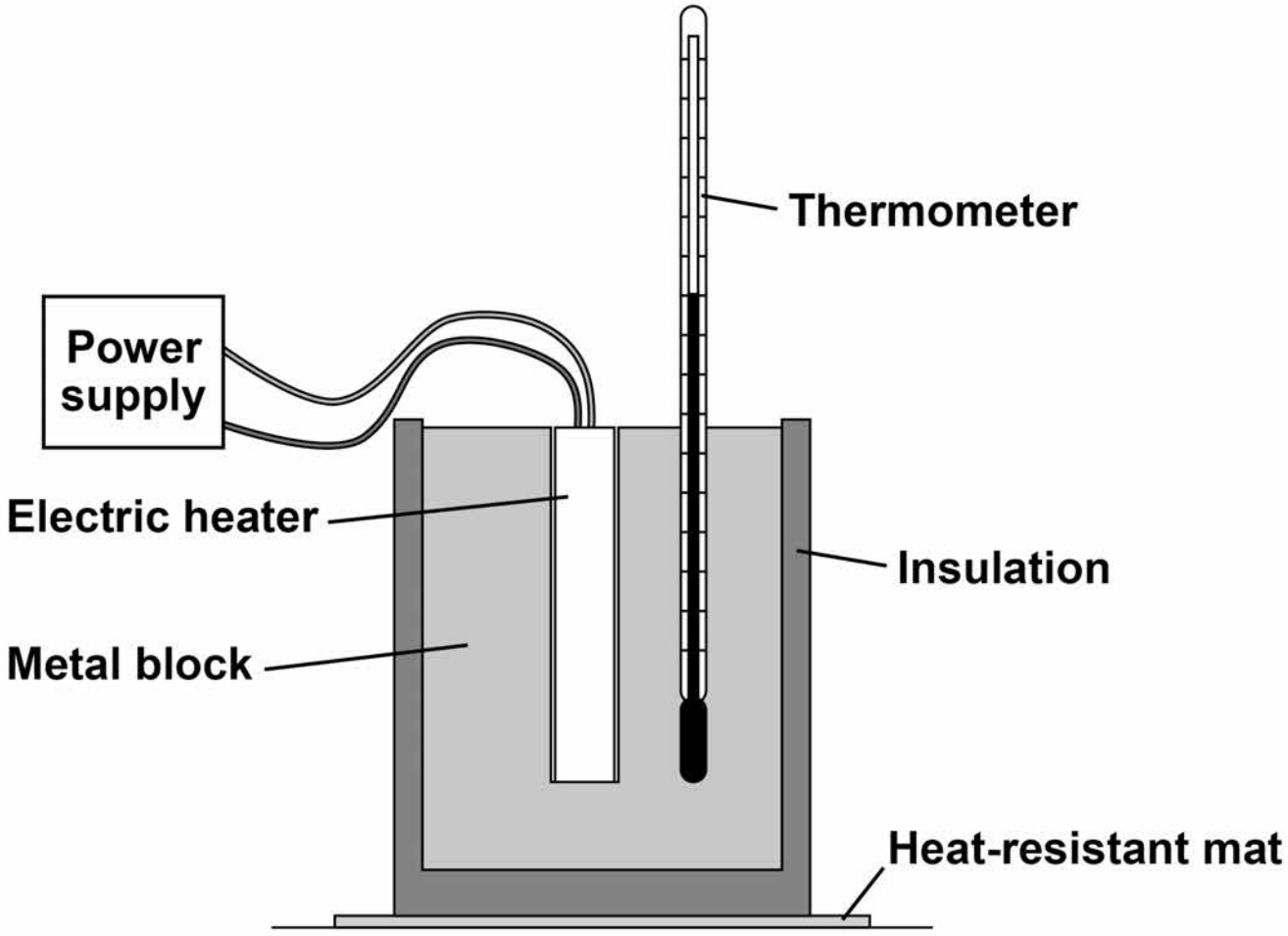
1 0 **A student investigated how the temperature of a metal block changed with time.**

An electric heater was used to increase the temperature of the block.

The heater was placed in a hole drilled in the block as shown in FIGURE 9.

FIGURE 9



[Turn over]

The student measured the temperature of the metal block every 60 seconds.
TABLE 5 shows the student's results.

TABLE 5

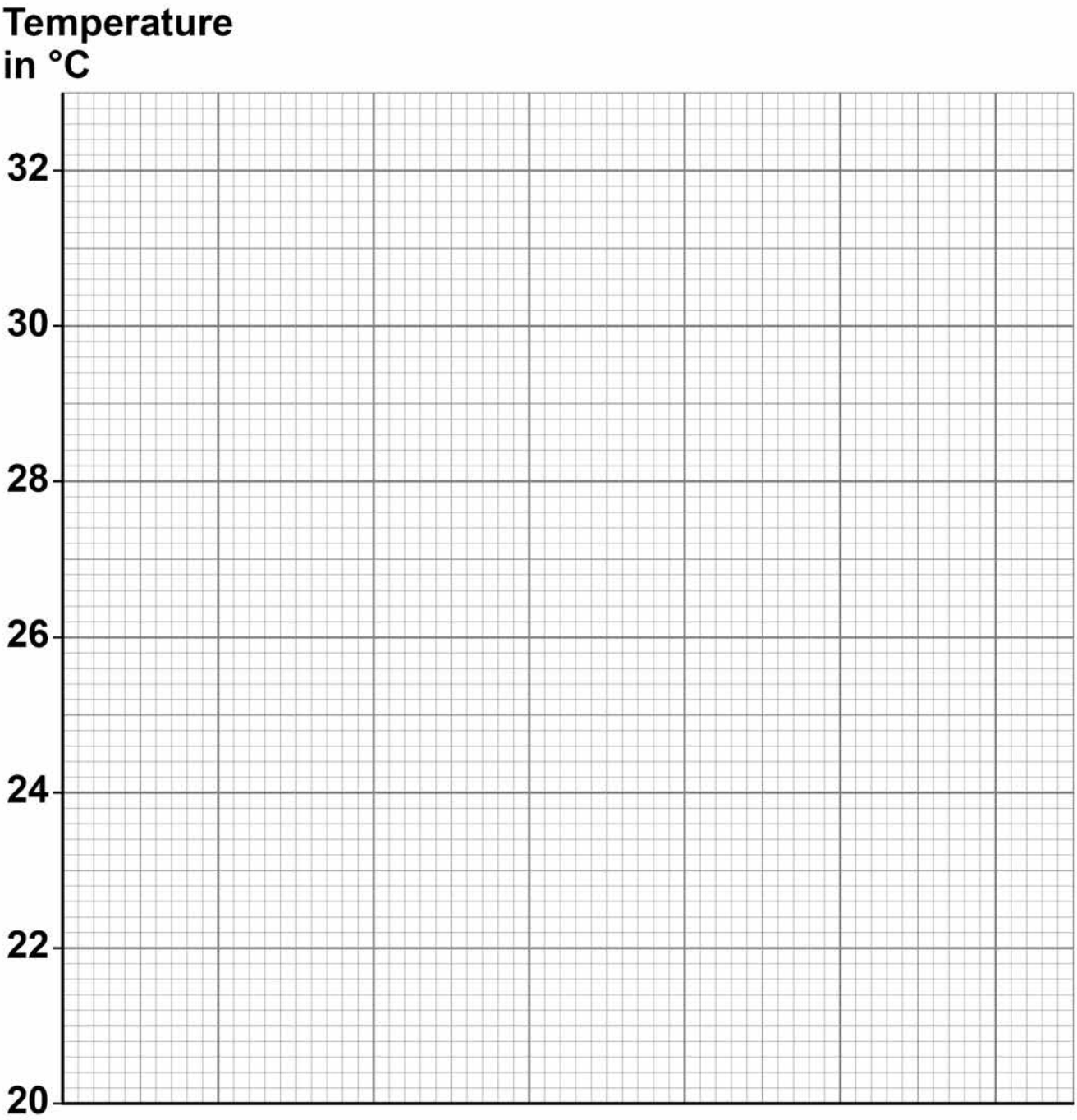
Time in s	Temperature in °C
0	20.0
60	24.5
120	29.0
180	31.0
240	31.5

1 0 . 1 Complete the graph of the data from TABLE 5 on FIGURE 10 on page 61.

- **Choose a suitable scale for the x-axis.**
- **Label the x-axis.**
- **Plot the student's results.**
- **Draw a line of best fit.**

[4 marks]

FIGURE 10



[Turn over]

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1 0 . 2 **The rate of change of temperature of the block is given by the gradient of the graph on page 61.**

Determine the gradient of the graph over the first 60 seconds. [2 marks]

Gradient = _____

1 0 . 3 **The metal block had a mass of 1.50 kg**

The specific heat capacity of the metal was 900 J/kg °C

Calculate the change in thermal energy of the metal during 240 seconds.

Use the Physics Equations Sheet.

Give your answer in kilojoules. [4 marks]

Change in thermal energy = _____ kJ

[Turn over]

Repeat of TABLE 5

Time in s	Temperature in °C
0	20.0
60	24.5
120	29.0
180	31.0
240	31.5

1 0 . 4 **Another student repeated the investigation.**

Give TWO variables this student would need to control to be able to compare their results with the results in TABLE 5 on page 66. [2 marks]

1 _____

_____

2 _____

_____

12

[Turn over]

1 1 **There are several methods of contraception.**

1 1 . 1 **Draw ONE line from each method of contraception to how the method works.**
[2 marks]

Method of contraception	How the method works
diaphragm	prevents embryo implanting
intrauterine device	prevents release of the egg
oral contraceptive	prevents sperm reaching the egg

1 1 . 2 **When a new oral contraceptive is tested on volunteers, the contraceptive is first given at a low dose. Later, the dose is increased.**

Why are new drugs given at low doses at first?
[1 mark]

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[Turn over]

1 1 . 3 **TABLE 6 shows information about three methods of contraception.**

TABLE 6

	Condom	Oral contraceptive	Hormone skin patch
Percentage (%) effectiveness	98.0	99.7	99.8
How contraception is obtained	From shops or sexual health clinic	From doctor or sexual health clinic	
Possible side effects	No serious side effects	Headaches, nausea, high blood pressure	Headaches, nausea, blood clots

Evaluate the use of these contraceptive methods. [6 marks]

END OF QUESTIONS

9

There are no questions printed on this page

For Examiner's Use	
Question	Mark
1	
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TOTAL	