GCSE SCIENCE
YEAR 10 SUMMER PREPARATION WORK
BIOLOGY
STUDENT BOOK
HIGHER

Please complete all of these questions in this book and store this work in your student revision files.

This will provide a useful resource for revision.

Name	
Class	
Teacher	

Revision Question Book 1b

GCSE Science

This book is suitable for students currently in Year 9.

In the following booklet there are several questions based on GCSE Biology Paper One. These questions are additional to the work which you must do on your GCSE course.

To gain the highest grade possible in your GCSE examinations it is recommended that you complete these questions at home or in revision sessions outside of lessons.

This will both familiarise yourself with both the concepts found in the GCSE syllabus and the examination technique found in examinations.

The mark scheme to the questions is integrated in the book for you to use independently.

To improve competency in answering questions on GCSE Science and achieve mastery in this module, answer all of these questions independently.

When you have completed your work in this book, please store this work at home.

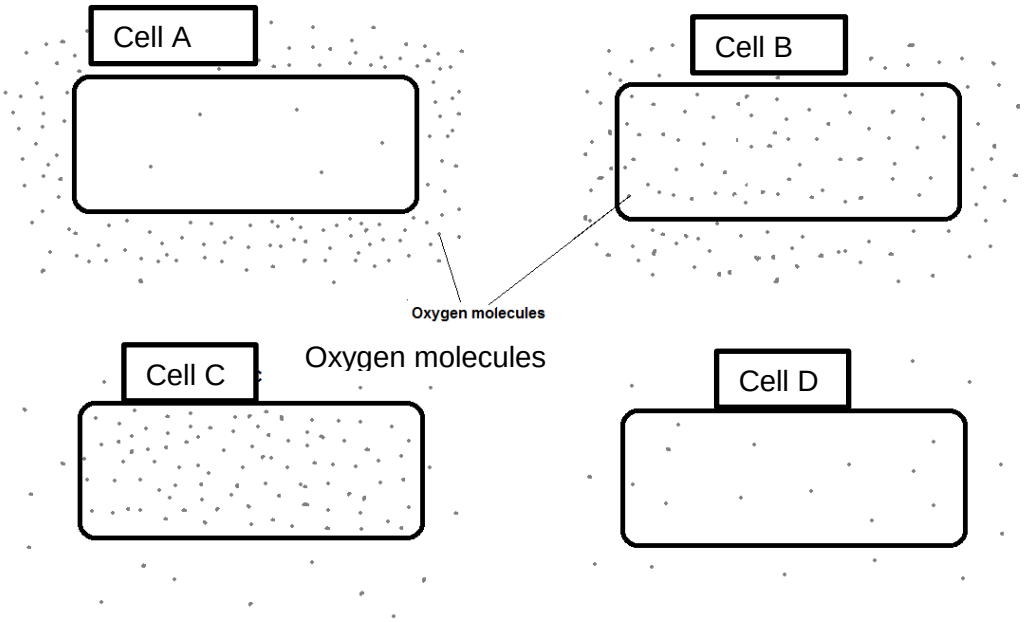
Many thanks for all of your hard work in GCSE Science.

Mr. Turnbull

TOPIC 1: CELL BIOLOGY

1.0 **Figure 1** shows cells containing and surrounded by oxygen molecules.
Oxygen can move into cells or out of cells.

Figure 1



1.1 Into which cell, **A**, **B**, **C** or **D**, will oxygen move the fastest?

[1 mark]

A ☐

B ☐

C ☐

D ☐

1.2 Use words from the box to complete the sentences.

active transport	**diffusion**	**membranes**
mitochondria	**nuclei**	**osmosis**

[2 marks]

Oxygen is taken into cells by the process of _____ .

The parts of cells that use the most oxygen are _____ .

1.3 Which process produces oxygen in some cells?

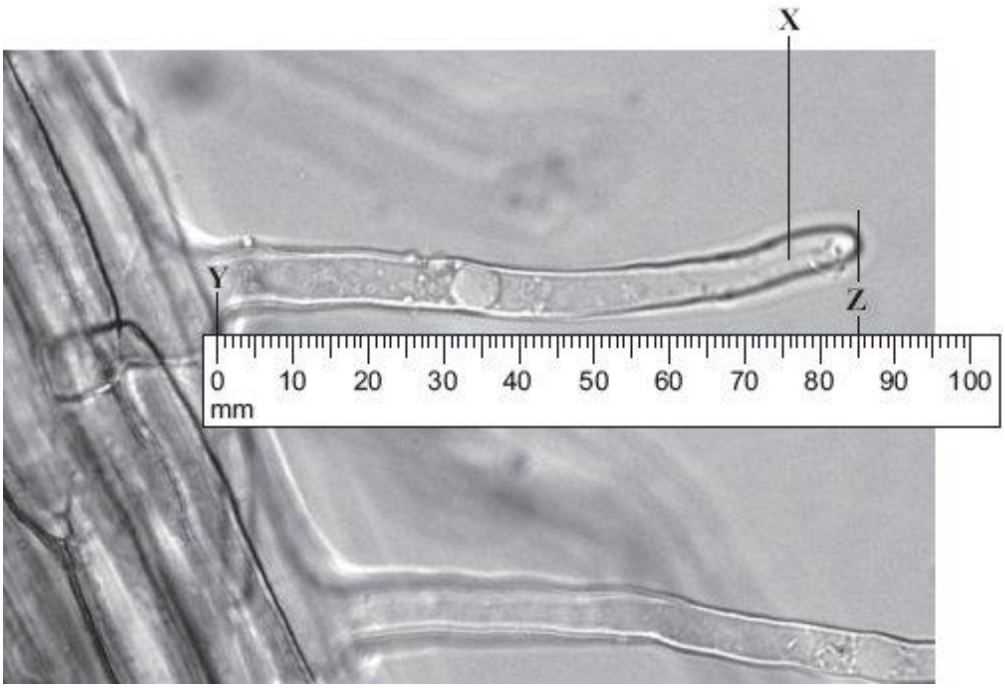
Tick **one** box.

[1 mark]

Diffusion	☐
Photosynthesis	☐
Protein synthesis	☐
Respiration	☐

2.0 Figure 2 shows part of the surface of a plant root.

Figure 2



2.1 There are hundreds of structure **X** on each root.

What is the name of structure **X**?

[1 mark]

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2.2 The photograph shows the root magnified 100 times. The distance between **Y** and **Z** in the photograph is the length of structure **X**.

Calculate the actual length of **Y**–**Z**.

[2 marks]

Actual length **Y**–**Z** = _____mm

2.3 Structure **X** is very small. There are thousands of structures like **X** on a plant root.

Explain how this helps the plant.

[2 marks]

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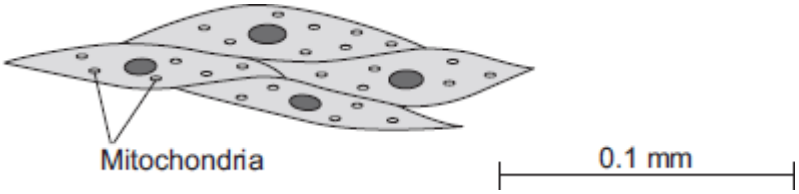
3.0 Figure 3 shows muscle cells from the wall of the stomach, as seen through a light microscope.

Figure 3



3.1 Describe the function of muscle cells in the wall of the stomach.

[2 marks]

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3.2 Figure 3 is highly magnified.

The scale bar in **Figure 3** represents 0.1 mm.

Calculate the magnification of the cells in **Figure 3**.

[2 marks]

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Magnification =_____ times

3.3 The muscle cells in **Figure 3** contain many mitochondria.

What is the function of mitochondria?

[2 marks]

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3.4 The muscle cells also contain many ribosomes. The ribosomes cannot be seen in **Figure 3**.

What is the function of a ribosome?

[1 mark]

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3.5 Suggest why the ribosomes **cannot** be seen through a light microscope.

[1 mark]

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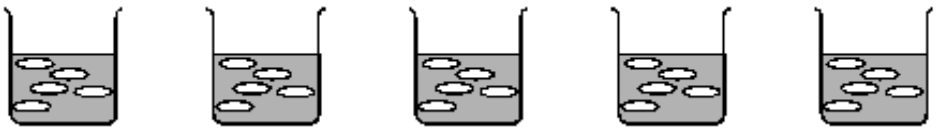
4.0 Some students set up an experiment to find the concentration of sucrose solution in potato cells.

The students used discs of potato cut to the same size and weighing approximately 10 grams.

The discs were put into each of five beakers.



Beaker 1	**Beaker 2**	**Beaker 3**	**Beaker 4**	**Beaker 5**
Distilled water	10% sucrose solution	20% sucrose solution	30% sucrose solution	40% sucrose solution

4.1 After two hours the students carefully dried the potato disks with paper towel before reweighing the discs.

Why did the students dry the potato before weighing it?

[1 mark]

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4.2 The students calculated the percentage gain or loss in mass of potato.

The students' results are shown in the **Table 1**.

Table 1

	Beaker 1	**Beaker 2**	**Beaker 3**	**Beaker 4**	**Beaker 5**
Final mass in g	13.0	12.2	9.0	7.9	7.3
Initial mass in g	10.0	10.6	10.0	10.1	10.4
Percentage gain or loss in mass	Gain 30%	Gain 15.1%	Loss 10%	Loss 21.8%	

Calculate the percentage loss of mass in beaker 5.

[3 marks]

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Percentage loss of mass: _____ %

4.3 Predict the concentration of sucrose solution in the potato cells.

Use the results in **Table 1**.

[1 mark]

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Concentration of sucrose solution: _____ %

5.0 Some scientists investigated the rates of absorption of different sugars by the small intestine.

In one experiment they used a piece of normal intestine.

In a second experiment they used a piece of intestine poisoned by cyanide.

Cyanide is poisonous because it prevents respiration.

Table 2 shows their results.

Table 2

	Relative rates of absorption	
Sugar	**Normal intestine**	**Intestine poisoned by cyanide**
Glucose	1.00	0.33
Galactose	1.10	0.53
Xylose	0.30	0.31
Arabinose	0.29	0.29

5.1 Name **two** sugars from **Table 2** which can be absorbed by active transport.

[2 marks]

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5.2 Use evidence from **Table 2** to explain why you chose these sugars.

[4 marks]

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5.3 All of the sugars named **Table X** can be absorbed by diffusion.

Explain how information from **Table X** provides evidence for this.

[2 marks]

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6.0 Bone marrow contains stem cells.

6.1 Explain why bone marrow can be called a tissue.

[2 marks]

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6.2 Read the information about stem cells.

Stem cells are used to treat some human diseases.

Stem cells can be collected from early embryos. These stem cells have not begun to differentiate, so they could be used to produce any kind of cell, tissue or organ. The use of embryonic stem cells to treat human diseases is new and, for some diseases, trials on patients are happening now.

Stem cells can also be collected from adult bone marrow. The operation is simple but may be painful. Stem cells in bone marrow mainly differentiate to form blood cells. These stem cells have been used successfully for many years to treat some kinds of blood disease. Recently there have been trials of other types of stem cell from bone marrow. These stem cells are used to treat diseases such as heart disease.

Evaluate the use of stem cells from embryos or from adult bone marrow for treating human diseases.

You should give a conclusion to your evaluation.

[5 marks]

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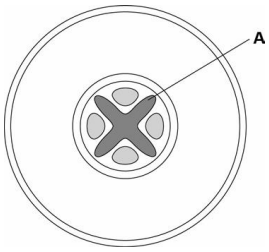
7.0 Figure 8 shows a cross-section through a plant root.

Figure 8



7.1 What is tissue A?

[1 mark]

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7.2 A student is given samples of two fluids.

One fluid is from the phloem of a plant and one from the xylem of a plant.

The student is asked to work out which fluid is from the phloem and which is from the xylem.

She measures the pH and the concentrations of sugar, nitrate ions and potassium ions of each fluid.

Table 4 shows the student's results.

Table 4

	Fluid A	Fluid B
pH	7.3	5.6
Sugar in mg/cm^3	118	1.18
Nitrate ions in mg/cm^3	10	600
Potassium ions in $\mu g/cm^3$	1.18	2500

Which fluid is from the phloem, and which is from the xylem?

Explain your answer.

Use the information from **Table 4**.

[4 marks]

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7.3 In fluid A, how many times greater is the concentration of sugar than the concentration of potassium ions?

[2 marks]

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7.4 The concentration of potassium ions in the soil is 3.9 µg/cm^3

The concentration of potassium ions in the root tissue is 2500 µg/cm^3

Explain why the concentration is so much higher in the roots than in the soil.

[3 marks]

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MARK SCHEME

Qu No.		Extra Information	Marks
1.1	A		1
1.2	diffusion mitochondria	in this order only	1 1
1.3	Photosynthesis		1

Qu No.		Extra Information	Marks
2.1	root hair (cell)		1
2.2	0.85 (mm)		1
2.3	(root hair cells) give a larger surface area (therefore) more water / ions / salts are absorbed	 **do not allow** food	1 1

Qu No.		Extra Information	Marks
3.1	(they) contract / shorten to churn / move / mix food	do **not** allow expand accept they carry out peristalsis	1 1
3.2	400	accept in range 390 – 410 allow **one** mark for answer in range 39 to 41 **or** 3900 to 4100	2
3.3	to transfer energy for use	allow release / give / supply / provide energy allow make ATP do **not** allow make / produce / create energy	1
3.4	to make protein / enzyme	ignore named protein	1
3.5	any **one** from, • (ribosomes) are too small or very small • light microscope does not have sufficient magnification / resolution • (ribosomes) are smaller than mitochondria		1

Qu No.		Extra Information	Marks
4.1	so that any change in mass was not due to water on the outside of the potato **or** so change in mass was due to changes inside the potato		1
4.2	10.4 – 7.3 = 3.1(g) 3.1(g) ÷ 10.4 = 0.29 **or** 0.3 0.29 × 100 = 29 (% loss)	 allow 29.8% or 30% correct answer with or without workings gains three marks	1 1 1
4.3	between 10 and 20%		1

Qu No.		Extra Information	Marks
5.1	glucose galactose		1 1
5.2			
Level 2:	A detailed and logical explanation is given which identifies the evidence from the table and links this to the explanation. Logical links are made and scientific terms are used accurately.		3-4
Level 1:	Discrete, relevant statements are made. The logic may be unclear and links may not be made.		1-2
	No relevant content		0
Indicative content			
Evidence • absorption is reduced by cyanide or absorption is higher when there is no cyanide • they are absorbed faster (than the other sugars) ***Explanation*** • active transport needs energy • less or no energy is available / released if cyanide is present • less or no energy if less / no respiration			
5.3	all sugars can be absorbed when the cells / gut are poisoned or when there is no respiration (because) diffusion does not need an energy supply		1 1

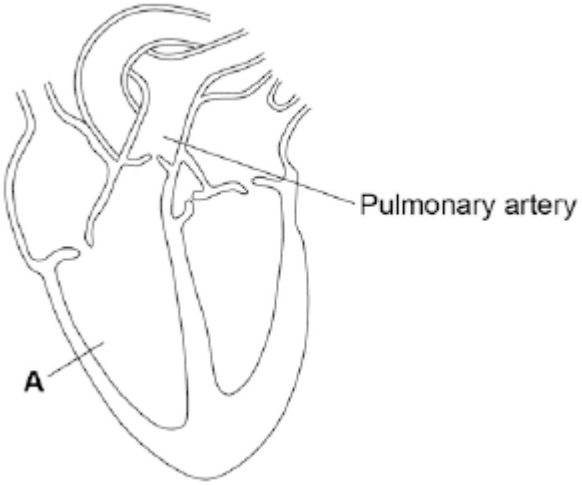
Qu No.		Extra Information	Marks
6.1	group / collection of cells which work together to produce blood cells		1 1
6.2	any **four** from: <u>embryo stem cells – examples of</u> pros • can treat a wide variety / lots of diseases / problems • many available / plentiful • using them better than wasting them • painless cons • (possible) harm / death to embryo • (relatively) untested / unreliable / may not work • embryo can't be 'asked' / 'embryo rights' idea <u>adult bone marrow stem cells – examples of</u> pros • no ethical issues (in collection) **or** permission given • quick recovery • (relatively) safe • well tried / tested / know they work cons • operation hazards e.g. infection • few types of cell / tissue produced **or** few diseases / problems treated • painful so may deter donors Conclusion to evaluation: A reasoned conclusion from the evidence	For all 4 marks to be awarded, there must be at least 1 pro and 1 con allow long term effects not known or may be more risky allow does not kill (donor) / low risk	4 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7.1	xylem		1	AO1/1 4.2.2.3
7.2	**A** is phloem, **B** is xylem any **three** from: • phloem transports sugars • there are more sugars in fluid A • xylem transports mineral ions/potassium ions/nitrate ions • there are more mineral ions in fluid B.		1 3	AO3/2b AO2/1 4.2.2.2
7.3	correct conversion of 1.18 µg to mg/cm^3 $\frac{118}{0.00118} = 100\,000$	allow **1** mark for 100 (ie no conversion to mg) allow 100 000 with no working shown for **2** marks	1 1	AO2/1 4.2.2.3
7.4	potassium ions are transported into the root against a concentration gradient by active transport		1 1 1	AO1/1 AO2/1 AO1/1 4.2.2.3
Total			**10**	

TOPIC 2: ORGANISATION

1.0 Figure 1 shows a diagram of the human heart.

Figure 1



1.1 What part of the heart is labelled **A**?

Tick **one** box.

[1 mark]

- Aorta ☐
- Atrium ☐
- Valve ☐
- Ventricle ☐

1.2 Where does the pulmonary artery take blood to?

Tick **one** box.

[1 mark]

- Brain ☐
- Liver ☐
- Lungs ☐
- Stomach ☐

1.3 Circle a valve on **Figure 1**.

[1 mark]

1.4 State the name of the blood vessel that brings blood from the legs to the right side of the heart.

[1 mark]

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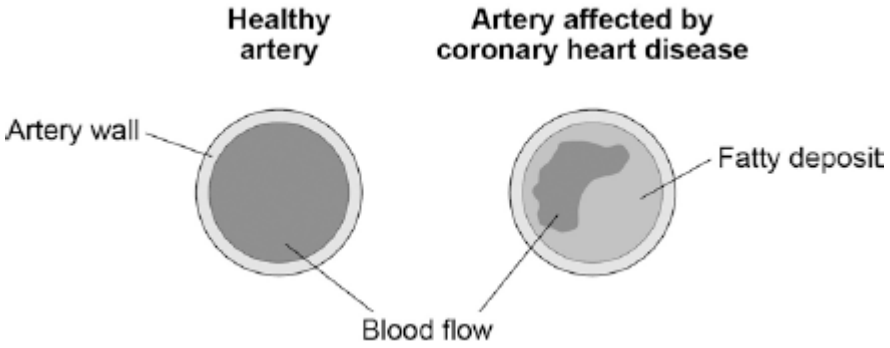
1.5 The coronary arteries supply blood to the heart.
Figure 2 shows two coronary arteries.

Figure 2



Describe **two** ways the healthy artery is different from the artery affected by coronary heart disease.

[2 marks]

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1.6 Suggest **two** risk factors for coronary heart disease.

[2 marks]

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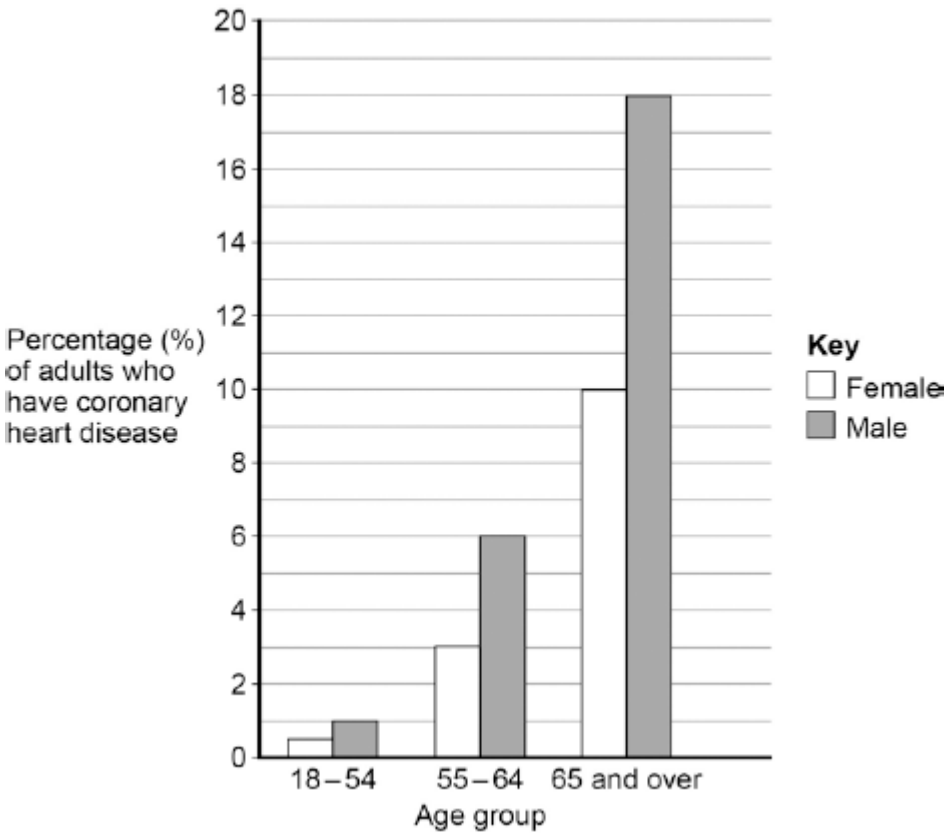
1.7 Figure 3 shows the percentages of adults in the UK who have coronary heart disease.

Figure 3



Calculate the difference in the percentage of male and female adults aged 65 and over who have coronary heart disease.

[1 mark]

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_____ %

1.8 Which is the correct conclusion for the data in **Figure 3**?

Tick **one** box.

[1 mark]

Children do **not** suffer from coronary heart disease ☐

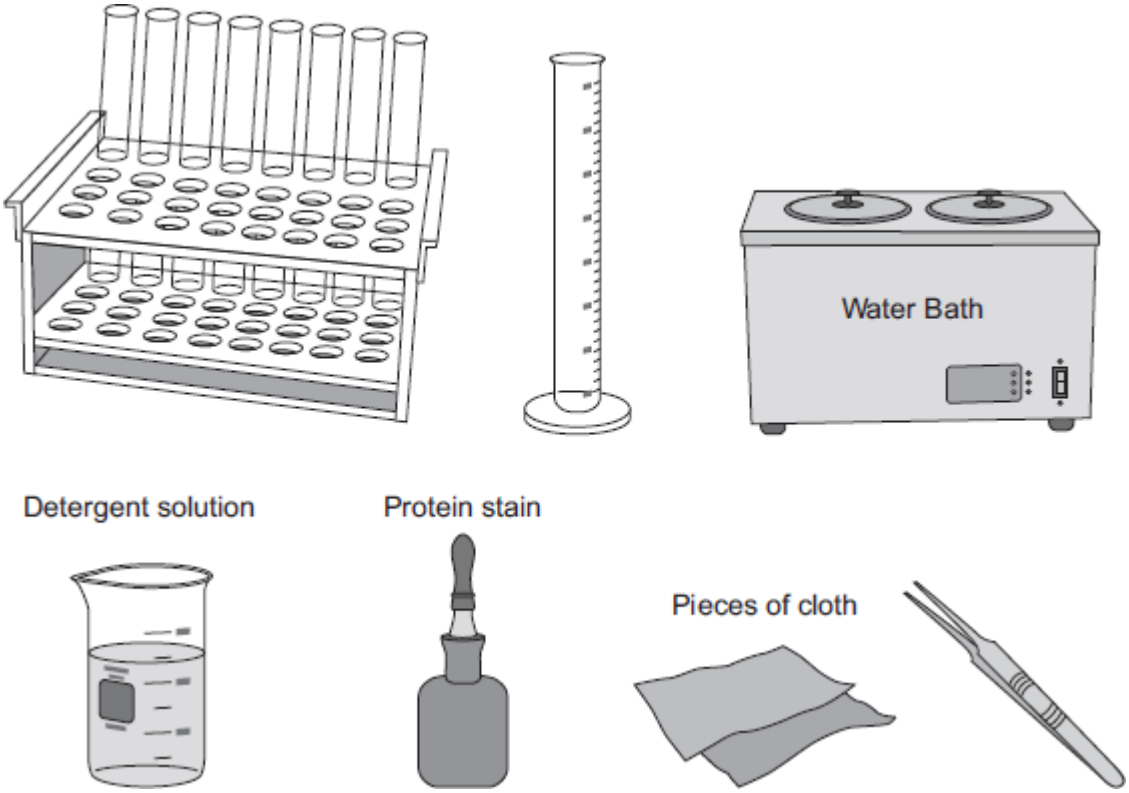
More males suffer from coronary heart disease than females ☐

More 'younger' people suffer from coronary heart disease than 'older' people ☐

2.0 Biological detergents contain protease enzymes.

2.1 Figure 4 shows some apparatus and materials.

Figure 4



Describe how you would use the apparatus and materials shown in **Figure 4** to find the best temperature for removing stains from clothing.

You should include how you would make the investigation a fair test.

[6 marks]

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2.2 In a similar investigation, a student investigated the effect of pH on the time taken to remove a stain from pieces of cloth.

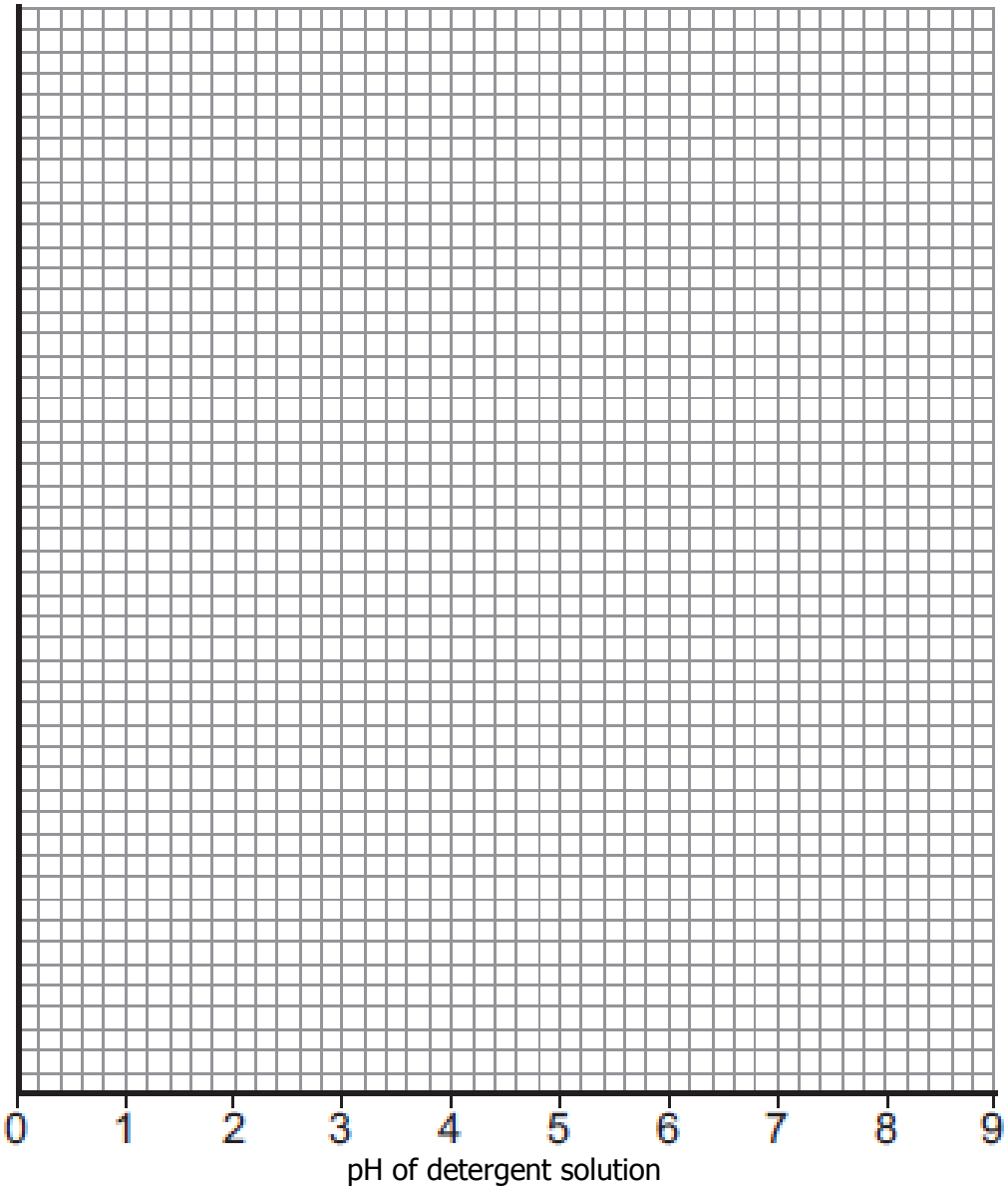
Table 1 shows the student's results.

Table 1

	pH of detergent solution								
	1	2	3	4	5	6	7	8	9
Time taken to remove stain in minutes	20	19	17	14	10	4	8	12	16

On the grid below draw a graph to show the student's results.

- Add a suitable scale and label to the y axis.
- Plot the student's results.
- Draw a line of best fit.



[4 marks]

2.3 State the best pH for using the detergent.

[1 mark]

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pH = _____

3.0 The leaves of most plants have stomata.

3.1 Name the cells which control the size of the stomata.

[1 mark]

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3.2 Give **one** function of stomata.

[1 mark]

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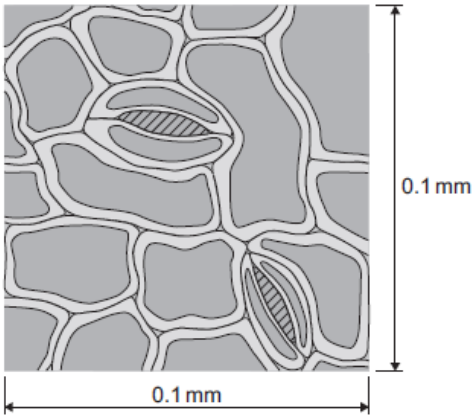
3.3 Figure 5 shows part of the surface of a leaf.

Figure 5



The length and width of this piece of leaf surface are both 0.1 mm.

Calculate the number of stomata per mm^2 of this leaf surface.

[2 marks]

Number of stomata per mm = _____

3.4 A different plant species has 400 stomata per mm^2 of leaf surface.

Having a large number of stomata per mm^2 of leaf surface can be a disadvantage to a plant.

Give **one** disadvantage.

[1 mark]

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3.5 A student investigated the loss of water from plant leaves.

The student did the following:

Step 1: took ten leaves from a plant
Step 2: weighed all ten leaves
Step 3: hung the leaves up in a classroom for 4 days
Step 4: weighed all ten leaves again
Step 5: calculated the mass of water lost by the leaves
Step 6: repeated steps **1** to **5** with grease spread on the upper surfaces of the leaves
Step 7: repeated steps **1** to **5** with grease spread on both the upper and lower surfaces of the leaves.

All the leaves were taken from the same type of plant.

Table 2 shows the student's results.

Table 2

Treatment of leaves	Mass of water the leaves lost in g
No grease was used on the leaves	0.98
Grease on upper surfaces of the leaves	0.86
Grease on upper and lower surfaces of the leaves	0.01

What mass of water was lost in 4 days through the upper surfaces of the leaves?

[1 mark]

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3.6 Very little water was lost when the lower surfaces of the leaves were covered in grease.
Explain why.

[3 marks]

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MARK SCHEME

Qu No.		Extra Information	Marks
1.1	Ventricle		1
1.2	Lungs		1
1.3	Valve circled on heart		1
1.4	Vena cava		1
1.5	No fatty deposit Healthy artery is wider or has bigger hole or has more blood flow		2
1.6	any **two** from: • smoking • high-fat diet • lack of exercise • having high blood pressure • having high cholesterol	allow overweight / obese	2
1.7	8 (%)		1
1.8	More males suffer from coronary heart disease than females		1

Qu No.		Extra Information	Marks
2.1			
Level 3:	There is a clear and logical method described. It could be easily followed and would enable valid results to be collected		5-6
Level 2:	The method described could be followed and would enable some results to be collected. The detail required to ensure valid results may be missing.		3-4
Level 1:	Some steps of a method are given, but these are not always given clearly and logically. Following the method would not give valid results.		1-2
Level 0:	No relevant content.		0
Indicative content			
• (use of measuring cylinder to) measure equal volumes of detergent solution • (use of dropping bottle to) apply same number of drops / amount of stain to each piece of cloth • include stainless cloth as control • use of forceps to transfer cloths • se of test tubes as containers for detergent solution + stained cloth • use water bath to provide a range of temperatures • cloths left in detergent solution at each temperature • for same length of time or measure time taken to remove stain • repetition • method of assessing the stain removal is given, i.e. percentage cover			
2.2	y axis: labelled 'Time (taken to remove stain in) minutes' plus suitable scale points or bars plotted correctly to within ± 1 mm one suitable line of best fit drawn on graph	data spread greater than half of grid to gain the mark deduct 1 mark for each incorrect plot up to a maximum of 2 do not allow extrapolation to (0.0)	1 2 1
2.3	6 ± 0.1	allow ecf from student graph	1

Qu No.		Extra Information	Marks
3.1	guard (cells)	allow phonetic spelling	1
3.2	any **one** from, • allow carbon dioxide to enter • allow oxygen to leave • control gas exchange	ignore reference to cells	1
3.3	200	correct answer gains 2 marks with or without working allow 1 mark for $0.1 \times 0.1 = 0.01$ (mm^2)	2
3.4	more / a lot of / increased water loss	allow plant more likely to wilt (in hot / dry conditions)	1
3.5	0.12		1
3.6	the lower surface has most stomata stomata are now covered / blocked (by grease) so, water cannot escape / evaporate from the stomata	 ignore waterproof to gain credit, stomata must be mentioned at least once	1 1 1

TOPIC 3: INFECTION AND RESPONSE

Note

This topic has not been covered in class

1.1 Pathogens are disease causing microorganisms.

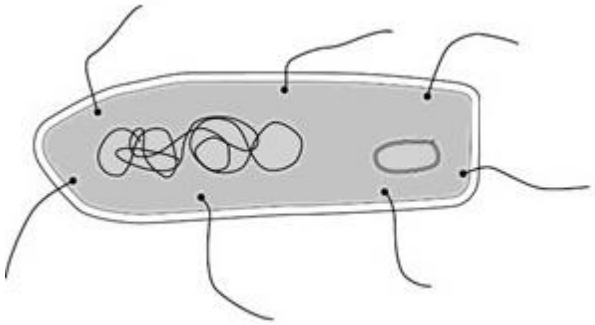
Draw **one** line from each disease to the correct disease-causing microorganism.

[3 marks]

Disease	**Microorganism**
Measles	Virus
Rose black spot	Bacterium
Salmonella	Fungi
	Protists

Figure 1 shows a bacterial cell.

Figure 1



1.2 Measure the length of the image of the cell in mm.

[1 mark]

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Length of image = _____ mm

1.3 The bacterial cell has been magnified 15 000 times.

Calculate the real length of the bacterial cell using your answer in 1.2.

[1 mark]

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Real length of cell = _____ µm

2.0 Drugs affect the human body.

New drugs must be tested and trialed before being used.

2.1 New drugs are tested in a laboratory before they are trialed on people.

What are new drugs tested on in a laboratory?

[1 mark]

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2.2 Why is it important that drugs are trialed before doctors give them to patients?

Tick (✓) **two** boxes.

[2 marks]

To check that the drug works ☐

To check the cost of the drug ☐

To find out if the drug is legal ☐

To find the best dose to use ☐

2.3 In a double-blind drug trial, only some people know which patients have been given the drug.

Who knows which patients have been given the drug?

Tick (✓) **one or more** boxes.

[1 mark]

The patient ☐

The doctor ☐

The scientists at the drug company ☐

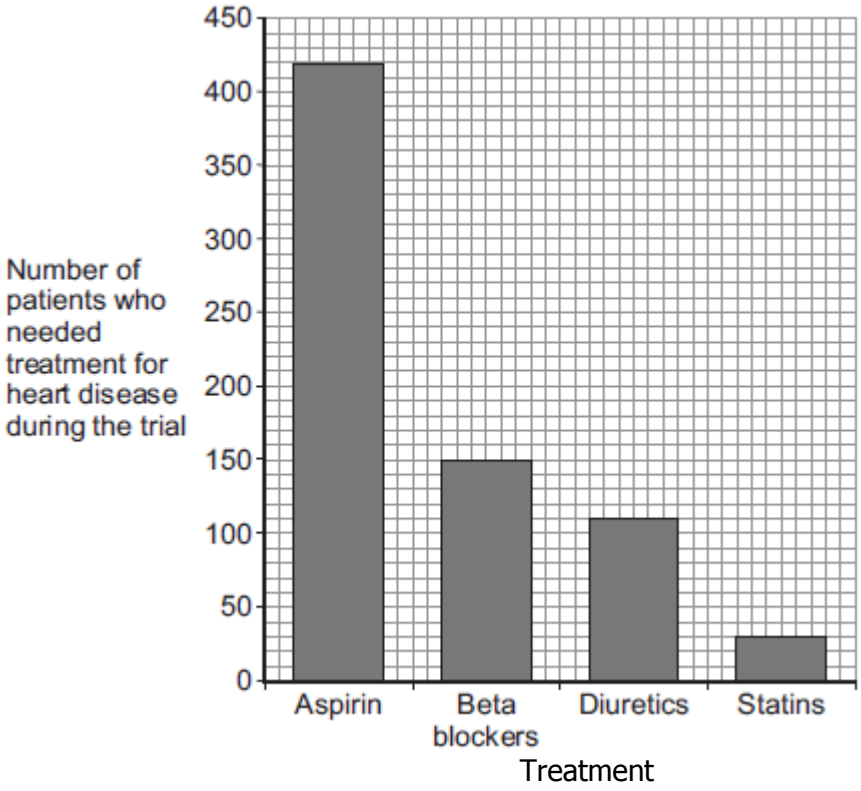
Doctors trialed four different treatments for reducing the risk of heart disease.

Each treatment was trialed on the same number of patients for 5 years.

The patients did **not** have heart disease at the start of the trial.

The **Figure 2** below shows the results.

Figure 2



2.4 How many patients who took aspirin needed treatment for heart disease during the trial?

[1 mark]

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Number of patients = _____

2.5 Based **only** on the evidence in the graph, which would be the best treatment to reduce the risk of developing heart disease?

[1 mark]

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2.6 Suggest **one** other factor that a doctor might consider before deciding which treatment to use for a patient.

[1 mark]

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3.0 Some forms of the Human Papilloma Virus (HPV) have been shown to cause cervical cancer.

Girls aged 11 to 14 now receive a vaccine for HPV.

Explain how the HPV vaccine could reduce the incidence of cancer.

Include in your answer:

- How the immune system responds to vaccines
- How giving girls the vaccine could reduce the number who get cervical cancer.

[6 marks]

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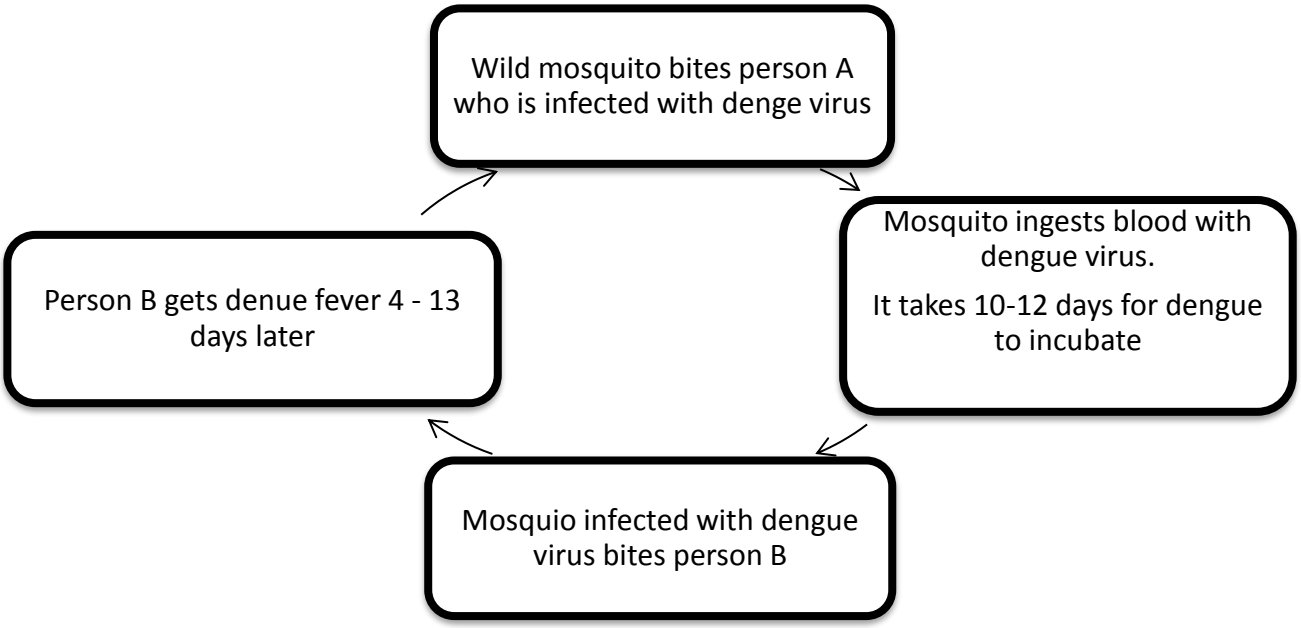
4.0 Dengue fever is a viral disease that affects up to 100 million people each year.

The lifecycle of the dengue virus can be summarised as:

Figure 3



4.1 The mosquito passes the virus from person to person.

What type of organism is the mosquito in this case?

Draw a ring around the correct answer.

[1 mark]

Fungus **Parasite** **Protist** **Vector**

4.2 Brazil is a country with high levels of the dengue virus in the population.

Give **two** ways in which people in Brazil can help prevent infection with dengue virus.

[2 marks]

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.....

4.3 What is the minimum incubation time from person **A** being bitten to person **B** getting dengue fever?.

Use information in **Figure 3**

[1 mark]

.....

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5.0 Pneumonia is a condition that causes severe breathing difficulties and can lead to death.

It is usually caused by a viral or bacterial infection.

The incidence of pneumonia in people with HIV has been five to ten times higher than in people without HIV.

5.1 Suggest why the incidence of pneumonia is higher in people with HIV

[2 marks]

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5.2 Atazanavir is a drug used to treat people with HIV.

Suggest what type of drug Atazanavir is.

[1 mark]

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.....

5.3 Scientists are trying to make a vaccine against HIV.

A vaccine to protect against HIV could be made using only a small part of the virus rather than a weakened form of the whole virus.

There would be **no** whole virus in the vaccine.

Suggest **two** advantages of using this type of vaccine.

[1 mark]

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5.4 Tobacco Mosaic Virus affects plants.

Plants infected with TMV are often smaller than healthy plants. Explain why.

[4 marks]

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6.0 Statins are drugs used to treat coronary heart disease (CHD).

New drugs must be trialled before they can be licensed for use.

Some scientists trialled two different types of statin.

The scientists:

- conducted the trial on 325 patients with a history of CHD in their family
- used a double-blind trial method
- measured the change in blood cholesterol levels over two years
- measured the change in thickness of an artery wall over two years.

6.1 During the trials the statins are tested for side effects.

Give two other reasons why the statins are trialled before use.

[2 marks]

Reason 1

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Reason 2

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6.2 Describe how the double-blind method is used in this trial.

[2 marks]

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6.3 The results of drug trials are peer reviewed before they are published.

Why are peer reviews important in drug trials?

[1 mark]

Tick **one** box.

- To calculate the best dose ☐
- To check the drug works ☐
- To make sure the scientist gets credit ☐
- To prevent false claims ☐

Table 2 shows the results of the trial.

Table 2

	Drug A	Drug B
Number of patients who died during the trial	1	2
Number of patients who reported aching muscles	16	17
Number of patients who reported mild abdominal cramps	18	16
Change in blood cholesterol level in percentage	–50.5	–41.2
Change in thickness of artery wall in mm	–0.0033	+0.032

6.4 Drug A is more effective than Drug B.

Give two reasons that support this conclusion.

Use information from **Table 2**.

[2 marks]

Reason 1

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Reason 2

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6.5 A scientist concludes that Drug A is a safer drug than Drug B.

Give two reasons why this is not a valid conclusion.

[2 marks]

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7.0 Coronary heart disease (CHD) can be caused by many factors.

Table 3 shows data related to CHD for five countries.

Table 3

Country	Number of deaths from CHD per 100 000 population per year	Percentage of the population who smoke tobacco	Percentage of the population who drink alcohol heavily	Amount of fruit and vegetables eaten in kg per person per year
A	285	36	19	180
B	251	63	34	404
C	186	47	36	251
D	149	23	34	218
E	128	27	12	222

7.1 Name one risk factor for CHD that is not shown in **Table 3**.

[1 mark]

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7.2 A student concludes that the main cause of CHD is not eating enough fruit and vegetables.

Give three reasons why the student's conclusion is not correct.

Use information from **Table 3**.

[3 marks]

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7.3 Explain how the build-up of fatty material can damage the heart.

[4 marks]

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7.4 Describe how statins can help to reduce deaths from CHD.

[2 marks]

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MARK SCHEME

Qu No.		Extra Information	Marks
1.1	Measles – virus Rose black spot – fungi Salmonella - bacterium	One mark per disease correctly matched	3
1.2	60 000 (µm)		1
1.3	4 (µm)	allow ecf using candidates answer to 1.2	1

Qu No.		Extra Information	Marks
2.1	any **one** from, • (live) animals • cells • tissues	ignore people / volunteers allow named examples, e.g. mice do not allow plants	1
2.2	to check that the drug works to find the best dose to use		1 1
2.3	only scientists at the drug company		1
2.4	420		1
2.5	Statin		1
2.6	any **one** from, • side effects • other medication (they are taking) • other medical conditions	 allow family history / age allow patient choice	1

Qu No.		Extra Information	Marks
3			
Level 3:	A detailed and coherent explanation is given. The student links the details of the immune response to the prevention of spread of cervical cancer. Logical links are made and scientific terms are used accurately.		5-6
Level 2:	A logical description is given of most of the stages of the immune response to HPV. The answer is not linked to the prevention of the spread of disease.		3-4
Level 1:	Some relevant points made which do not cover the entire process. The logic may be unclear and links may not be made.		1-2
	No relevant content		0
	Indicative content		
	• Vaccination involves introducing small quantities of dead or inactive forms of HPV; • Stimulate the white blood cells; • To produce antibodies against HPV; • Memory cells for the HPV (antigen) is produced; • If infected, antibodies against HPV are produced faster; • Stops infection with the virus / HPV; • Girls who get the vaccine less likely to get cancer; • Lower likelihood that virus spread via sexual contact; • and so prevent spread cervical cancer even to those who haven't received the vaccine.	do **not** allow small amount of HPV allow lymphocytes / B-cells allow immunoglobulins allow kill / destroy virus	

Qu No.		Extra Information	Marks
4.1	Vector		1
4.2	destroy the mosquitos prevent the mosquitos from biting people	 allow use mosquito repellent / nets	1 1
4.3	14		1

Qu No.		Extra Information	Marks
5.1	immune system becomes severely damaged so white blood cells can no longer destroy the pathogen (unlike a person without HIV)		1 1
5.2	Antiretroviral		1
5.3	safer/ no risk of getting the disease it can't reproduce		1 1
5.4	parts of the leaf have no chlorophyll / chloroplasts (so) less light is absorbed for photosynthesis (therefore) less glucose made from photosynthesis (and so) less proteins made (from glucose) for growth		1 1 1 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6.1	any **two** from: • to work out the correct dose to be given • to check that the drug is working correctly • to check for toxic effects.		2	AO1/2 4.3.3.7
6.2	patients are randomly allocated to receive statin or a placebo so neither patient nor doctor knows who has received which	answer in terms of only the drug company knows who is taking the statin or the placebo gains **2** marks	1 1	AO1/2 4.3.3.7
6.3	To prevent false claims		1	AO1/2 4.3.3.7
6.4	drug **A** reduced the blood cholesterol level more than drug **B** drug) reduced the thickness of the artery **or** drug **B** increased the thickness of the artery	allow drug **A** made the artery thinner **or** drug **B** made the artery thicker ignore side effects	1 1	AO3/1a 4.3.3.7
6.5	differences in number of patients reporting side effects are very similar we don't know what the patients died of		1 1	AO3/2b 4.3.3.7
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7.1	(lack of) exercise	allow description of type or amount of exercise allow other risk factors not mentioned in table, eg high cholesterol levels, blood pressure, levels of obesity, diabetes	1	AO1/1 4.3.1.2
7.2	the second highest death rate has the highest fruit and vegetable consumption the lowest death rates don't have high fruit and vegetable consumption lowest death rates have a low percentage of the population that smokes.		3	AO3/1a 4.3.1.2
7.3	(it builds up) inside the coronary arteries (causing) them to narrow (this) reduces blood flow so less oxygen gets to the heart muscle		1 1 1 1	AO1/1 4.3.1.3 AO1/1 4.3.1.3 AO1/1 4.3.1.3 AO2/1 4.2.1.3
7.4	(statins) reduce cholesterol in the blood so there is less build up of fatty material (in coronary arteries)	 allow slows the rate of fat deposit	1 1	AO1/1 4.3.1.3
Total			**10**	

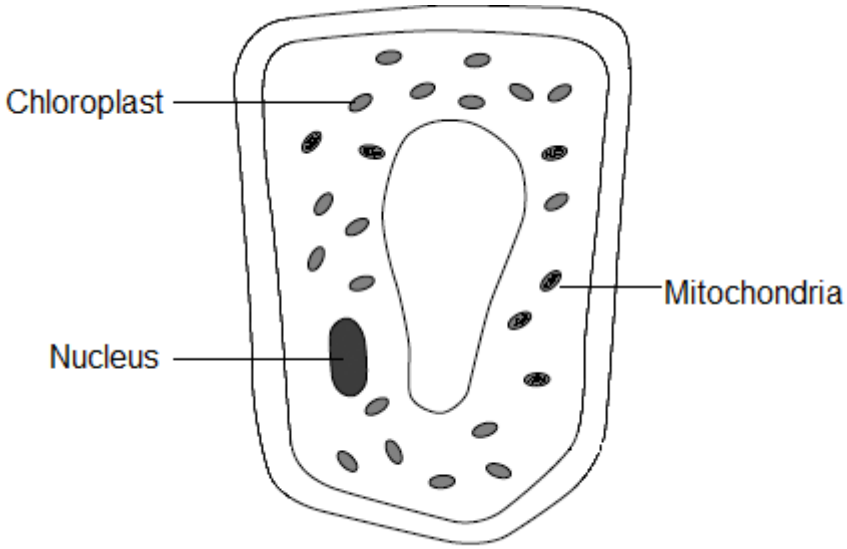
TOPIC 4: BIOENERGETICS

Note

This topic has not been covered in class

1.0 Figure 1 shows a plant cell.

Figure 1



1.1 Draw one line from each part of the cell to its function.

[3 marks]

Part of the cell	Function
Nucleus	Where most of the chemical reactions take place
Chloroplast	Absorbs light energy to make food
Mitochondria	Carries out respiration
	Controls the activities of the cell

1.2 Respiration takes place in the cell.

Use a word from the list to complete the sentence.

[1 mark]

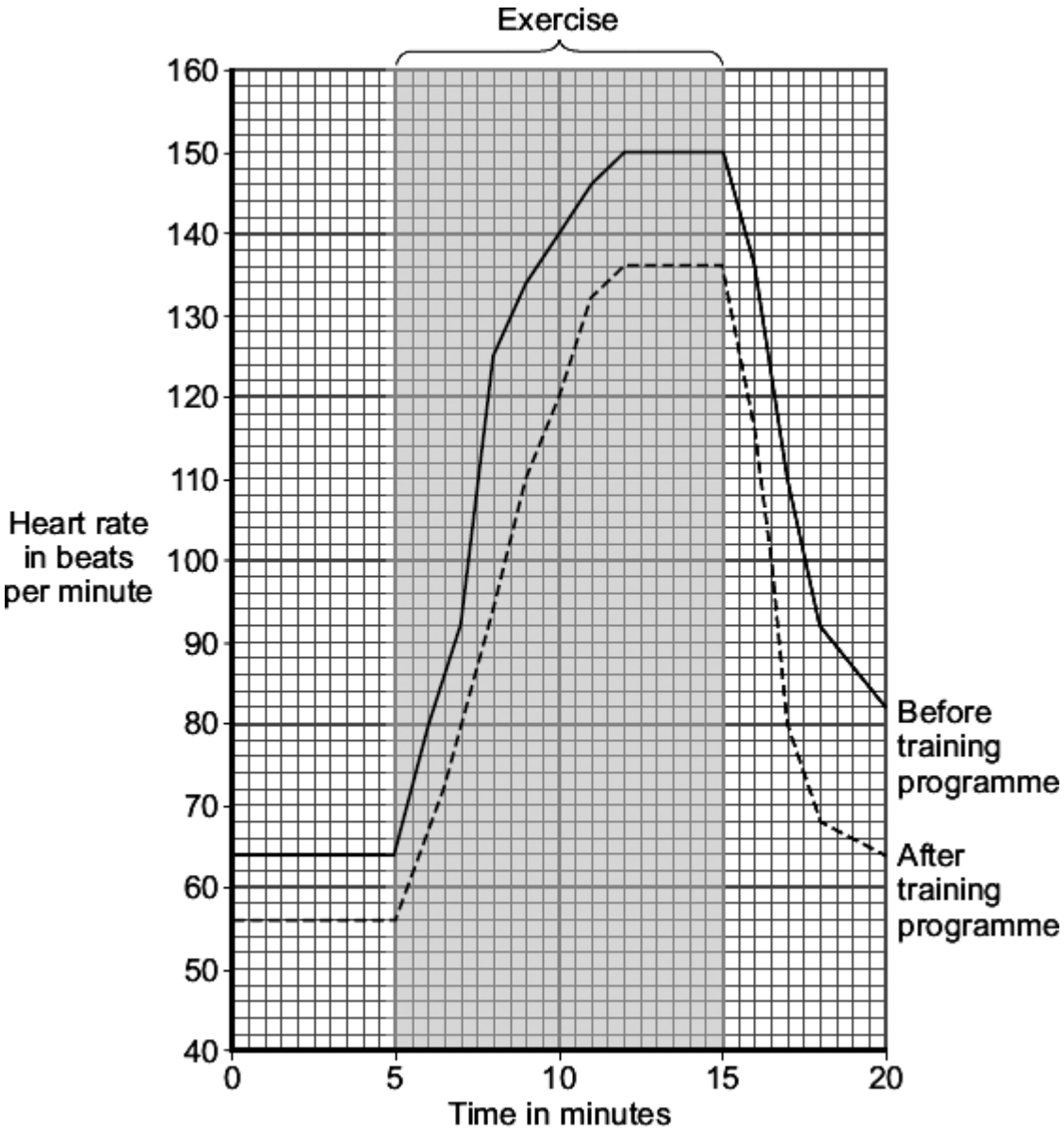
amino acids **energy** **glucose** **oxygen**

All cells use respiration to release _____.

2.0 An athlete did a 6-month training programme.

Figure 2 shows the effect of the same amount of exercise on his heart rate before and after the training programme.

Figure 2



2.1 What was the minimum heart rate of the athlete before the training programme?

[1 mark]

.....

.....

Minimum heart rate = _____beats per minute

2.2 Give **two** differences between the heart rate of the athlete before and after the training programme.

[2 marks]

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.....

.....

.....

2.3 Which **two** substances need to be supplied to the muscles in larger amounts during exercise?

Choose **two** substances from the list.

[2 marks]

Carbon dioxide Glucose Lactic acid Oxygen Urea

2.4 Use **Figure 2** to find the heart rate of the **trained** athlete 3 minutes after he stopped exercising.

[1 mark]

.....

.....

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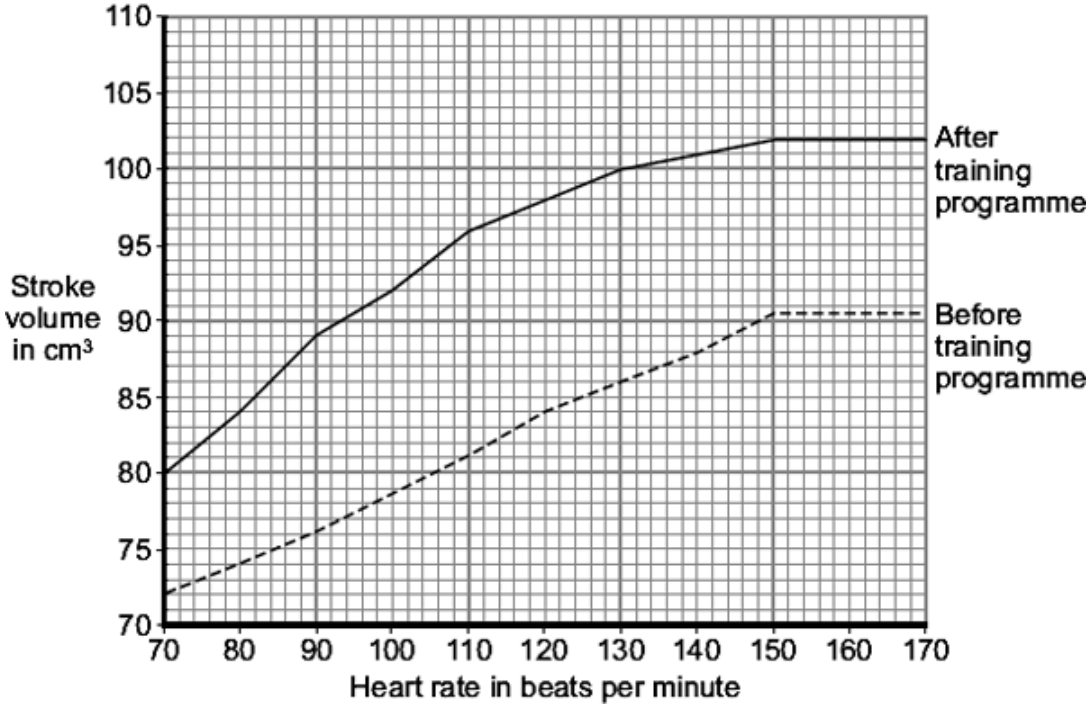
Heart rate = _____ beats per minute

The stroke volume of the heart is the volume of blood pumped out of the left side of the heart in one heart beat.

Figure 3 shows the relationship between the stroke volume and the heart rate before and after the athlete did the training programme.

Figure 3



2.5 The **cardiac output** is calculated using the following equation:

cardiac output = heart rate × stroke volume

Calculate the cardiac output of the athlete **after** training, 8 minutes after the start of the exercise. Use information from **Figure 2** and **Figure 3.**

[2 marks]

Show clearly how you work out your answer.

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.....

Cardiac output = _____ cm^3 blood per minute

2.6 An increased cardiac output will provide more oxygen and more glucose to the working muscles. Explain how this helps the athlete during exercise.

[4 marks]

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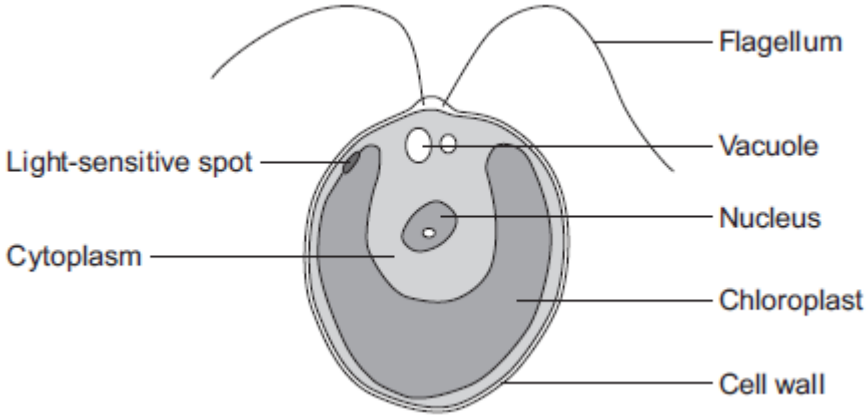
3.0 Figure 4 shows a single-celled alga which lives in fresh water.

Figure 4



3.1 Which part of the cell labelled above is made of cellulose?

[1 mark]

.....

.....

3.2 Water enters and leaves the algal cell.

What is the name of the process by which water moves into cells?

[1 mark]

.....

.....

3.3 Describe what happens to the algal cell as water moves into the cell.

[1 mark]

.....

.....

3.4 The alga can photosynthesise.

Complete the **word** equation for photosynthesis.

[2 marks]

water + ... $\xrightarrow{\text{Light energy}}$ ..... + oxygen

3.5 The flagellum helps the cell to move through water.

Scientists think that the flagellum and the light-sensitive spot work together to increase photosynthesis.

Suggest how this might happen.

[2 marks]

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4.0 This question is about photosynthesis.

4.1 Plants make glucose during photosynthesis.
Some of the glucose is changed into insoluble starch.

What happens to this starch?

[1 mark]

The starch is converted into oxygen. ☐

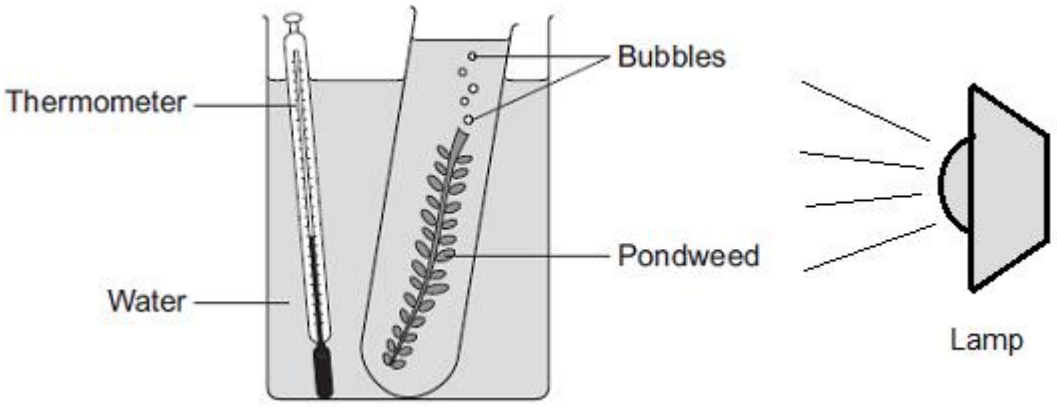
The starch is stored for use later. ☐

The starch is used to make the leaf green. ☐

4.2A student investigated the effect of light intensity on the rate of photosynthesis in pondweed.

Figure 5 shows the way the experiment was set up.

Figure 5



The student needed to control some variables to make the investigation fair.
State **two** variables the student needed to control in this investigation.

[2 marks]

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4.3 The bubbles of gas are only produced while photosynthesis is taking place.
What **two** measurements would the student make to calculate the rate of photosynthesis?

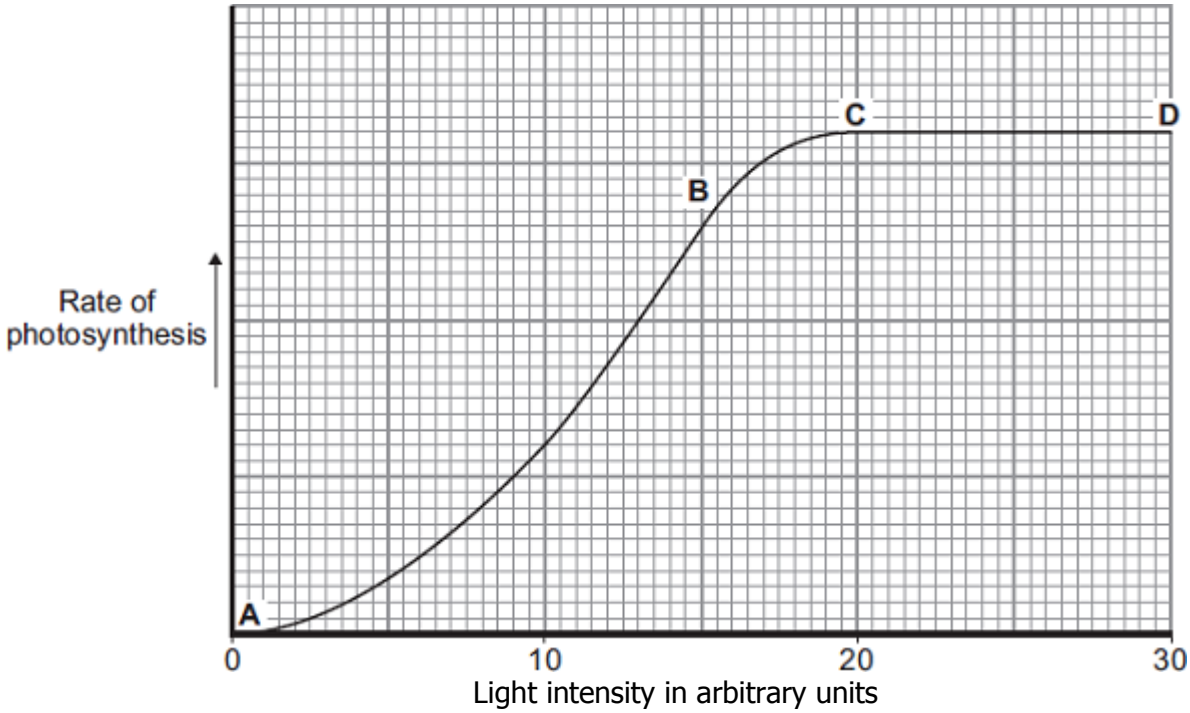
[2 marks]

.....

.....

4.4 Figure 6 shows the effect of light intensity on the rate of photosynthesis in the pondweed.

Figure 6



Name the factor that limits the rate of photosynthesis between the points labelled **A** and **B** on the graph.

[1 mark]

.....

.....

4.5 Suggest which factor might be limiting the rate of photosynthesis between the points labelled **C** and **D** on the graph.

[1 mark]

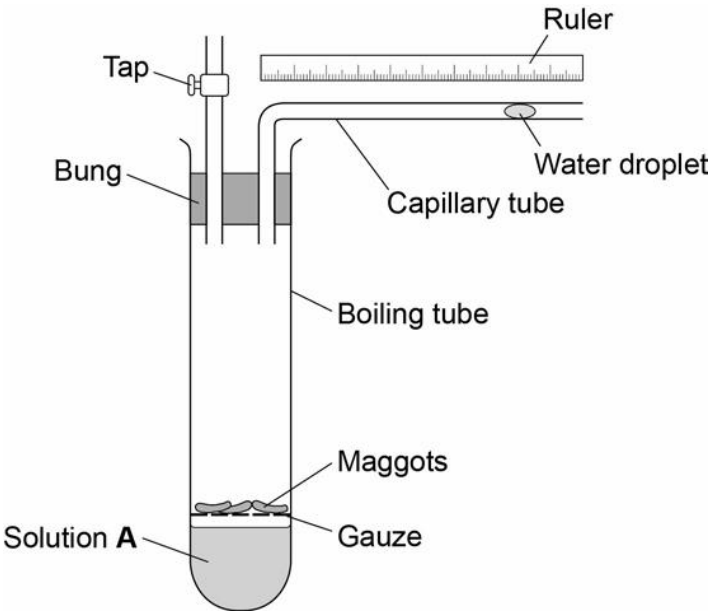
.....

.....

A student investigates the rate of respiration in maggots.

Figure 3 shows the equipment he uses.

Figure 3



5.1 Why does the student put the maggots on gauze?

[1 mark]

.....

.....

5.2 When maggots respire they take in a gas from the air and release a different gas.

Solution A absorbs the gas released.

At the start of the investigation the student records the distance of the water droplet from the bend in the capillary tube.

Explain what happens to the water droplet as the maggots respire.

[4 marks]

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Table 1 shows the results the student calculated.

Table 1

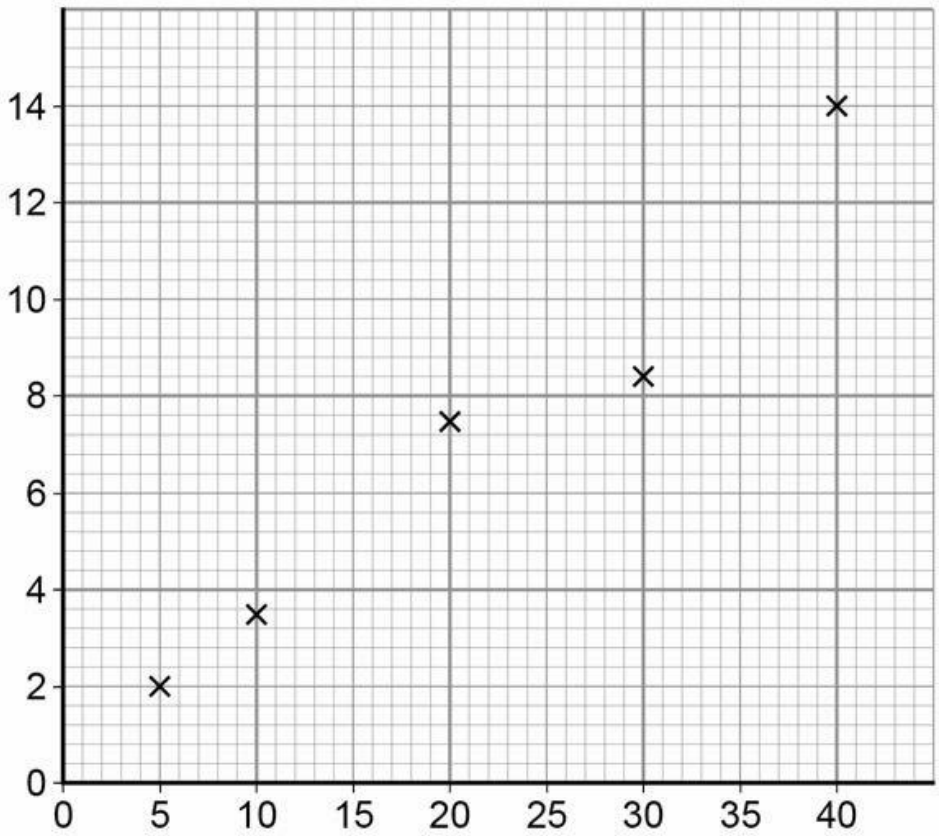
Temperature in °C	Rate of respiration in units
5	2.2
10	3.5
20	7.5
30	8.4
40	14.0

5.3 The student uses his results to plot the graph in **Figure 4.**

Label the x and y axis.

[1 mark]

Figure 4



5.4 How could the student find out if the result at 30 °C is anomalous?

[1 mark]

.....

.....

5.5 Suggest what the value at 30 °C should be to fit the pattern of the graph.

[1 mark]

.....

.....

MARK SCHEME

Qu No.		Extra Information	Marks
1.1	Nucleus – Controls the activities… Chloroplast – Where most of the… Mitochondria – Carries out respiration	1 mark for each correct line mark each line from left hand box two lines from left hand box cancels mark for that box	3
1.2	energy		1

Qu No.		Extra Information	Marks
2.1	64 (beats per minute)		1
2.2	any **two** from: • lower resting pulse • lower rate during exercise • recovers faster after exercise	accept correct use of numbers accept lower pulse rate if neither of the first two marking points awarded, allow 1 mark for 'lower rate'.	2
2.3	Glucose oxygen		1 1
2.4	68		1
2.5	(136 × 100.5) = 13,668	Allow 13000 to 13800. if answer incorrect, allow one mark for obvious attempt to read both graphs and multiply	2
2.6	any **four** from: • trained athlete has higher stroke • volume / more blood per beat • same volume blood expelled with • fewer beats **or** for same heart • rate more blood is expelled		4

Qu No.		Extra Information	Marks
3.1	cell wall		1
3.2	osmosis	allow diffusion	1
3.3	cell wall prevents bursting		1
3.4	Carbon dioxide Glucose		1 1
3.5	any **two** from: • light sensitive spot detects light • tells flagellum to move towards light • more light = more photosynthesis		2

Qu No.		Extra Information	Marks
4.1	the starch is stored for use later		1
4.2	any **two** from: • carbon dioxide (concentration) • light intensity • light colour / wavelength • pH • size of pondweed / plant • same species / type of pondweed • volume of water in the tube	do not accept temperature ignore reference to time allow 1 mark for light if neither intensity of colour are awarded. ignore volume of water unqualified	2
4.3	number / amount of bubbles **or** amount of gas / oxygen (relevant reference to) time / named time interval	ignore the bubbles unqualified allow how long it bubbles for do not allow time bubbles to start / stop ignore speed / rate of bubbling ignore instruments do not allow other factors e.g. temperature accept how many bubbles per minute for 2 marks	1 1
4.4	Light intensity		1
4.5	Temperature/carbon dioxide / CO_2	Allow heat allow CO2 do not allow CO^2	1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5.1	(to) stop them falling in the solution **or** to stop them drowning (in the solution)		1	AO2/2 4.2.1.1
5.2	**Level 2:** A detailed and coherent explanation is given of how the droplet moves, clearly and logically linked to the process of respiration.		3–4	AO2/2
	Level 1: Simple statements are made about movement of the water droplet, but any attempts at explaining the reason or linking the movement to the process of respiration are unclear and poorly structured.		1–2	
	No relevant content		0	
	Indicative content • water droplet moves towards the maggots/boiling tube Explanation: • the oxygen in the boiling tube is used up in respiration • (and) the carbon dioxide released from respiration is absorbed by solution **A** • which causes a pressure difference • so air is drawn into the tube • bringing the water droplet with it.			4.2.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5.3	*x* axis: Temperature in °C *y* axis: Rate of respiration in units	both needed for the mark	1	AO2/2 4.2.1.1
5.4	repeat the experiment at 30 °C		1	AO3/1a 4.2.1.1
5.5	10.5	allow range 10.4–10.8	1	AO2/1 4.2.1.1
Total			**8**	

Acknowledgements

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This document has been produced for educational purposes only.

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