

Please write clearly in block capitals.

Centre number

Candidate number

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE BIOLOGY

F

Foundation Tier Paper 1F

Tuesday 12 May 2020

Afternoon

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- a ruler
- a scientific calculator.

Instructions

- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- 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.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	



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Do not write outside the box

Answer **all** questions in the spaces provided.

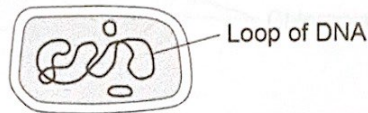
0 1

This question is about cells.

0 1 . 1

Figure 1 shows a cell.

Figure 1



0 1 2

What is the function of the cell wall?

[1 mark]

What type of cell is shown in Figure 1?

[1 mark]

Tick (✓) **one** box.

Animal

Bacterium

Plant

0 1 3

The sign cell is green.

Which part of the sign cell makes it green in colour?

[1 mark]

Tick (✓) **one** box.

Cellulose

Chloroplast

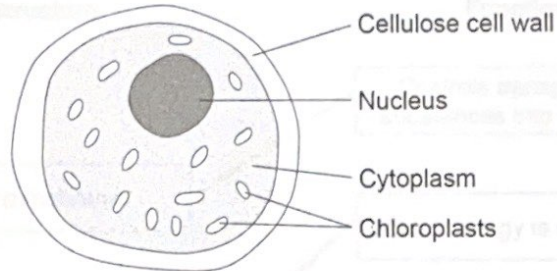
Chlorophyll

Nucleus



Figure 2 shows an algal cell.

Figure 2



0 1 . 2 What is the function of the cell wall?

[1 mark]

Tick (✓) **one** box.

To contain the genetic material

To stop the chloroplasts leaking out

To strengthen the cell

0 1 . 3 The algal cell is green.

Which part of the algal cell makes it green in colour?

[1 mark]

Tick (✓) **one** box.

Cellulose

Chloroplast

Cytoplasm

Nucleus

Turn over ►



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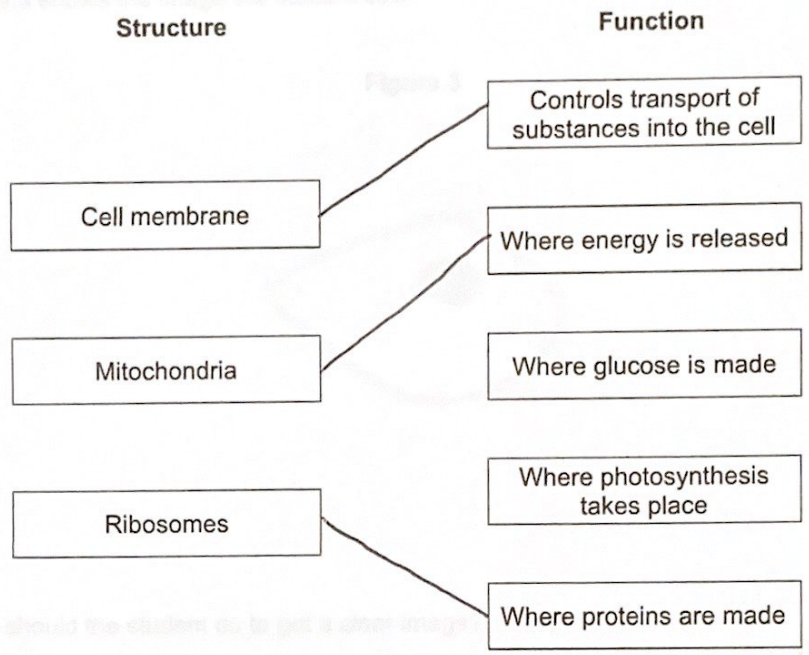
0 1 . 4

Cells contain sub-cellular structures.

Draw **one** line from each structure to its function.

[3 marks]

Figure 3 shows the rough the correct way



What should the student do to get a star rating? (1 mark)

Tick (✓) one box.

Adjust the microphone

Show dialog window

Remember on the site

Question 1 continues on the next page

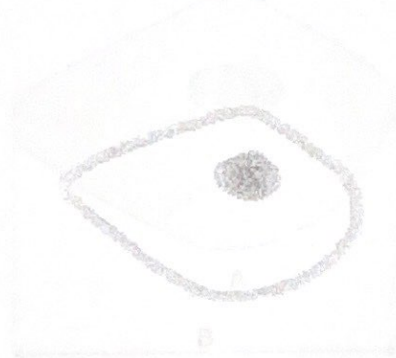


A student prepared a microscope slide of cheek cells.

The student looked at one cell using a microscope.

Figure 3 shows the image the student saw.

Figure 3



0 1 . 5 What should the student do to get a clear image?

[1 mark]

Tick (✓) **one** box.

Adjust the focus knob

Make the light dimmer

Put water on the slide

Question 1 continues on the next page

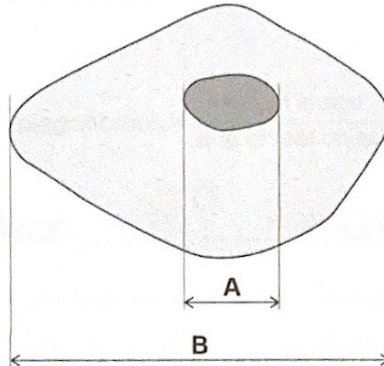
Turn over ►



The student then obtained a clear image.

Figure 4 shows the clear image.

Figure 4



- 0 1 . 6 Measure the length of the nucleus (A) and the length of the cell (B) in millimetres (mm).

[2 marks]

A = 15 mm

B = 60 mm

- 0 1 . 7 How many times longer is the cell (B) than the nucleus (A)?

[1 mark]

$$60 \div 15 = 4$$

Number of times longer = 4



0 1 . 8

The student looked at another cell.

The image width of the cell was 40 mm

The real width of the cell was 0.1 mm

Calculate the magnification of the cell.

[2 marks]

Use the equation:

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

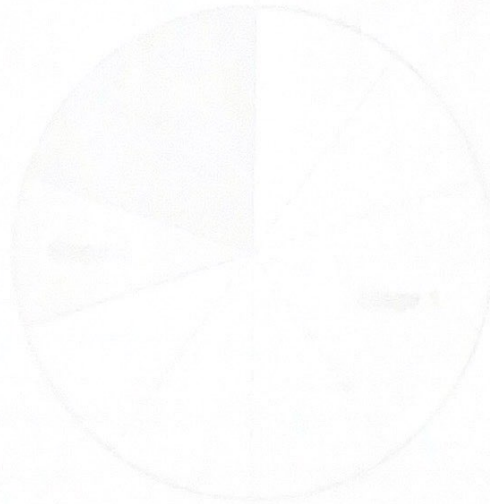
$$\text{magnification} = \frac{40}{0.1} = 400$$

Magnification = ×

400

12

Turn over for the next question



Turn over ►



0 2

This question is about cell division.

0 2 . 1

Which process makes two identical new body cells for growth and repair?

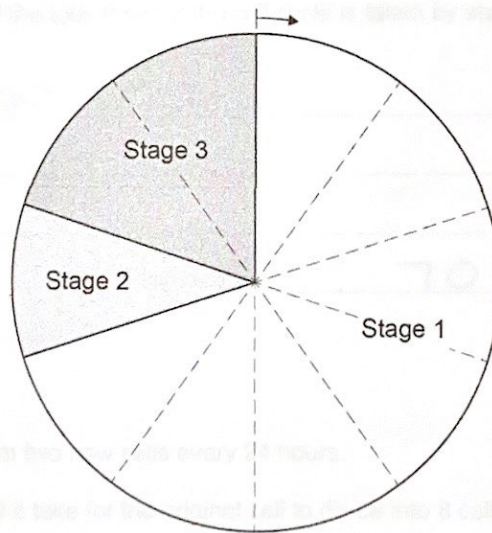
[1 mark]

Tick (✓) **one** box.

- Differentiation
- Fertilisation
- Mitosis

Figure 5 shows the three stages of a cell cycle.

Figure 5



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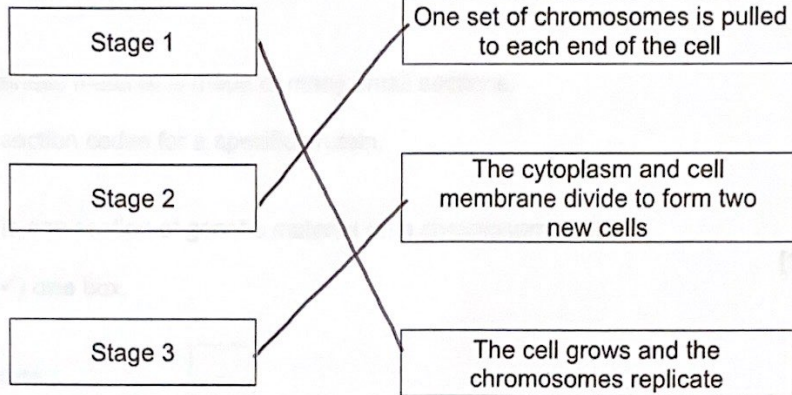
0 2 . 2

Draw one line from each stage of the cell cycle to what happens during that stage.

[2 marks]

Stage of cell cycle

What happens during that stage



0 2 . 3

What percentage of the total time for the cell cycle is taken by stage 1?

[2 marks]

$$\frac{7}{10} \times 100 = 70$$

Percentage = 70 %

0 2 . 4

A cell divides to form two new cells every 24 hours.

How many days will it take for the original cell to divide into 8 cells?

[1 mark]

Tick (✓) one box.

1

3

6

8

Turn over ►



0 2 . 5 The chromosomes contain the genetic material.

Name the chemical which the genetic material is made from.

[1 mark]

DNA

0 2 . 6 The genetic material is made of many small sections.

Each section codes for a specific protein.

What is one section of genetic material on a chromosome called?

[1 mark]

Tick (✓) **one** box.

A gamete

A gene

A nucleus

0 2 . 7 Stem cells are cells which have **not** yet been specialised to carry out a particular job.

Bone marrow cells are one example of stem cells.

Explain how a transplant of bone marrow cells can help to treat medical conditions.

[2 marks]

Bone marrow cells differentiate into many other types of cells so will cure diseases where cells are damaged and need replacing.

10



0 3

The human body can defend itself against microorganisms that cause disease.

Viruses are one type of microorganism that cause disease.

0 3 . 1

Name **one** type of microorganism that causes disease in humans.

Do **not** refer to viruses in your answer.

[1 mark]

Bacteria

0 3 . 2

Which **two** defence systems prevent microorganisms infecting the human body?

[2 marks]

Tick (✓) **two** boxes.

Air is warmed as it is breathed into the lungs.

Hairs on the skin trap microorganisms.

Hydrochloric acid is produced by the stomach.

Teeth in the mouth crush and kill microorganisms.

The skin is a barrier covering the whole body.

0 3 . 3

If microorganisms enter the human body the immune system can destroy the microorganisms.

How does the immune system destroy microorganisms?

Tick (✓) **one** box.

[1 mark]

Platelets kill the microorganisms.

Red blood cells stick to the microorganisms.

White blood cells engulf the microorganisms.



0 3 . 4 Vaccinations prevent people becoming ill with diseases such as measles.

Complete the sentences.

[2 marks]

Choose answers from the box.

active

fast

resistant

slow

weakened

In a vaccine the measles virus is weakened.

If the measles virus enters the body after vaccination the immune system reaction will be fast.

0 3 . 5 How is the measles virus spread from one person to another?

[1 mark]

By coughs and sneezes

Question 3 continues on the next page

0 3 . 6 What was the range for the days on which children first showed chickenpox spots?

Use Table 1.

[1 mark]

From day 10 to day 18

0 3 . 7 Incubation time is the usual time from exposure to a pathogen until the first symptoms appear.

Suggest the most likely incubation time for chickenpox.

[1 mark]

Incubation time = 14 days



Doctors investigated the spread of the virus that causes chickenpox.

The first symptom of chickenpox after exposure to the virus is spots on the body.

23 children were playing together at a party.

On the day of the party one of the children developed chickenpox spots.

Every two days after the party, the doctors recorded when the other 22 children first showed chickenpox spots.

Table 1 shows the results.

Table 1

Day when chickenpox spots first showed	Number of children
2	0
4	0
6	0
8	0
10	1
12	1
14	6
16	4
18	2
20	0
Total	14

03.6 What was the range for the days on which children first showed chickenpox spots?

Use Table 1.

[1 mark]

From day 10 to day 18

03.7 Incubation time is the usual time from exposure to a pathogen until the first symptoms appear.

Suggest the most likely incubation time for chickenpox.

[1 mark]

Incubation time = 14 days



03.8

Suggest **one** reason why some of the children did **not** develop chickenpox.

[1 mark]

They were immune because they had
it previously

03.9

One mother gave antibiotics to her child who had chickenpox.

Suggest why this child did **not** recover more quickly than the other children who had chickenpox.

[1 mark]

~~Antibiotics~~ Antibiotics do not kill viruses

11

Turn over for the next question

[1 mark]

04.3

What is the man's maximum heart rate?

Use Figure 6.

[1 mark]

Man's maximum heart rate = 190 beats per minute

04.4

The man concluded that he was exercising at a safe heart rate.

Give the reason for his conclusion.

Use your answers from Question 04.2 and Question 04.3

[1 mark]

Because his heart rate is lower than the
Maximum safe rate (190 < 175)



04.1 Describe the trend for breathing rate shown in **Figure 6**.

Use data from **Figure 6** in your answer.

[3 marks]

The breathing rate increased for the first 4 minutes then stayed constant at 50 breaths per minute.

04.2 The safe maximum heart rate for a person exercising can be calculated using the equation:

$$\text{safe maximum heart rate} = 220 - \text{age in years}$$

Calculate the safe maximum heart rate for the man.

[1 mark]

$$\text{Safe maximum heart rate} = 220 - 45 = 175$$

$$\text{Safe maximum heart rate} = 175 \text{ beats per minute}$$

04.3 What is the man's maximum heart rate?

Use **Figure 6**.

[1 mark]

$$\text{Man's maximum heart rate} = 140 \text{ beats per minute}$$

04.4 The man concluded that he was exercising at a safe heart rate.

Give the reason for his conclusion.

Use your answers from Question **04.2** and Question **04.3**

[1 mark]

Because his rate is lower than the maximum safe rate ($140 < 175$)



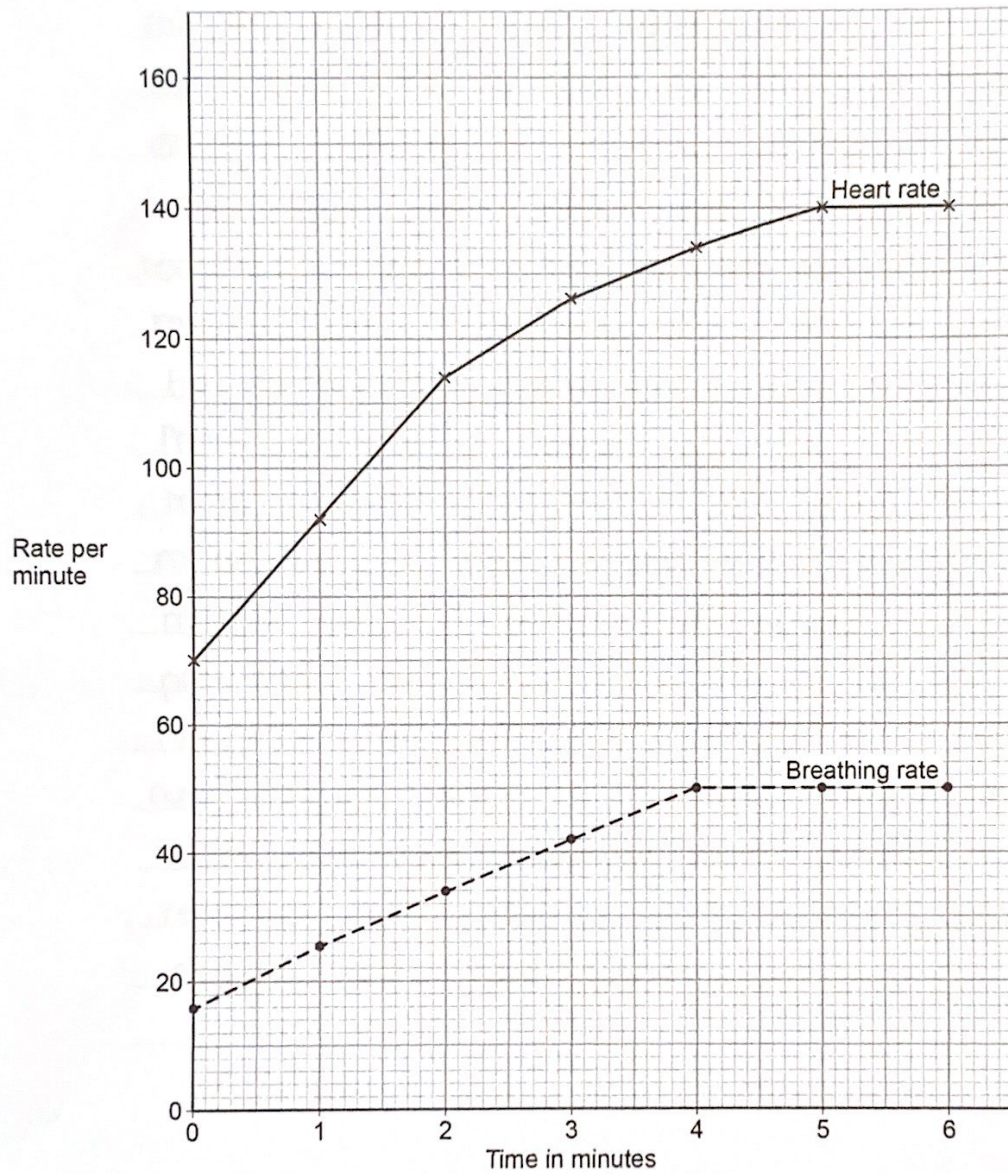
0 4

A 45-year-old man exercised on a rowing machine for six minutes.

A fitness monitor recorded his heart rate and breathing rate every minute.

Figure 6 shows the results.

Figure 6



1 6

0 4 . 5 Explain the ways the man's body has responded to the exercise.

Use information from **Figure 6** on page 16.

[6 marks]

His heart rate increased when exercising in order to increase blood flowing to the lungs and muscles. Muscles need oxygen and glucose from the blood for ^{aerobic} respiration, so they can produce energy needed for muscle contraction. Increased blood flow also allows for the efficient removal of carbon dioxide from the respiring muscle cells. Breathing rate also increases to supply the body with more oxygen. More oxygen is taken into the lungs so more oxygen circulates in the blood and more oxygen ~~can~~ reaches the respiring muscle cells. If insufficient oxygen is provided, anaerobic respiration occurs which results in the build up of lactic acid and an oxygen debt and muscle fatigue. The heart rate and breathing rate increase to remove the lactic acid and repay this oxygen debt more quickly.

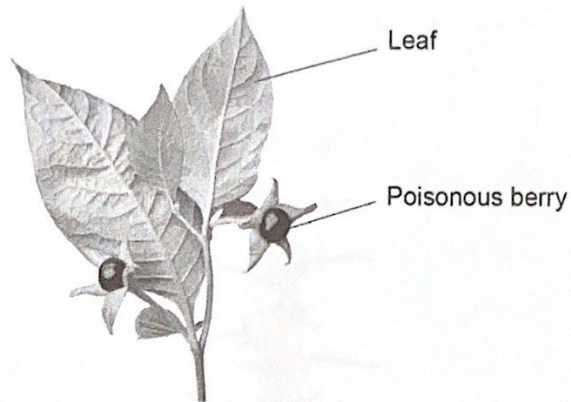
12



0 5

Figure 7 shows part of a deadly nightshade plant.

Figure 7



0 5 . 1

How will the poisonous berries help the deadly nightshade plant to survive?

[1 mark]

Will stop animals eating it.

0 5 . 2

Which type of defence mechanism are the berries?

[1 mark]

Tick (✓) **one** box.

Chemical

Mechanical

Physical



Figure 8 shows part of a gorse plant.

Figure 8



0 5 . 3 Suggest how the gorse plant is adapted to defend itself.

[1 mark]

It has thorns to stop animals eating it.

0 5 . 4 The green leaves of the gorse plant make glucose for the plant to use.

What are **two** uses of glucose in the gorse plant?

[2 marks]

Tick (✓) **two** boxes.

For defence

For respiration

To absorb water

To release minerals

To store as starch



0 5 . 5 A student wanted to show that the leaves of a gorse plant contain glucose.

The student crushed the leaves to extract the liquid from the cells.

Describe the method the student could use to test the liquid from the cells for glucose.

Include the result if glucose is present.

[3 marks]

First you would add benedicts solution to the sample then heat it. If the glucose is present then the blue colour will change to yellow/orange/red.

0 5 . 6 The roots of the gorse plant have bacteria that turn nitrogen gas into nitrate ions.

Explain why nitrate ions are needed by the gorse plant.

[2 marks]

Nitrate ions are needed to produce amino acids which make up proteins. Proteins are required to make new cells and for plant growth.

0 5 . 7 The roots of gorse plants can be infected by honey fungus.

The honey fungus produces tiny spores underground.

Suggest how the honey fungus spores travel from the roots of an infected gorse plant to the roots of a healthy gorse plant.

[1 mark]

In the water in the soil.

Turn over ►



A drug can be extracted from gorse seeds.

Doctors want to trial the drug from gorse seeds to see if it can treat diarrhoea.

0 5 . 8

Which **two** factors must the doctors test the drug for in the trial?

[2 marks]

Tick (✓) **two** boxes.

Appearance

Dosage

Solubility

Taste

Toxicity

0 5 . 9

In the trial some patients will take tablets made from gorse seeds and some patients will take tablets made from sugar.

What are the tablets made from sugar called?

[1 mark]

Tick (✓) **one** box.

Antibiotics

Antibodies

Painkillers

Placebos

14



0 6

Blood is transported around the body in blood vessels.

0 6 . 1

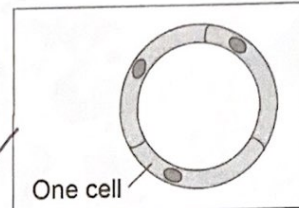
Draw **one** line from each type of blood vessel to the structure of the blood vessel.

[2 marks]

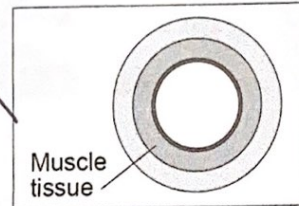
Type of blood vessel

Structure of blood vessel

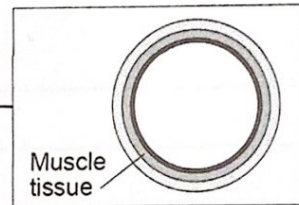
Artery



Capillary



Vein



0 6 . 2

Explain how the structure of an artery is related to its function.

[2 marks]

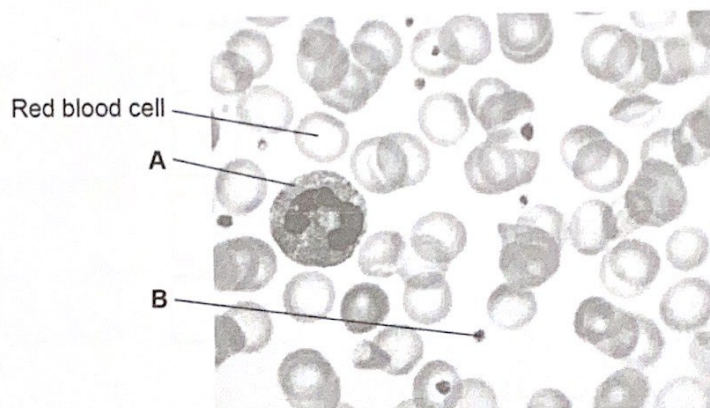
They have thick elastic walls to withstand the high blood pressure.

Turn over ►



Figure 9 shows blood viewed through a microscope.

Figure 9



0 6 . 3

Name **A** and **B** in Figure 9.

[2 marks]

A white blood cell

B platelet

0 6 . 4

A red blood cell:

- has no nucleus
- contains a red pigment called haemoglobin.

Suggest how these adaptations help the red blood cell carry out its function.

[2 marks]

No nucleus more space for haemoglobin

Haemoglobin to bind and carry oxygen around the body.



0 6 . 5 The blood components are carried around the body in the liquid part of the blood.

What is the liquid part of the blood called?

[1 mark]

Tick (✓) **one** box.

Cell sap

Plasma

Saliva

Urine

Table 2 shows the results of a man's blood test.

Table 2

Blood component	Patient results	Normal range
Red blood cells	4.8	4.5 to 6.5
Lymphocytes	2.6	1.0 to 4.0
Neutrophils	5.1	1.8 to 7.5
Platelets	50	140 to 400

0 6 . 6 Which component of the man's blood is **not** within the normal range?

[1 mark]

Platelets

0 6 . 7 Suggest a symptom the man might show.

[1 mark]

Continued bleeding



0 7 This question is about photosynthesis.

0 7 . 1 Complete the word equation for photosynthesis.

[2 marks]

carbon dioxide + water → glucose + oxygen

0 7 . 2 Describe how energy for the photosynthesis reaction is gained by plants.

[2 marks]

Light energy is absorbed by chlorophyll
in chloroplasts

Students investigated the effect of temperature on the rate of photosynthesis.

The students shone light from a lamp onto pondweed and measured the volume of oxygen produced per hour.

Table 3 shows the results.

Table 3

Temperature in °C	Rate of photosynthesis in cm ³ /hour			
	Test 1	Test 2	Test 3	Mean
20	18.5	19.3	19.5	X
25	32.6	34.1	32.9	33.2
30	41.9	45.2	44.9	44.0
35	38.6	39.8	44.0	40.8
40	23.1	20.5	22.4	22.0
45	1.9	14.2	2.2	2.1



07.3 Calculate mean value X.

[2 marks]

$$x = \frac{18.5 + 19.3 + 19.5}{3} = 19.1$$

Temp in °C	Test 1	Test 2	Test 3	Mean
20	18.5	x = 19.1		cm ³ /hour
25	20.8	20.1	20.3	20.2
30	41.8	40.2	40.0	44.0
35	29.0	28.4	28.0	28.8
40				27.8
45	1.0	14.2	2.2	2.1

The students identified one anomalous result in Table 3.

07.4 Draw a ring around the anomalous result in Table 3.

[1 mark]

07.5 Why did the rate of photosynthesis decrease from 30 °C to 40 °C?

[1 mark]

07.5 Suggest one possible cause of the anomalous result.

[1 mark]

The value on the scale could have
been misread

07.6 How did the students deal with the anomalous result?

[1 mark]

Did not use it in the calculation of the
mean

07.7 Give one factor the students should have kept constant in this investigation.

[1 mark]

Light intensity

Turn over ►



Table 3 is repeated below.

Table 3

Temperature in °C	Rate of photosynthesis in cm ³ /hour			
	Test 1	Test 2	Test 3	Mean
20	18.5	19.3	19.5	X
25	32.6	34.1	32.9	33.2
30	41.9	45.2	44.9	44.0
35	38.6	39.8	44.0	40.8
40	23.1	20.5	22.4	22.0
45	1.9	14.2	2.2	2.1

07.8 Why did the rate of photosynthesis decrease from 35 °C to 45 °C?

[1 mark]

Enzymes start to denature and their active site changes shape



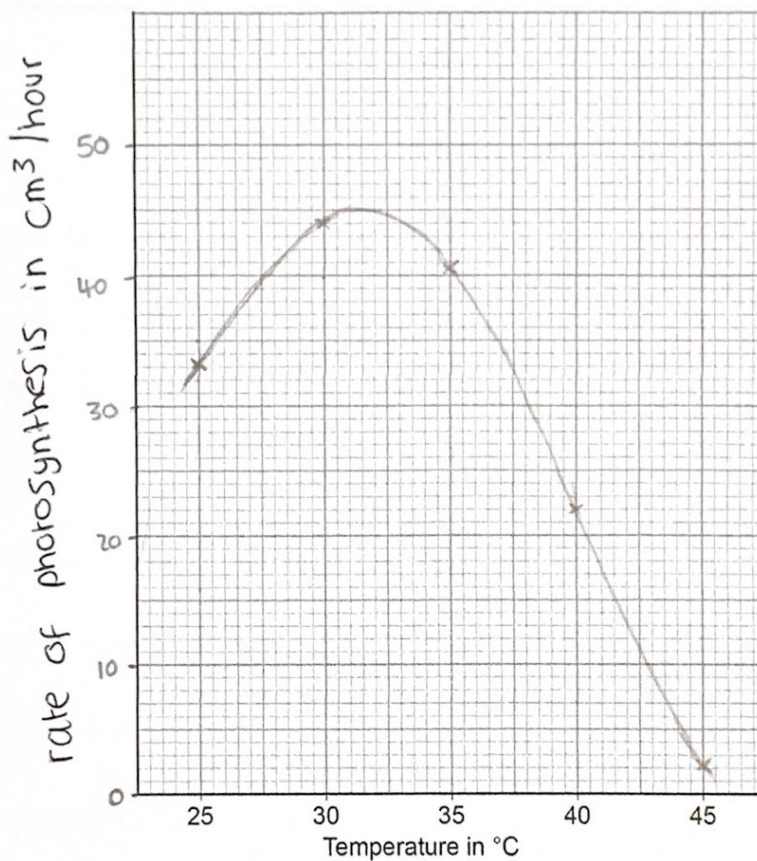
07.9 Complete Figure 10 using data from Table 3.

You should:

- label the y-axis
- use a suitable scale for the y-axis
- plot the mean data from Table 3 for temperatures from 25 °C to 45 °C
- draw a line of best fit.

[5 marks]

Figure 10



16

Turn over for the next question

Turn over ►



0 8

Diffusion is an important process in animals and plants.

0 8 . 1

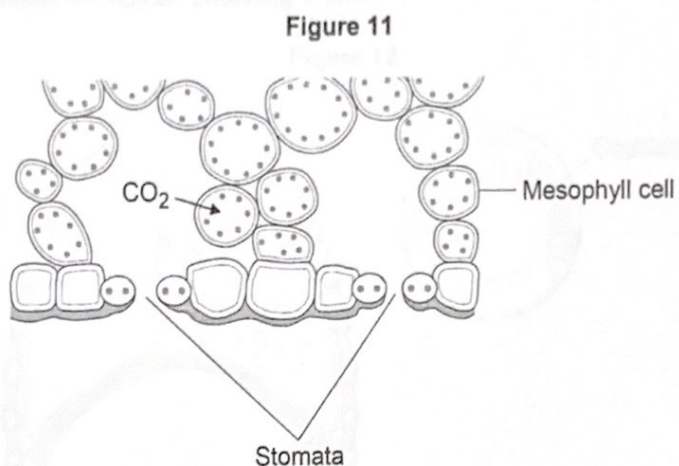
What is meant by the term diffusion?

[2 marks]

The net movement of particles from an area of high concentration to low, down a concentration gradient.



0 8 . 2 Figure 11 shows part of a leaf.



Molecules of carbon dioxide diffuse from the air into the mesophyll cells.

Which **two** changes will increase the rate at which carbon dioxide diffuses into the mesophyll cells?

[2 marks]

Tick (✓) **two** boxes.

Decreased number of chloroplasts in the cells

Decreased surface area of cells in contact with the air

Increased carbon dioxide concentration in the air

Increased number of stomata that are open

Increased oxygen concentration in the air

Question 8 continues on the next page

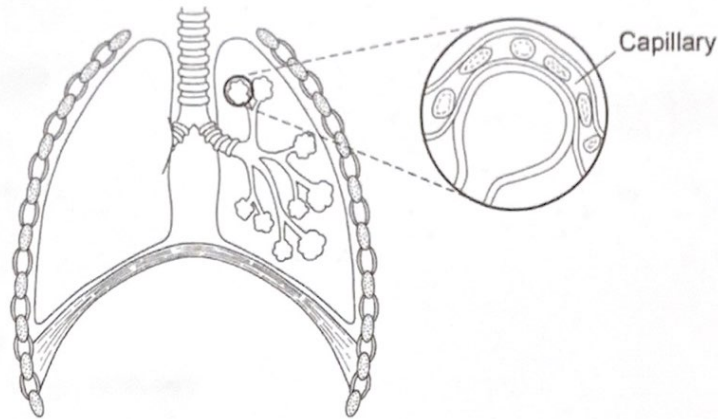
Turn over ►



0 8 . 3 Diffusion also happens in the human lungs.

Figure 12 shows the human breathing system.

Figure 12



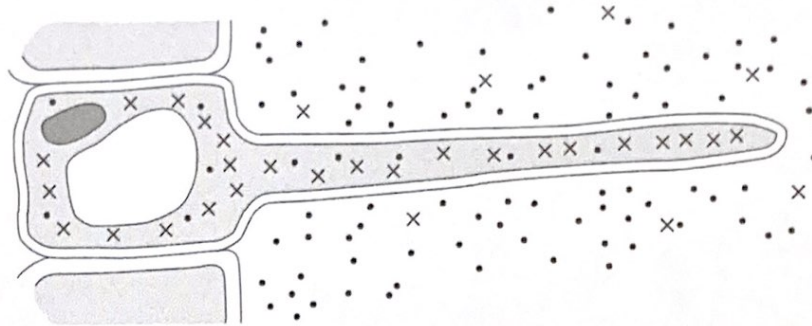
Explain how the human lungs are adapted for efficient exchange of gases by diffusion. [6 marks]

The lungs contain lots of little air sacks called alveoli that provide a large surface area for gas exchange in and out of the blood. The alveoli are surrounded by lots of capillaries and alveoli walls are very thin which provides a short diffusion path for oxygen and carbon dioxide. Breathing moves air in and ~~out~~ out, bringing in fresh oxygen and removing carbon dioxide which maintains a concentration gradient. The vast capillary network surrounding the alveoli also helps to maintain the diffusion gradient as it quickly removes oxygen from the air for use around the body and brings the waste CO_2 to the lungs quickly for exhalation.



Figure 13 shows a root hair cell.

Figure 13



Key

•• Water molecules

X X Nitrate ions

0 8 . 4 Name the process by which water molecules enter the root hair cell.

[1 mark]

osmosis

0 8 . 5 Nitrate ions need a different method of transport into the root hair cell.

Explain how the nitrate ions in **Figure 13** are transported into the root hair cell.

Use information from **Figure 13** in your answer.

[3 marks]

Name of process active transport

Explanation Energy is required to move the ions ~~area~~ up the concentration gradient from the soil where there is a lower concentration to the root hair cell where there is a higher concentration.

14

END OF QUESTIONS

