AQA

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.

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

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.

J U N 2 0 8 4 6 1 1 F 0 1

IB/M/Jun20/E25

8461/1F

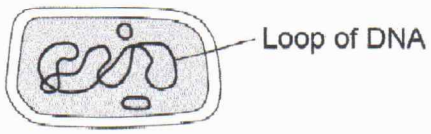
Answer **all** questions in the spaces provided.

Do not write outside the box

0 1 This question is about cells.

0 1 . 1 **Figure 1** shows a cell.

Figure 1



What type of cell is shown in **Figure 1**?

[1 mark]

Tick (✓) **one** box.

Animal ☐ – Animal cells have a centraly defined nucleus

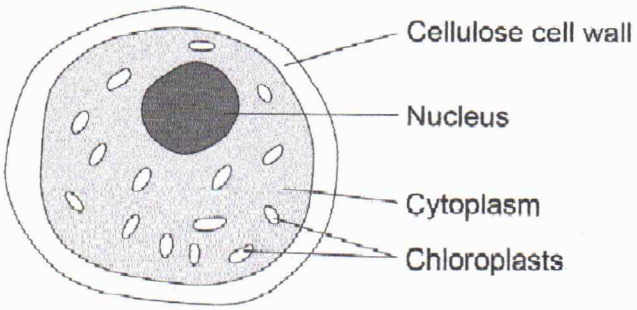
Bacterium ☑ – Bacteria has naked DNA

Plant ☐ – plant cells have a vacuole and a double envelope

Do not write outside the box

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 – nucleus ☐

To stop the chloroplasts leaking out ☐ – Cell membrane encloses organelles and regulates flow of materials into and out of cell

Cell wall – To strengthen the cell ✓

Cell wall is made of cellulose fibres that offer strength

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 – strengthens cell wall ☐

Chloroplast – green pigment ✓

Cytoplasm – fluid matrix where biochemical reactions occur ☐

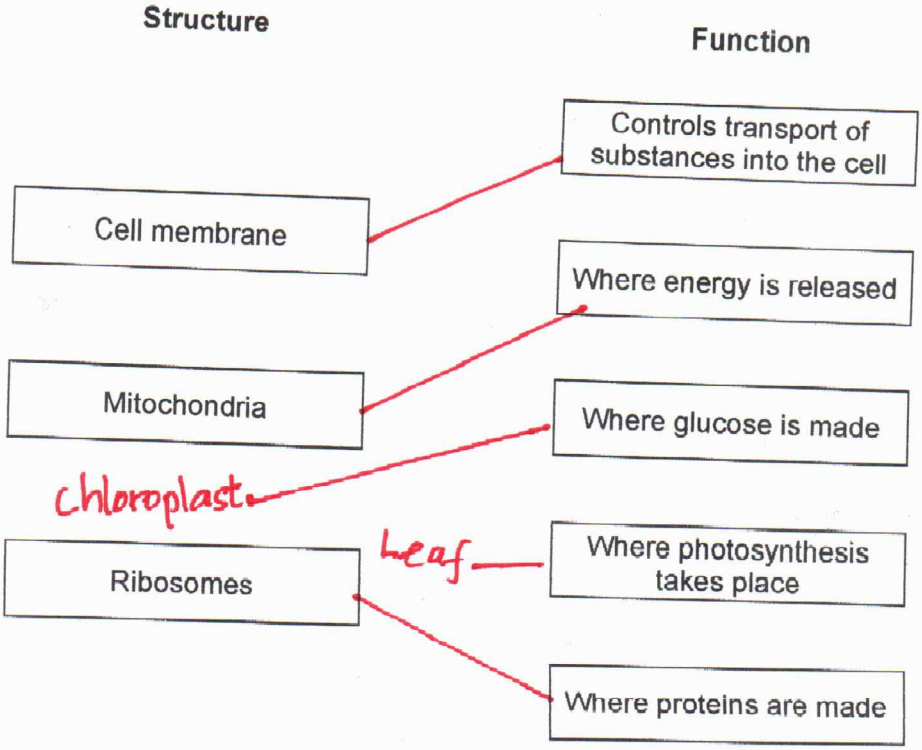
Nucleus – Contains genetic material ☐

0 1 . 4 Cells contain sub-cellular structures.

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

[3 marks]

Do not write outside the box



Do not write outside the box

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 – for better resolution ☑ ✓

Make the light dimmer – light control ☐

Put water on the slide – for cover slip to stick ☐

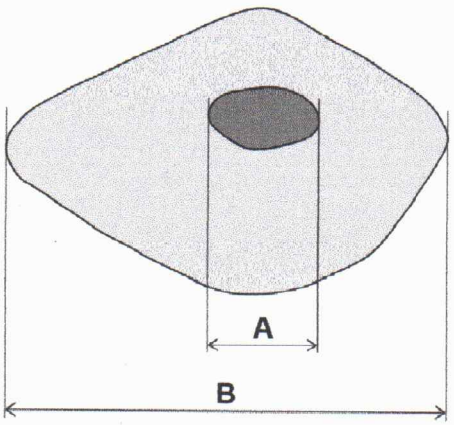
Question 1 continues on the next page

Do not write outside the box

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 = 15mm mm

B = 60 mm

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

[1 mark]

60/15 = 4 times

Number of times longer = 4

Do not write outside the box

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:

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

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

$\Rightarrow \times 400$

Magnification = × _____

12

Turn over for the next question

Do not write outside the box

0 2 This question is about cell division.

0 2 . 1 Which process makes two identical new body cells for growth and repair?

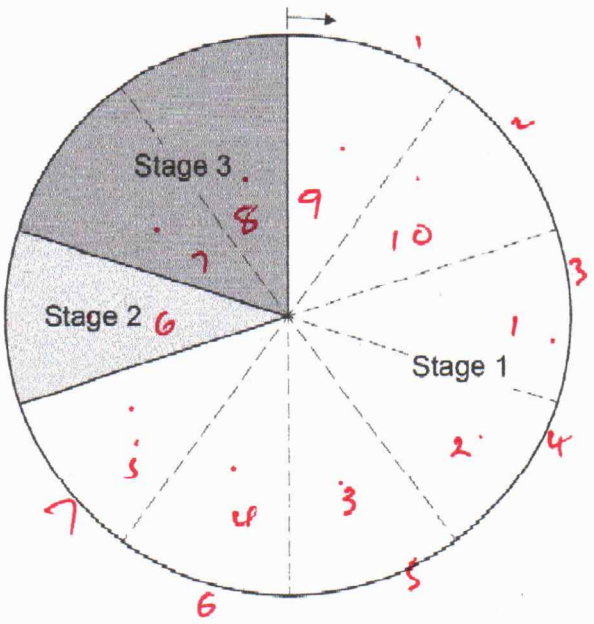
[1 mark]

Tick (✓) **one** box.

- Differentiation ☐ Differentiation – Specialisation of cells to do one role/form an organ
- Fertilisation ☐ Fertilisation – Fusion of female and male gametes
- Mitosis ☑ – Cell division where a diploid cell produces two identical cells genetically

Figure 5 shows the three stages of a cell cycle.

Figure 5



Do not write outside the box

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
Stage 1	One set of chromosomes is pulled to each end of the cell
Stage 2	The cytoplasm and cell membrane divide to form two new cells
Stage 3	The cell grows and the chromosomes replicate

0 2 . 3 What percentage of the total time for the cell cycle is taken by stage 1?

[2 marks]

$7/10 \times 100 = 70\%$

Stage 1 = 7

total sections = 10

Percentage = _____ %

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 ☐

$\frac{7}{10} \times \frac{24}{2} = 8$ cells.

Do not write outside the box

0 2 . 5 The chromosomes contain the genetic material.

Name the chemical which the genetic material is made from.

[1 mark]

DNA (Deoxyribonucleic acid)

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 ☐ - Gamete- reproductive cell

A gene ☑ - a gene codes specific protein (sequence of amino acids)

A nucleus ☐ Nucleus- contains genetic material

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 types of cells. So it will cure disease by replacing cells that are damaged by disease

10

Do not write outside the box

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]

Fungi, bacteria, protists

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. - not all air has microbes ☐

Hairs on the skin trap microorganisms. - cause disease ☐

Hydrochloric acid is produced by the stomach. ✓ HCl is chemical barrier to infection

Teeth in the mouth crush and kill microorganisms. ☐

The skin is a barrier covering the whole body. ✓ Skin - Mechanical barrier to deny pathogens entry into the body

0 3 . 3 If microorganisms enter the human body the immune system can destroy the microorganisms.

How does the immune system destroy microorganisms?

[1 mark]

Tick (✓) **one** box.

Platelets kill the microorganisms. platelets help in blood clotting ☐

Red blood cells stick to the microorganisms. Red blood cells transport oxygen ☐

White blood cells engulf the microorganisms. ✓ phagocytes engulf microorganisms

Do not write outside the box

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]

Coughs from infected persons introduce the virus into the air. Then the virus enters the air passages of healthy persons.

Question 3 continues on the next page

Do not write outside the box

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**

more spots appear

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]

on day 14 there is the highest number of spots

Incubation time = 14 days

Do not write outside the box

0 3 . 8 Suggest **one** reason why some of the children did **not** develop chickenpox.

[1 mark]

They had been vaccinated

0 3 . 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 cannot destroy viruses. A virus has no cell wall or cell membrane and so it cannot be targeted. Antibiotics only kill bacteria

11

Turn over for the next question

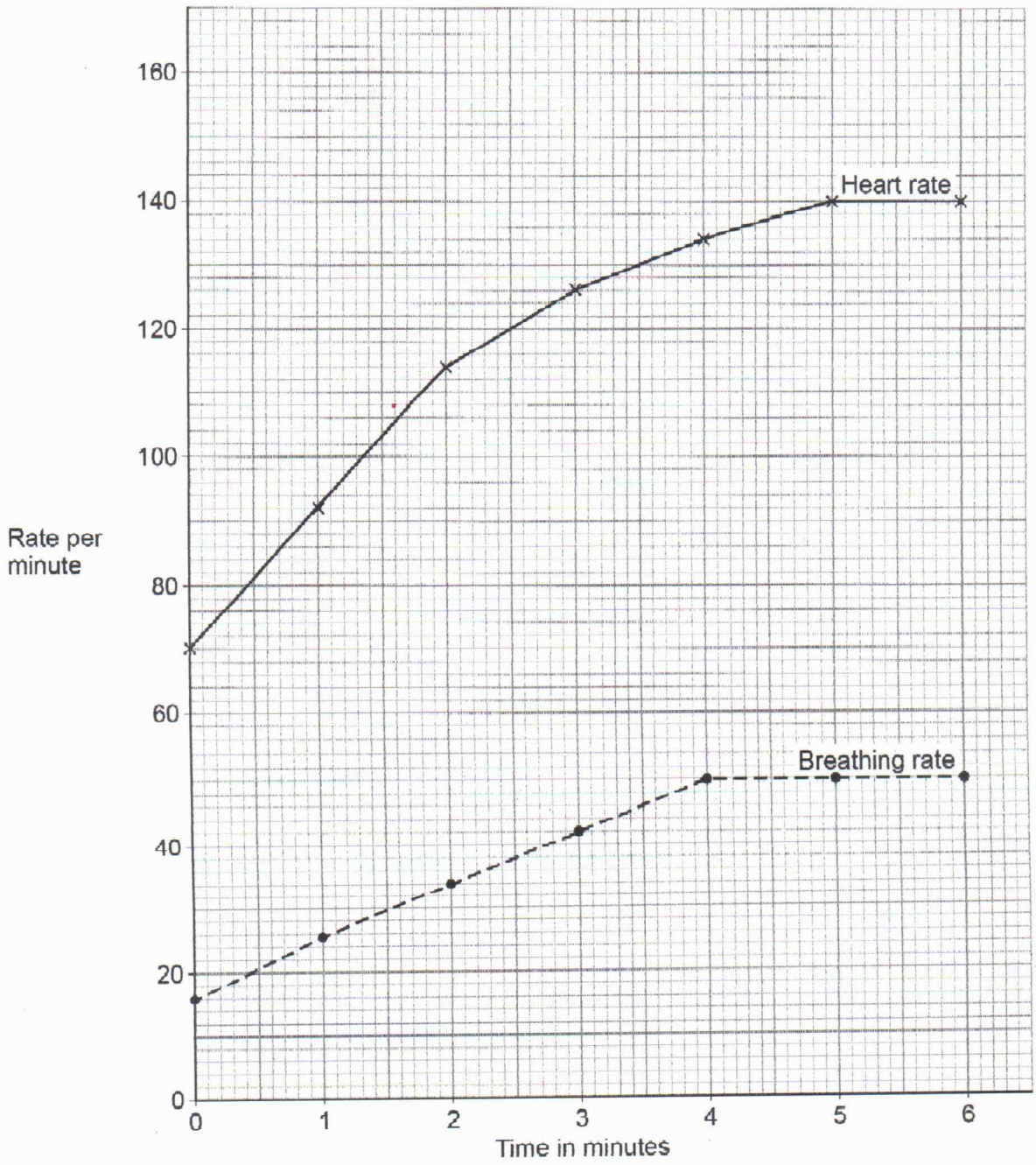
Do not write outside the box

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



Do not write outside the box

0 4 . 1 Describe the trend for breathing rate shown in **Figure 6**.

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

[3 marks]

Breathing rate increased at first from a rate of zero upto 4 then remained the constant till the 6th minute

0 4 . 2 The safe maximum heart rate for a person exercising can be calculated using the equation:

safe maximum heart rate = 220 – age in years

Calculate the safe maximum heart rate for the man.

[1 mark]

Safe maximum heart rate = 175 beats per minute

0 4 . 3 What is the man's maximum heart rate?

Use **Figure 6**.

[1 mark]

Man's maximum heart rate = 140 beats per minute

0 4 . 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]

The man's rate was lower than the maximum safe rate

Do not write outside the box

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]

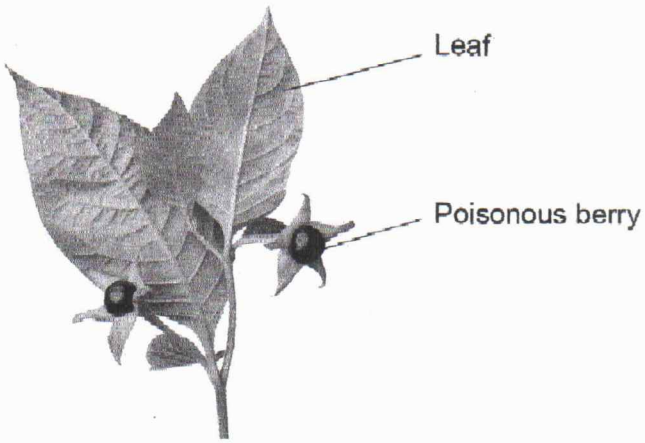
- Exercise increases heart rate. Faster heart rate increase blood flow to the lungs and muscles. This helps in delivery of oxygen to muscles and also increase removal of carbon dioxide from muscles. Oxygen is used in respiration to generate energy for the exercise. Intake of oxygen reduce accumulation of lactic acid in muscles.
- Exercise increases depth and frequency of breathing. This increase oxygen uptake and elimination of carbon dioxide.
- Respiration of glucose for energy generation takes place aerobically and anaerobically. Anaerobic respiration produces lactic acid within muscle cells. Anaerobic respiration produce less energy compared to aerobic respiration.

12

Do not write outside the box

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]

The poisonous berries stop herbivores from eating the nightshade.

0 5 . 2 Which type of defence mechanism are the berries?

[1 mark]

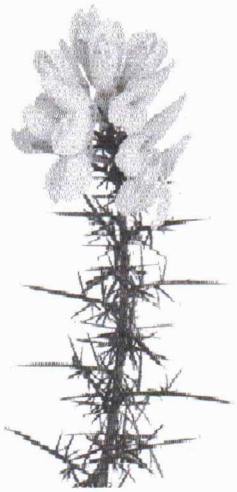
Tick (✓) **one** box.

Chemical	✓ – chemicals are toxic to the herbivores
Mechanical	
Physical	

Do not write outside the box

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]

Thorns stop herbivores from eating the gorse plant.

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 – Thorns	
For respiration	✓
To absorb water	
To release minerals	
To store as starch	✓

Glucose made by plants is converted to starch for storage or respired to produce energy.

Do not write outside the box

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]

Add drops of Benedict's solution to the liquid extract from cells. Then heat the mixture in a water-bath. If glucose is present, the colour changes from blue to orange.

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]

Nitrates are required to make amino acids, DNA and chlorophyll. The amino acids link in a sequence to form proteins. The proteins are used to make enzymes.

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]

The spores flow together with water in the soil.

Do not write outside the box

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 – package ☐
- Dosage ☑ – To know how much is required to treat patient.
- Solubility – water is main solvent ☐
- Taste – for kids only ☐
- Toxicity ☑ – Toxicity helps to understand damage the drug may cause to body organs.

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 ☐ – Drugs against bacteria
- Antibodies ☐ – produced by lymphocytes
- Painkillers ☐ – analgesic drug / pain reliever
- Placebos ☑ – an intervention that looks like a drug that is under test.

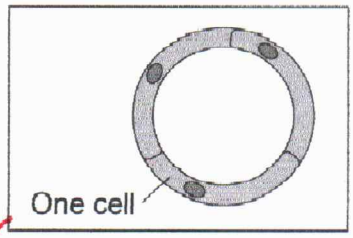
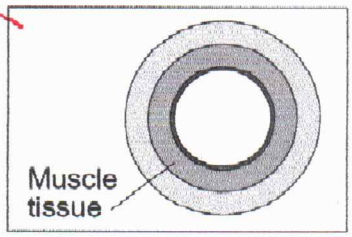
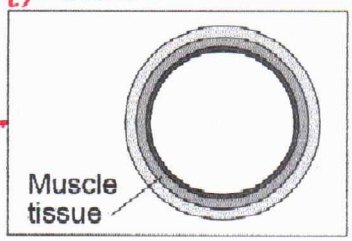
14

Do not write outside the box

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	

Blood at high pressure. So thick muscular wall withstand pressure

Thin walls allow for exchange of materials by diffusion

Wide lumen and thin muscular wall - blood at low pressure

0 6 . 2 Explain how the structure of an artery is related to its function.

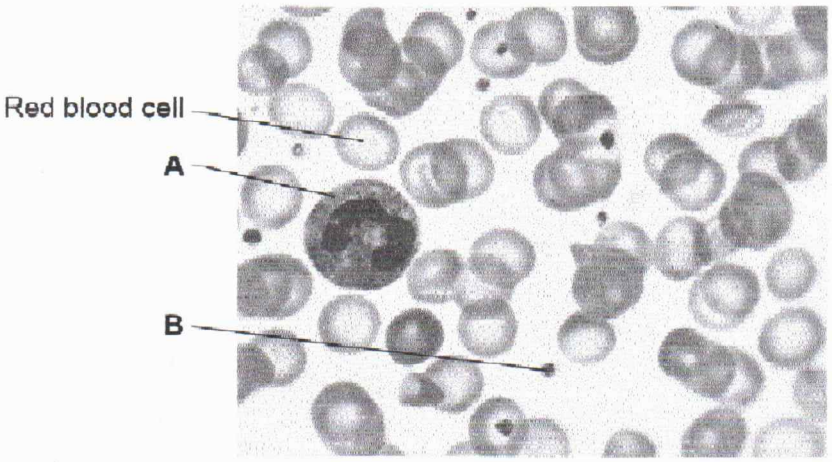
[2 marks]

The walls of the arteries have thick muscle tissue to withstand pressure. Blood flowing at the arteries is at higher pressure.

Do not write outside the box

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 cells

B Platelets

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 - This provides more space for packaging more oxygen

Haemoglobin - Haem groups in the haemoglobin bind to oxygen for easy transport from lungs to body tissues.

Do not write outside the box

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 ☐ – Fluid found in the vacuoles of plant cells

Plasma ☑ – Liquid part of blood

Saliva ☐ – Liquid secreted by salivary glands

Urine ☐ → Toxic fluid formed after filtration of waste from blood at the kidney

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 – Too low range (outlier)

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

[1 mark]

Continued bleeding because platelets are less in the blood

11

Do not write outside the box

0 7 This question is about photosynthesis.

0 7 . 1 Complete the word equation for photosynthesis.

[2 marks]

Carbon dioxide + Water —(chlorophyll, sunlight)→ Glucose + oxygen

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

[2 marks]

Light energy from the sun is trapped by chlorophyll. Then this energy is used to make glucose using water and carbon dioxide.

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

Do not write outside the box

0 7 . 3 Calculate mean value **X**. **[2 marks]**

$\frac{18.5 + 19.3 + 19.5}{3} = \frac{57.3}{3} = 19.1$

X = 19.1 cm^3/hour

The students identified one anomalous result in **Table 3**.

0 7 . 4 Draw a ring around the anomalous result in **Table 3**. **[1 mark]**

At 14.2 – rate of photosynthesis too low

0 7 . 5 Suggest **one** possible cause of the anomalous result. **[1 mark]**

- The pondweed had not acclimatised
- There was air in the syringe
- Temperature changed

0 7 . 6 How did the students deal with the anomalous result? **[1 mark]**

They did not use 14.2 in working out the mean rate of photosynthesis

0 7 . 7 Give **one** factor the students should have kept constant in this investigation. **[1 mark]**

- Light intensity
- CO_2 concentration

Do not write outside the box

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

0 7 . 8 Why did the rate of photosynthesis decrease from 35 °C to 45 °C?

[1 mark]

Enzymes are denatured at high temperatures beyond 40°C. The enzymes become denatured hence unable to catalyse reactions.

Do not write outside the box

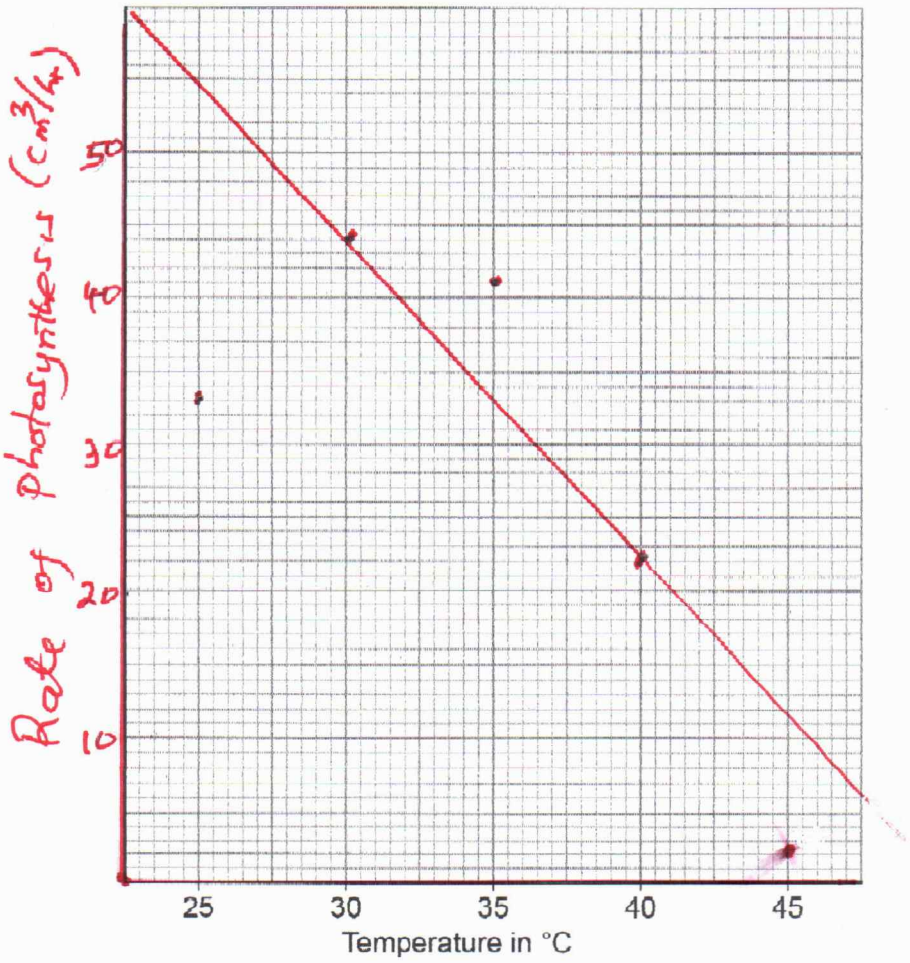
0 7 . 9 Complete **Figure 10** using data from **Table 3**.

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

Do not write outside the box

0 8 Diffusion is an important process in animals and plants.

0 8 . 1 What is meant by the term diffusion?

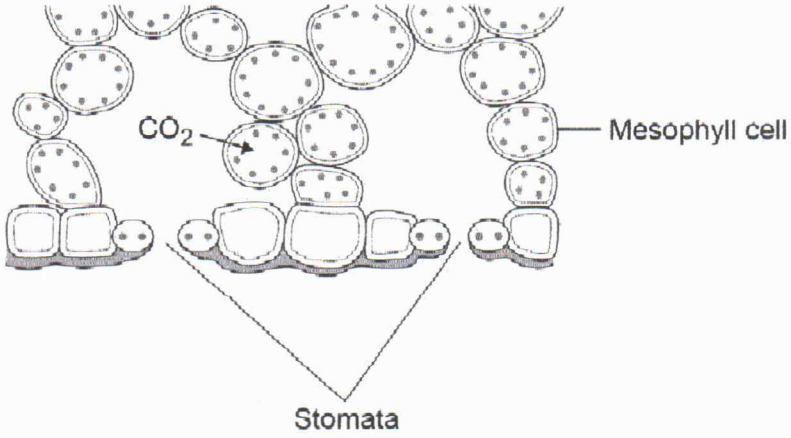
[2 marks]

Spreading of particles from region of high concentration to a region of low concentration

Do not write outside the box

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

Figure 11



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 - false ☐

Decreased surface area of cells in contact with the air - false ☐

Increased carbon dioxide concentration in the air - This allows for diffusion of CO_2 from air into the leaf ☑

Increased number of stomata that are open - Stomata are entry points of CO_2 into the leaf ☑

Increased oxygen concentration in the air - false ☐

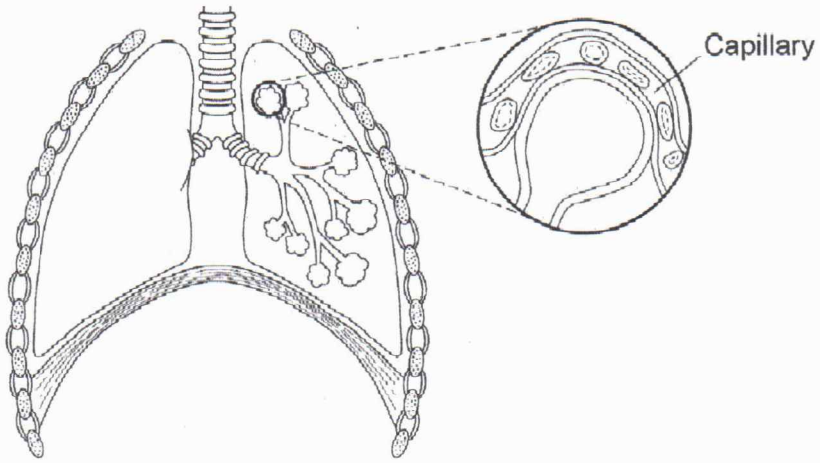
Question 8 continues on the next page

Do not write outside the box

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

Figure 12 shows the human breathing system.

Figure 12



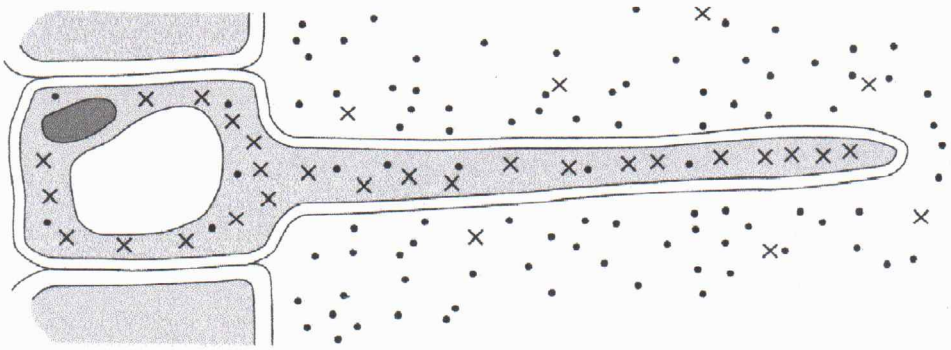
Explain how the human lungs are adapted for efficient exchange of gases by diffusion.
[6 marks]

- Many alveoli in the lungs provide a large surface area for exchange of gases.
- The alveolar walls are thin to provide short path for diffusion of gases (CO_2 and CO_2).
- The lungs has rich supply of blood capillaries. This helps to remove oxygenated blood faster and also remove CO_2 from lungs.
- Inhalation and exhalation keeps the lungs ventilated so that fresh oxygen enters lungs and CO_2 is removed.

Do not write outside the box

Figure 13 shows a root hair cell.

Figure 13



Key

Water molecules

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 Nitrates are moved into cells from region of low concentration (soil) to region of high concentration (root hair cell). This process uses energy from respiration

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END OF QUESTIONS