AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
BIOLOGY

H

Higher Tier Paper 1H

Tuesday 14 May 2019 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.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- 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	

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

Do not write outside the box

0 1 **Figure 1** shows an animal cell viewed using a microscope.

Figure 1

0 1 . 1 The cell contains a nucleus.

What is the function of the nucleus?

[1 mark]

controls the (activities of the) cell

0 1 . 2 Name **one** type of cell that does **not** contain a nucleus.

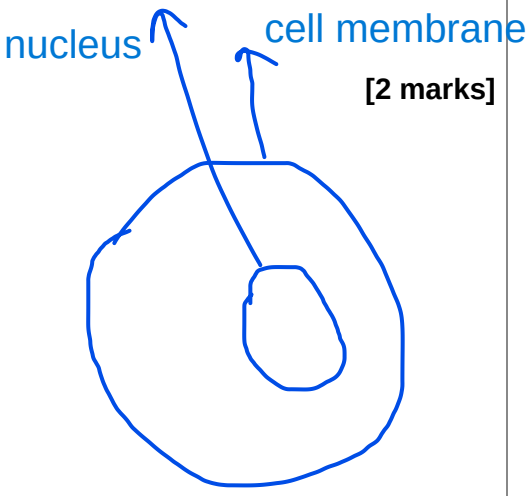
[1 mark]

red blood cell / RBC

Do not write outside the box

0 1 . 3 Draw a simple diagram of the cell in **Figure 1**.

Label **two** parts of the cell.



[2 marks]

cell shape is similar to cell in Figure 1 and nucleus present

any two features correctly identified and labelled:
- nucleus
- (cell) membrane
- cytoplasm
- mitochondria / mitochondrion
- ribosome(s)

0 1 . 4 Name **one** structure found in a plant cell but **not** found in an animal cell.

[1 mark]

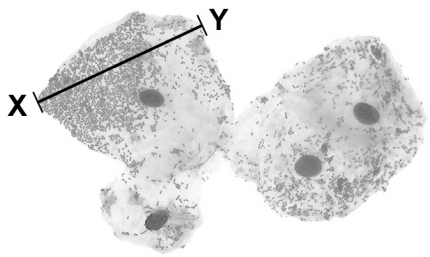
:
- (cellulose cell) wall
-

Question 1 continues on the next page

Do not write outside the box

Figure 2 shows some different cells.

Figure 2



0 1 . 5 The real length from point **X** to point **Y** is 0.06 mm

Calculate the magnification.

Use the equation:

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

[3 marks]

24 (mm) or 2.4 (cm)

$\frac{24}{0.06}$

or

$\frac{2.4}{0.06}$

Magnification = × (×) 400

Do not write outside the box

0 1 . 6 The cells shown in **Figure 2** were viewed using a light microscope.

Give **two** advantages of using an electron microscope instead of a light microscope.

[2 marks]

1 high(er) magnification

2 high(er) resolution or high(er) resolving power

10

Turn over for the next question

Do not write outside the box

0 2 Mosquitoes carry a pathogen that causes malaria.

0 2 . 1 What type of pathogen causes malaria?

[1 mark]

Tick (✓) **one** box.

A bacterium ☐

A fungus ☐

A protist ☑

A virus ☐

Mosquito nets can help prevent the spread of malaria.

Table 1 shows the results of a study in one area of Africa.

Table 1

Total number of people in the study	Number of people who use mosquito nets when sleeping	Percentage of people with malaria	
		Who use mosquito nets when sleeping	Who do NOT use mosquito nets when sleeping
476	426	1.2	40

A newspaper made the following statement:

‘Study shows mosquito nets are scientifically proven to prevent malaria.’

0 2 . 2 Give **one** piece of evidence that supports the statement.

[1 mark]

lower percentage of people with malaria when using (mosquito) nets

Do not write outside the box

0 2 . 3 Suggest **one** reason why the statement may **not** be valid.

[1 mark]

some people who use (mosquito) nets have malaria

Table 2 shows information about the number of deaths from malaria in the same area of Africa.

Table 2

Year	Number of deaths from malaria per 100 000 people
2005	161
2007	136
2009	114
2011	97
2013	94
2015	92

0 2 . 4 Predict the number of people per 100 000 who died from malaria in 2017 if the trend stayed the same.

[1 mark]

any value between 88 to 91

Number of people per 100 000 = _____

0 2 . 5 Use of mosquito nets has helped to reduce the number of deaths from malaria each year.

Suggest **one** other reason for the reduced number of deaths from malaria each year.

[1 mark]

improved health care

Do not write outside the box

0 2 . 6 Describe how the human body:

- prevents pathogens from entering
- defends itself against pathogens inside the body.

[6 marks]

prevents pathogens from entering

skin

- tough / dry / dead outer layer
- skin acts as a barrier
- sebum / oil on (surface of) skin
- sebum / oil repels pathogens
- scabs form over cuts or scabs form a barrier
- platelets are involved in forming clots / scab stomach
- contains (hydrochloric) acid
- (HCl) kills bacteria
- in food or in swallowed mucus eyes
- produce tears
- contains enzymes to kill bacteria
- tears are antiseptic

breathing system

- trachea / bronchi / nose produce mucus
- mucus is sticky
- (mucus) traps bacteria
- (mucus) carried away by cilia

defends itself against pathogens inside the body

- immune system / white blood cells (WBCs)
- WBCs engulf pathogens
- antitoxins are produced
- (antitoxins) neutralise toxins / poisons (produced by pathogen)
- antibodies are produced
- (antibodies) help destroy pathogens
- memory cells (are formed)
- (memory cells give a) more rapid response if pathogen re-enters

11

Do not write outside the box

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

0 3 This question is about photosynthesis.

0 3 . 1 Complete the word equation for photosynthesis:

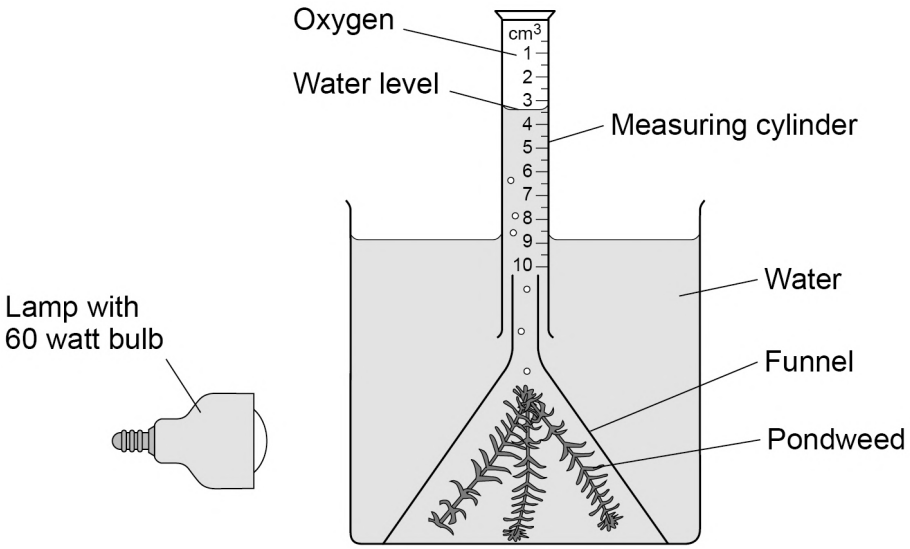
[2 marks]

carbon dioxide + water → glucose + oxygen

A student investigated photosynthesis using pondweed.

Figure 3 shows the apparatus the student used.

Figure 3



This is the method used.

1. Set up the apparatus as shown in **Figure 3**.
2. Switch on the lamp.
3. After 20 minutes, record the volume of oxygen collected in the measuring cylinder.
4. Repeat steps 1–3 using bulbs of different power output.

Do not write outside the box

0 3 . 2 What was the independent variable in the investigation?

[1 mark]

Tick (✓) **one** box.

- Power output of bulb ✓
- Rate of photosynthesis
- Time to collect oxygen
- Volume of oxygen collected

0 3 . 3 Suggest **two** ways the method could be improved so the results would be more valid.

[2 marks]

1 repeat and calculate a mean or repeat and to eliminate anomalies

2 • control the (water) temperature

Question 3 continues on the next page

Do not write outside the box

Table 3 shows the student's results.

Table 3

Power output of bulb in watts	Volume of oxygen collected in 20 minutes in cm^3	Rate of photosynthesis in cm^3/hour
60	0.5	1.5
100	0.8	2.4
150	1.1	**X**
200	1.2	3.6
250	1.2	3.6

0 3 . 4 Calculate value **X** in **Table 3**.

[1 mark]

3.3 (cm3/hour)

X = _____ cm^3/hour

Do not write outside the box

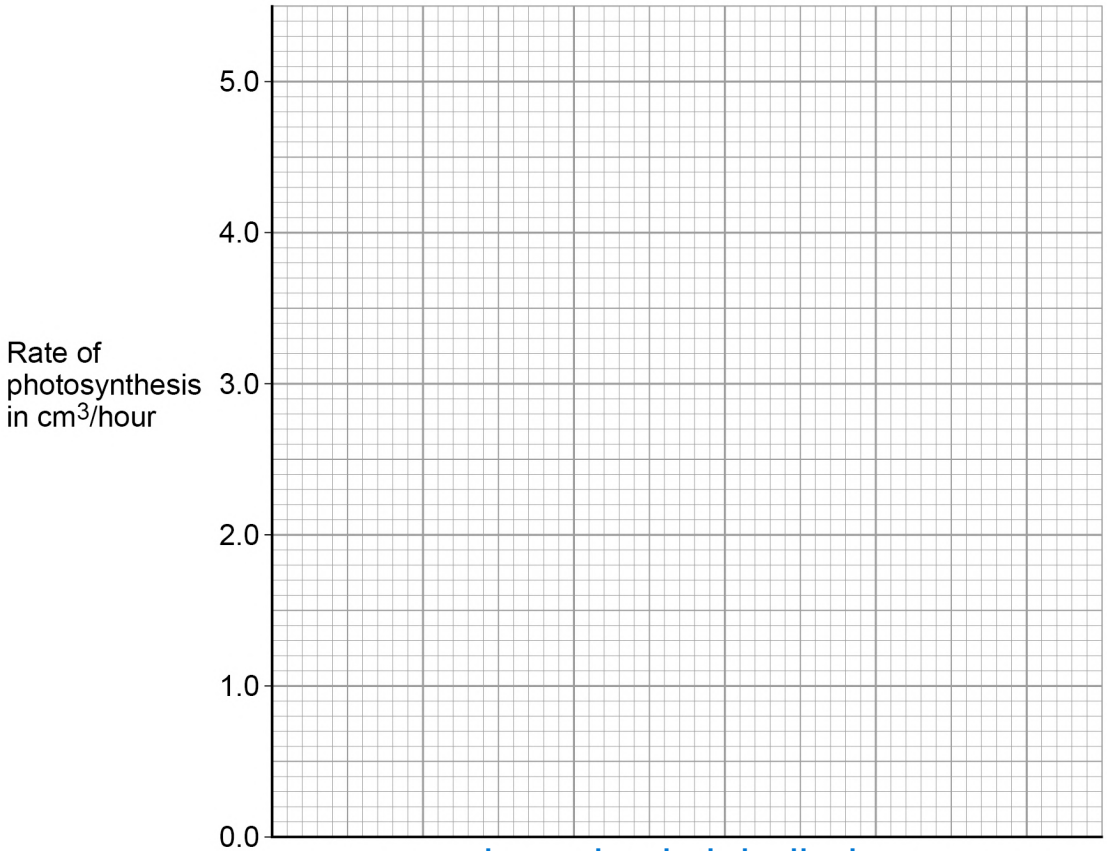
0 3 . 5 Complete **Figure 4**.

[4 marks]

You should:

- label the x-axis
- use a suitable scale
- plot the data from **Table 3** and your answer to Question **03.4**
- draw a line of best fit.

Figure 4



correct scale and axis labelled
all points plotted correctly
correct curved line of best fit

0 3 . 6 Determine the expected rate of photosynthesis with a bulb of power output 75 watts.

Use **Figure 4**.

[1 mark]

correct answer from their line drawn on Figure 4

Rate of photosynthesis at 75 watts = _____ cm^3/hour

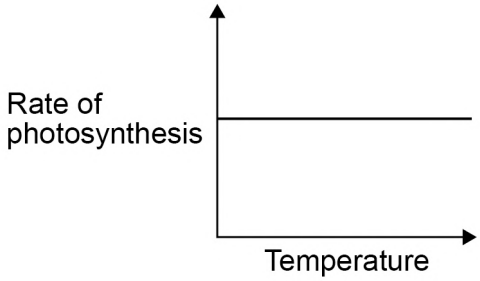
Turn over ►

Do not write outside the box

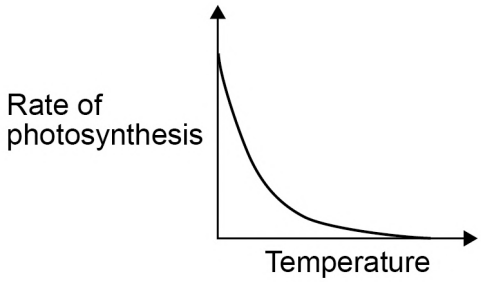
0 3 . 7 Which graph shows the effect of temperature on the rate of photosynthesis?

[1 mark]

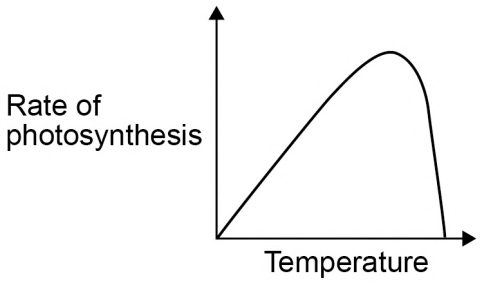
Tick (✓) **one** box.



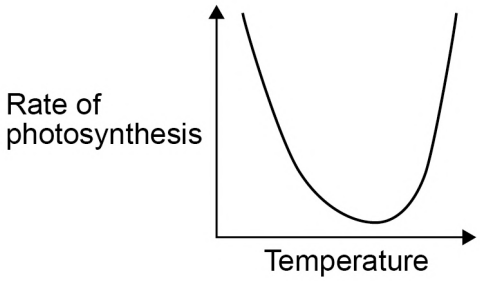
☐



☐



☑



☐

12

Do not write outside the box

0 4 Water moves from a plant to the atmosphere through the leaves.

0 4 . 1 How is the volume of water lost from the leaves controlled?

[1 mark]

(by the guard cells) opening and closing the stomata

0 4 . 2 Describe the transport of water through a plant from the roots to the atmosphere.

[3 marks]

(water is) transported in xylem

water evaporates (from leaves)

through the stomata

Question 4 continues on the next page

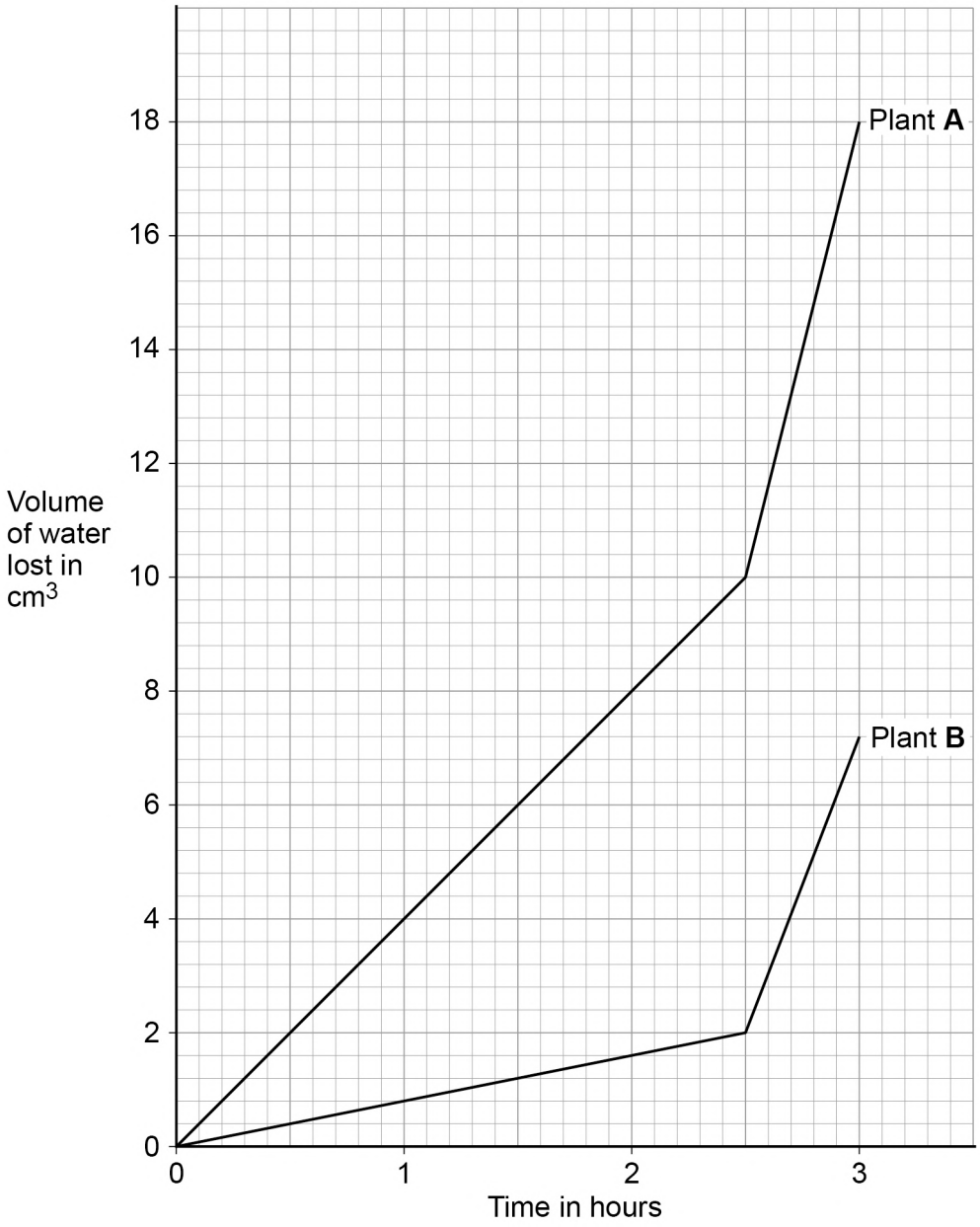
Do not write outside the box

A student investigated the volume of water lost from two plants of different species.

Both plants were kept together.

Figure 5 shows the student's results.

Figure 5



Do not write outside the box

0 4 . 3 Suggest **one** reason for the difference in the rate of water loss from the two plants in the first 2.5 hours.

[1 mark]

plant A has more stomata

Both plants were moved to a different place at 2.5 hours.

0 4 . 4 Calculate the rate of water loss per hour in plant **B** from 2.5 hours to 3 hours.

Give your answer to **2** significant figures.

[3 marks]

5.2

(5.2 × 2 =) 10.4

or

$\frac{5.2}{0.5}$ =10.4

Rate of water loss = 10 cm^3/hour

0 4 . 5 Suggest **two** reasons why the rate of water loss in both plants changed after 2.5 hours.

[2 marks]

1 (rate increased because)

any two from:

2 • (it was) warmer

• light intensity was higher

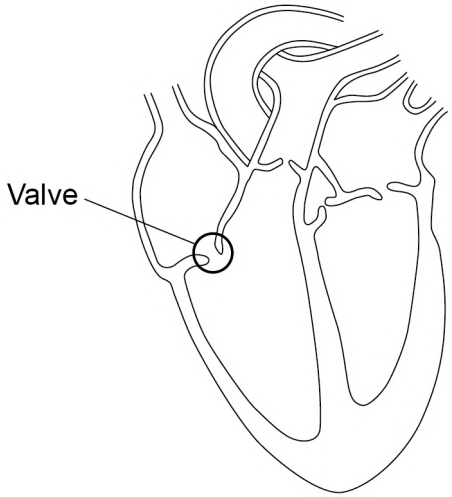
10

Do not write outside the box

0 5 **Figure 6** shows the internal structure of the human heart.

One of the heart valves is labelled.

Figure 6



Sometimes a valve in the heart can start to leak.

0 5 . 1 Explain why a person with a leaking heart valve has difficulty exercising.

[4 marks]

Indicative content:

- backflow can occur or some blood flows backwards
- less blood leaves the heart or less blood is pumped around the body or some blood stays in the heart (instead of being pumped out) or reduced blood pressure or reduced flow rate
- less oxygen supplied to muscles / cells
- (so) less aerobic respiration
- (so) less energy released
- (so) less (efficient) muscle contraction
- anaerobic respiration takes place
- less (efficient) removal of lactic acid or lactic acid builds up or oxygen debt occurs
- (lactic acid building up) causes muscle fatigue
- less (efficient) removal of carbon dioxide (from blood)

Do not write outside the box

Question 5 continues on the next page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

A patient with a leaking heart valve may have the valve replaced.

A study compared two different types of replacement heart valve:

- mechanical valves
- biological valves from pigs.

The data used in the study was collected from female patients aged 50–69.

Table 4 shows the data.

Table 4

	Type of replacement heart valve	
	Mechanical	**Biological**
Number of patients given the valve	2852	1754
Number of patients who died from heart-related problems after valve replacement	180	178
Percentage of patients alive after 5 years	91	89
Percentage of patients needing a second valve replacement within 6 years	2.2	5.2
Percentage of patients who had a blood clot on the brain after surgery	5.8	0.1

0 5 . 2 Give **one** conclusion about the death of patients from heart-related problems after a valve replacement.

Include calculations to support your answer.

[3 marks]

(deaths mechanical valve =)
6% / 6.31136%

(deaths biological valve =)
10% / 10.14823%

(therefore a) higher proportion /
percentage of patients die with biological valve

Do not write outside the box

0 5 . 3 One risk of mechanical valves is that blood clots can form on the surface of the valve.

Name the component of the blood that starts the process of blood clotting.

[1 mark]

platelets

0 5 . 4 Evaluate the use of mechanical replacement heart valves and biological replacement heart valves.

Use information from **Table 4** and your own knowledge.

[6 marks]

Indicative content:

mechanical valves
• longer lasting or more durable or don't wear out as easily or less likely to need replacing (within 6 years)
• blood clots (on the brain) are more likely (after surgery)
• patient has to take anti-clotting medication (for the rest of their lives)
• if medication not taken (correctly), clots can lead to blood clots
on brain / heart attack
• medication can lead to excessive bleeding (after injury)
• some patients say they can hear the valves opening and closing
• survival rate at 5 years is slightly higher for mechanical valve
• lower percentage of deaths due to heart-related problems

biological valves
• no additional medication required
• ethical issues surrounding use of animal tissue
• valve may harden
• more likely to need further operation or another new valve
• more likely to be rejected
• more likely to need (immuno-suppressant) medication

both valves
• both are readily available
• little wait time

14

Do not write outside the box

0 6 People with diabetes have difficulty controlling their blood glucose concentration.

0 6 . 1 Which part of the blood transports glucose?

[1 mark]

Tick (✓) **one** box.

- Lymphocytes ☐
- Plasma ☑
- Platelets ☐
- Red blood cells ☐

Glucose is often found in the urine of people with diabetes.

0 6 . 2 Name a chemical used to test for glucose.

[1 mark]

Benedict's (reagent / solution)

0 6 . 3 Describe a test that could be used to show that a person's urine contains glucose.

[2 marks]

Test add chemical / Benedict's (reagent to urine) and boil / heat

Positive result (colour changes from blue to brick) red

Do not write outside the box

0 6 . 4 The body cells of a person with untreated diabetes lose more water than the body cells of a person who does **not** have diabetes.

Explain how diabetes can cause the body cells to lose more water.

[3 marks]

the blood is more concentrated
or less dilute (than the solution in the cells)

(so) water moves out of cells by
osmosis

water moves through a partially
permeable membrane

0 6 . 5 Glucose is absorbed into the blood in the small intestine by both diffusion and active transport.

Describe how the small intestine is adapted for efficient absorption.

[5 marks]

projections / folds / villi provide a
large surface area

walls of projections / folds / villi /
capillaries are thin / one cell
thick for shorter absorption /
diffusion distance

(small intestine is) very long,
increasing time (for absorption)

good / efficient blood supply to maintain concentration gradient

cells have many mitochondria for (aerobic) respiration for
active transport

12

Do not write outside the box

0 7 A small animal called an axolotl lives in water. The axolotl has a double circulatory system.

0 7 . 1 Define the term double circulatory system.

[1 mark]

blood is pumped to the lungs by one / right side of the heart

Figure 7 shows the double circulatory system of the axolotl.

Figure 7

The following figure cannot be reproduced here due to third-party copyright restrictions.

0 7 . 2 The heart of the axolotl has only one ventricle.

Label the ventricle on **Figure 7**.

[1 mark]

ventricle correctly identified as any part of grey area below:

Do not write outside the box

0 7 . 3 Explain why having only one ventricle makes the circulatory system less efficient than having two ventricles.

[2 marks]

oxygenated and deoxygenated blood mixes

(so) less oxygen reaches the body / tissues / cells

Figure 8 shows an axolotl.

Figure 8

0 7 . 4 Explain why an axolotl may die in water with a low concentration of oxygen.

[4 marks]

concentration gradient (of oxygen) is shallow(er) / less steep

(therefore) less oxygen diffuses into blood / cells / gills

(so) less (aerobic) respiration

occurs so less energy is released / available

or

(so more) anaerobic respiration occurs so less energy is released / available

(so) less metabolism

Do not write outside the box

If a gill of an axolotl is removed, a new gill will grow in its place.

Scientists hope to use information on how axolotls grow new gills to help with regenerating human tissue.

0 7 . 5 Name the type of cell that divides when a new gill grows.

[1 mark]

stem (cells)

0 7 . 6 Name **one** condition that could be treated using regenerated human tissue.

[1 mark]

any one from:
- paralysis
- diabetes

0 7 . 7 Suggest **one** reason why an axolotl is a suitable animal for research in the laboratory.

[1 mark]

easy to breed

0 7 . 8 An axolotl may **not** be a suitable animal to study when researching regeneration in human tissue.

Suggest **one** reason why.

[1 mark]

it's not a mammal or it is an amphibian

12

Do not write outside the box

0 8 Pancreatic cancer develops when a malignant tumour grows inside the pancreas.

0 8 . 1 The pancreas produces digestive enzymes.

What is an enzymes?

[2 marks]

(chemical which) catalyses /
speeds up biological reactions

idea of specificity

0 8 . 2 Carbohydrase is an enzyme produced by the pancreas.

Name **two** other organs in the digestive system that produce carbohydrase.

[2 marks]

1 salivary gland

2 small intestine

0 8 . 3 One symptom of pancreatic cancer is weight loss.

Explain how pancreatic cancer may cause a person to lose weight.

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

[4 marks]

reduced / no enzyme production / release (from pancreas)

food is not broken down fully or food is not digested fully

plus any one of the following routes for max 2 marks:

less glucose / sugar absorbed or less glucose / sugar passes into the blood(stream)

(so) less glucose available for respiration so more (body / stored) fat used up in metabolism / respiration

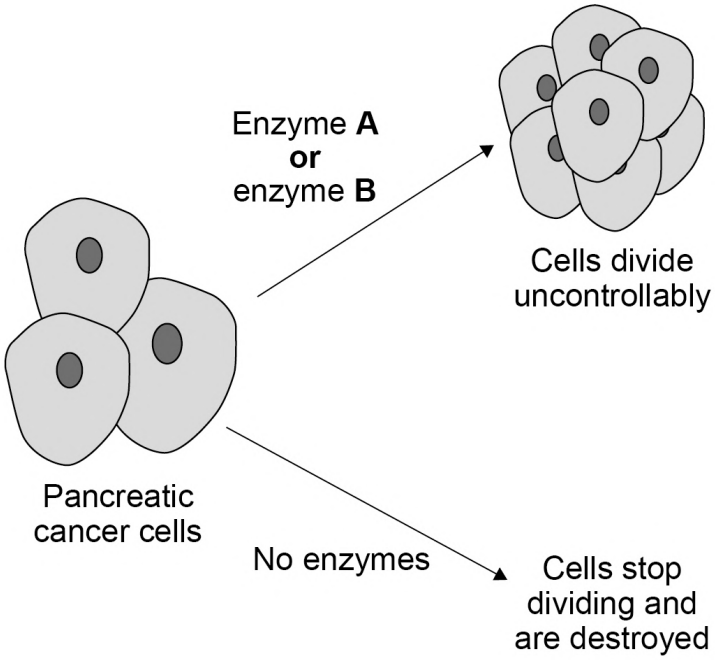
Enzyme **A** and enzyme **B** are involved in controlling cell division in pancreatic cancer cells.

Most cancer cells produce both enzyme **A** and enzyme **B**.

Some people have a gene mutation that stops cancer cells producing enzyme **B**.

Figure 9 shows how cell division is controlled in pancreatic cancer cells.

Figure 9



Do not write outside the box

Scientists have developed a drug that inhibits enzyme **A**.

The drug is given to pancreatic cancer patients who have the gene mutation that stops cancer cells producing enzyme **B**.

The drug only targets cancer cells.

0 8 . 4 Explain why the drug can be used to treat pancreatic cancer in patients with the gene mutation.

Use information from **Figure 9**.

[3 marks]

(cancer) cells cannot divide
or (cancer) cells are destroyed / killed

(so) tumour doesn't grow / get bigger or tumour less likely to spread or tumour less likely to form secondary tumours

(because) enzymes A and B are not working / active / effective / present

0 8 . 5 Explain why the drug could **not** be used to treat pancreatic cancer in a patient that produces both enzyme **A** and enzyme **B**.

[2 marks]

(functional) enzyme B would still be made / present

(therefore cancer) cells would still divide uncontrollably

Question 8 continues on the next page

Do not write outside the box

0 8 . 6 The drug was trialled before it was licensed for use.

To improve validity of the results in the trial:

- some patients were given a placebo
- a double-blind trial was used.

Give reasons why a placebo and a double-blind trial were used.

[2 marks]

A placebo to avoid the patients thinking they feel better with the drug

A double-blind trial

• to avoid bias(ed results)

0 8 . 7 One stage in a drug trial is to test the drug on healthy volunteers.

What is the next stage in the drug trial?

[1 mark]

Tick (✓) **one** box.

Testing on all patients with the disease ☐

Testing on human tissue ☐

Testing on live animals ☐

Testing on volunteers with the disease ☑

Do not write outside the box

0 8 . 8 A monoclonal antibody has been produced to treat pancreatic cancer.

Explain how the monoclonal antibody works to treat pancreatic cancer.

[3 marks]

monoclonal antibody is attached to radioactive substance / toxin / drug / chemical

monoclonal antibody will (only) attach to / target (antigen on) cancer cells / tumour

(so) radioactive substance / toxin / drug / chemical will (bind to cancer cells and) stop them growing / dividing

19

END OF QUESTIONS

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED