Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number	Candidate Number

Time 1 hour 45 minutes

Paper reference **1BI0/2F**

Biology
PAPER 2
Foundation Tier

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- In questions marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- Good luck with your examination.

Turn over ▶

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P 6 7 0 6 5 A 0 1 3 2

Pearson

Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 Figure 1 shows human blood seen using a light microscope.

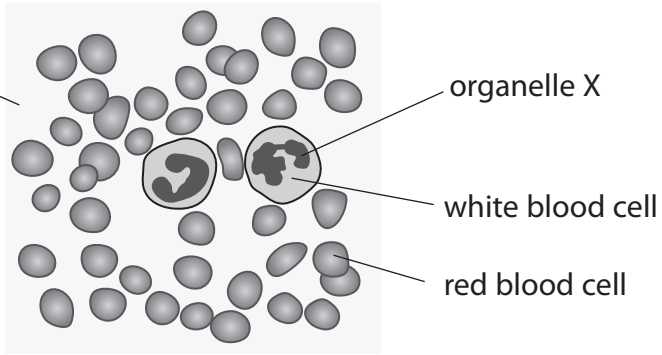

Figure 1

(a) (i) The organelle labelled X controls the activities of the white blood cell.

What is the name of organelle X?

(1)

☒ **A** mitochondrion

☒ **B** ribosome

☒ **C** chromosome

☒ **D** nucleus

(ii) Use words from the box to complete the sentences.

(2)

gas	haemoglobin	hormone
liquid	platelet	solid

Red blood cells contain the substance haemoglobin (1).

Blood plasma is a liquid (1).

(iii) Describe **two** ways that white blood cells protect the body from disease.

(2)

1 make antibodies

2 • {surround / engulf / digest} {pathogens / bacteria / viruses

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(b) Figure 2 shows a white blood cell on a 100 μm scale.

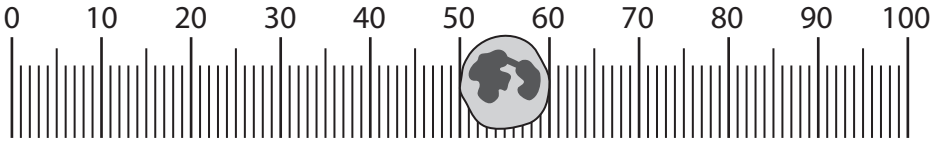

Figure 2

State the width of the white blood cell.

(1)

10 (μm)

..... μm

(c) Figure 1 shows human blood seen using a light microscope.

Explain why using an electron microscope shows the structures in the white blood cells more clearly.

(2)

greater resolution (1)

• so greater magnification is possible (1)

(Total for Question 1 = 8 marks)

2 (a) There are three levels of organisation in an ecosystem.

Which order shows the levels of organisation from lowest to highest?

(1)

- ☒ **A** community, population, organism
- ☒ **B** community, organism, population
- ☒ **C** organism, community, population
- ☒ **D** organism, population, community

(b) Figure 3 shows food webs for two gardens.

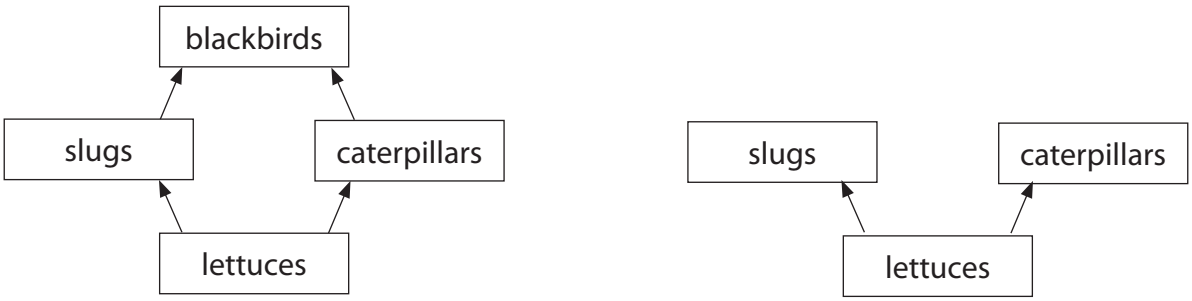

Figure 3

Slug pellets are put on the soil around the lettuce plants in garden A and garden B.

Slug pellets kill slugs.

(i) A scientist predicts that the number of caterpillars will decrease in garden A.

Give **one** reason why the number of caterpillars will decrease in garden A.

(1)

The blackbirds will be eating more caterpillars (because there are fewer slugs)

(ii) The scientist predicts that the number of caterpillars will increase in garden B.

Give **one** reason why the number of caterpillars will increase in garden B.

(1)

There will be more {food / lettuce} for the caterpillars to eat (because there are fewer slugs eating the lettuce)

(iii) Figure 4 shows the population of slugs in garden A for five years.

Slug pellets were used during the first year.

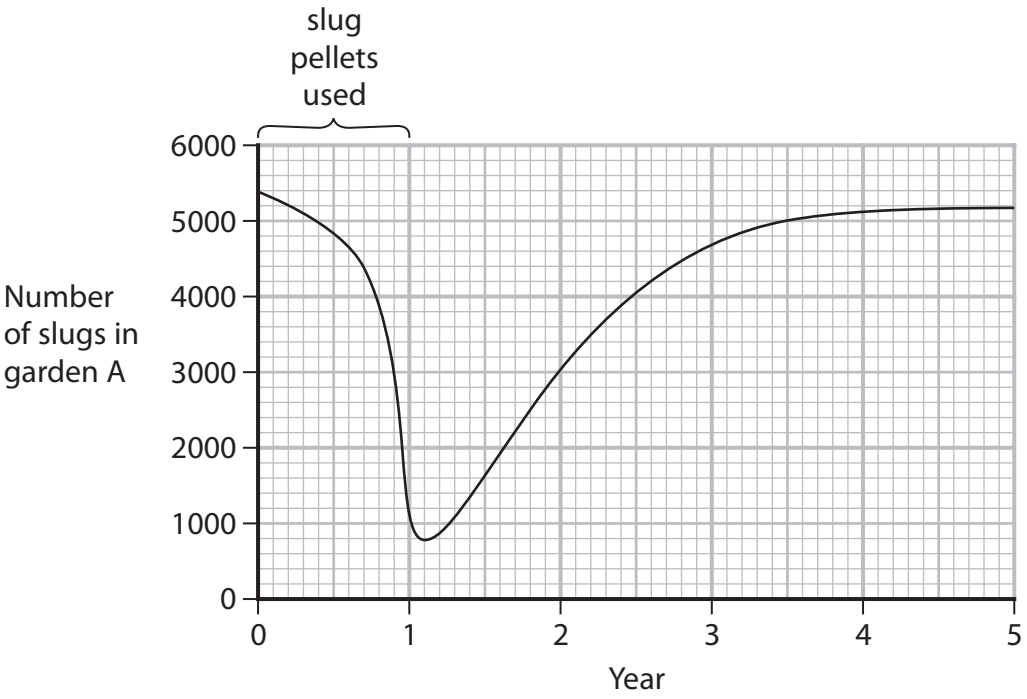

Figure 4

Describe the trend in the slug population from year 1 to year 5.

(2)

falls a little (1)

• (then) increases (1)

(c) (i) Flatworms from New Zealand that eat slugs are now living in the UK.

Which term describes a species from one country that is living in another country?

(1)

☒ **A** pathogenic

☒ **B** non-pathogenic

☒ **C** indigenous

☒ **D** non-indigenous

(ii) Figure 5 shows tiny white animals called mites on the skin of a slug.

The mites feed on blood.

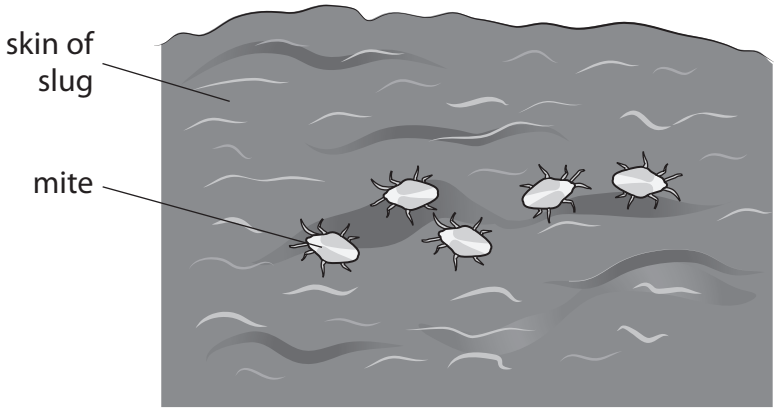

Figure 5

Explain why these mites are classed as parasites.

(2)

parasites live in / on their host (1)

• parasites feed off their host (1)

(Total for Question 2 = 8 marks)

3 A student investigated fish food.

(a) The student added some fish food to a blue liquid in a test tube.

The solution turned from blue to purple.

(i) Use words from the box to complete the sentences.

(2)

ethanol	Biuret	fat
iodine	protein	starch

The blue liquid was Biuret (1) solution.

The purple colour showed that the fish food contained protein (1).

(ii) The blue solution may be harmful if swallowed.

Which procedure is a health and safety precaution needed for this investigation?

(1)

- ☒ **A** use a new test tube
- ☒ **B** wipe up any spilt liquids
- ☒ **C** measure the volume of the solutions
- ☒ **D** use a heat proof mat

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(b) Fish eat fish food.

The fish food contains energy.

Some of this energy is used by the fish for growth.

Figure 6 shows this energy transfer.

Each square in Figure 6 represents 1 kJ of energy.

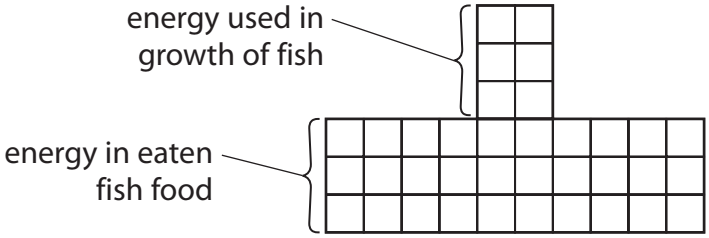


Figure 6

(i) Calculate the percentage of energy from the fish food that has been used in the growth of fish.

(2)

data
6(kJ) and 30(kJ) (1)

evaluation
6 ÷ 30 X 100 = 20 (%)

..... %

(ii) Describe what happened to the fish food that was eaten but was not used in the growth of the fish.

(2)

it is egested (1)

• used in respiration / for energy (1)

(Total for Question 3 = 7 marks)

4 (a) Endocrine glands make hormones.

Which endocrine gland is situated in the head and is attached to the brain?

(1)

- ☒ **A** adrenal
- ☒ **B** pancreas
- ☒ **C** pituitary
- ☒ **D** thyroid

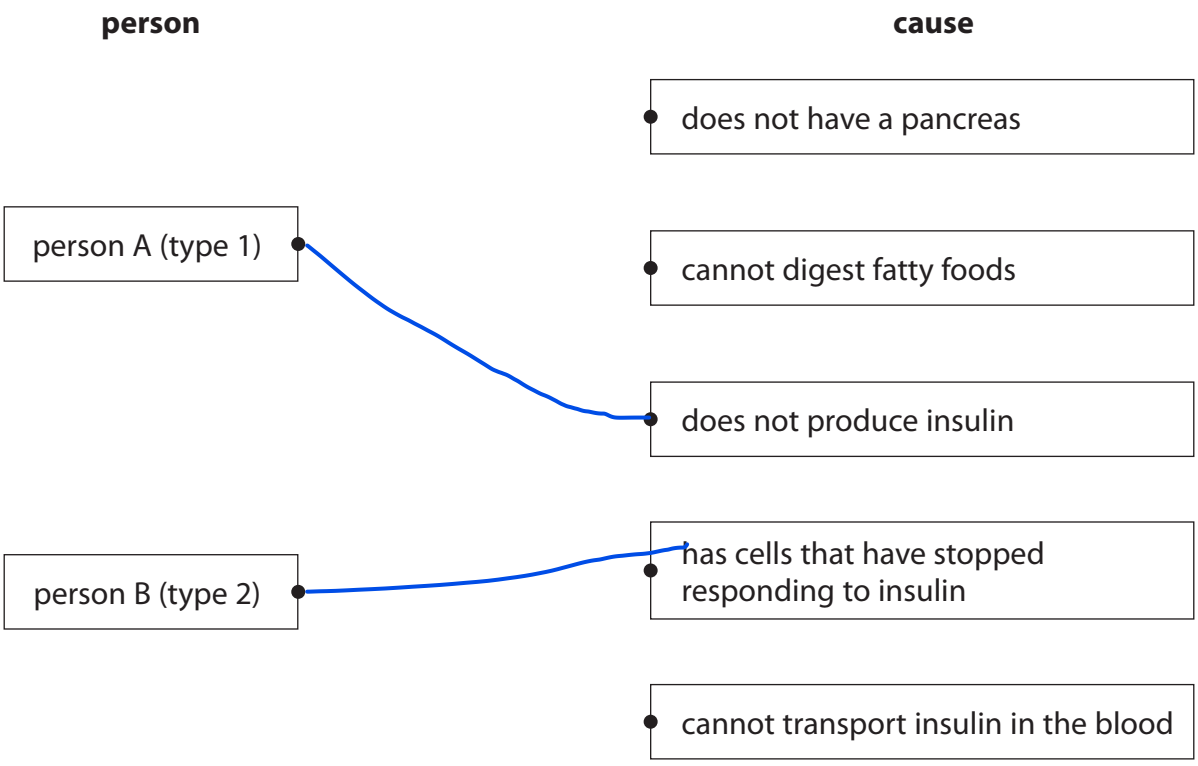
Diabetics cannot effectively control the concentration of glucose in their blood.

(b) Person A has type 1 diabetes.

Person B has type 2 diabetes.

Draw one straight line from each person to the cause of their type of diabetes.

(2)



(c) A scientist investigated how the waist to hip ratio affected the probability of developing type 2 diabetes.

The scientist chose 100 females in each of five waist to hip ratio groups and recorded if they developed type 2 diabetes.

Figure 7 shows the results.

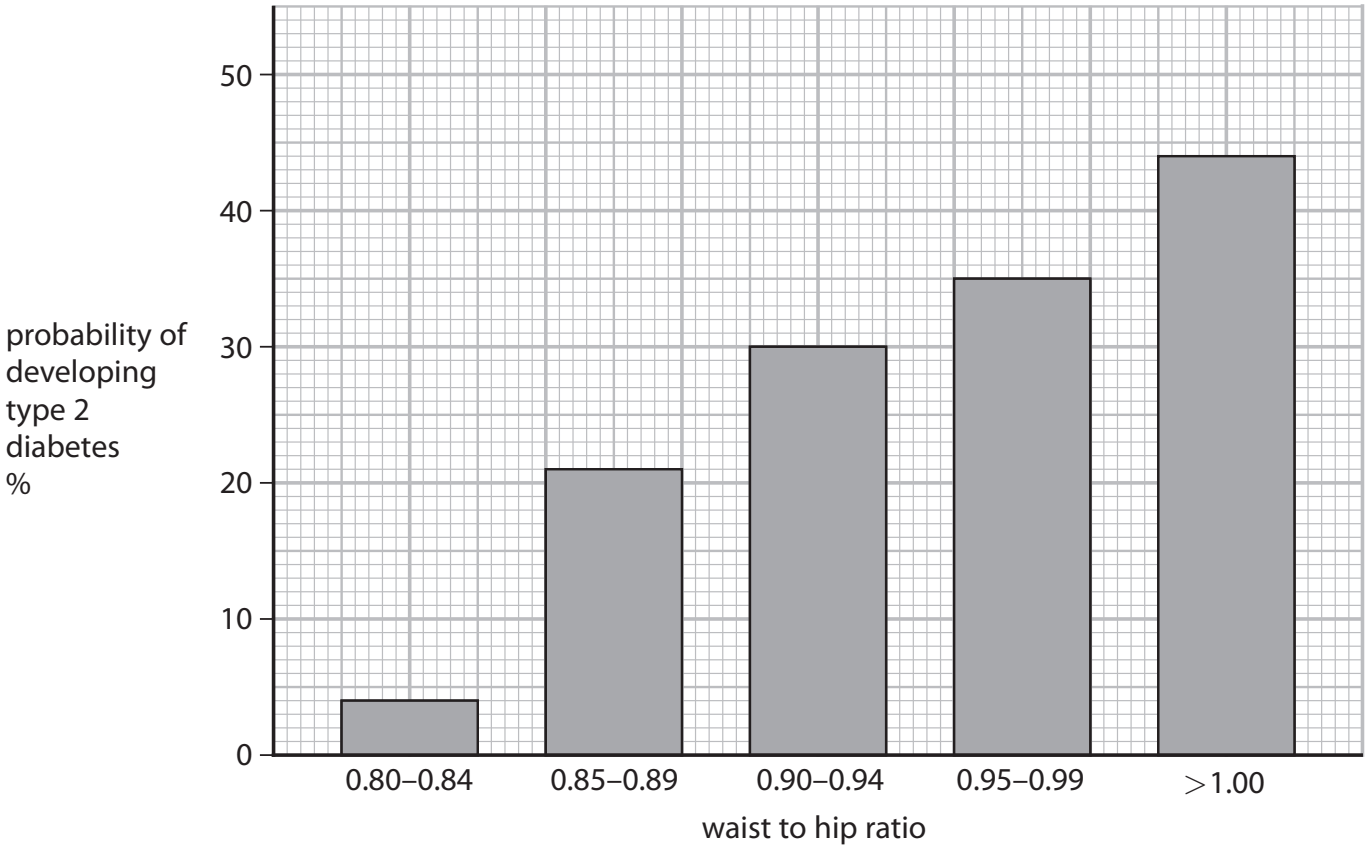


Figure 7

(i) Describe the trend shown in Figure 7.

Use data from Figure 7 in your answer.

(2)

as the waist to hip ratio increases the probability of developing type 2 iabetes increases (1)

• accurate data from the results is used in the answer (1)

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(ii) A female has a waist measurement of 78.3 cm and a hip measurement of 90.0 cm.

Calculate the waist to hip ratio for this female and use Figure 7 to estimate the probability that she will develop type 2 diabetes.

(2)

evaluation
• (78.3 ÷ 90.0) = 0.87 (1)

probability
• 21(%)

probability ..... %

(d) (i) The scientist also measured the BMI of the females.

BMI and waist to hip ratio are two factors that affect the probability of females developing type 2 diabetes.

State **two** other factors about the females in the study that would affect the probability of them developing type 2 diabetes.

(2)

1 age (1)

2 • diet (1)

(ii) State why an athlete may have a high BMI but still have a low probability of developing type 2 diabetes.

(1)

their high BMI is due to a high % of muscle (instead of fat)

(Total for Question 4 = 10 marks)

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5 In Ireland during the 19th century, a mould caused potato plants to rot.

(a) Explain how this mould affected food security in Ireland.

(2)

food security will have decreased (1)

• (because there was) less food / a reduced variety of food (1)

(b) A group of pupils investigated the effect of temperature on mould growth on bread.

Figure 8 shows the bread after being kept at different temperatures for seven days.

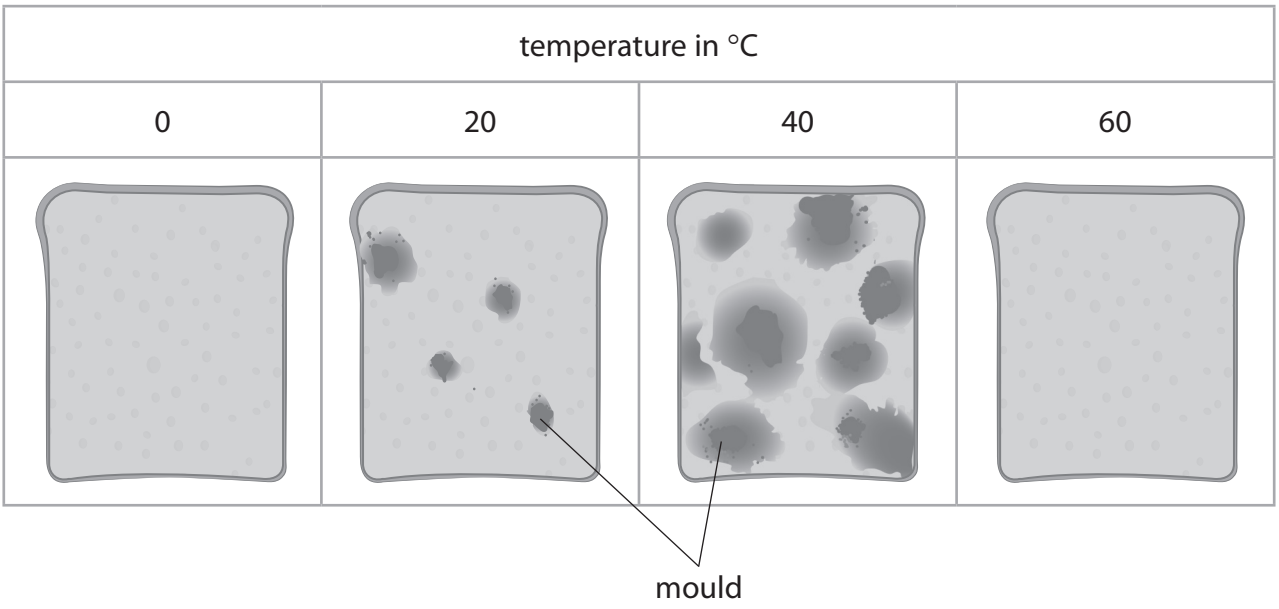

Figure 8

(i) Which is the best estimate of the percentage cover of mould on the bread at 40 °C?

(1)

☒ **A** 0%

☒ **B** 25%

☒ **C** 50%

☒ **D** 75%

(ii) State **two** conclusions that can be made about the growth of mould on the bread from 0 °C to 40 °C shown in Figure 8.

(2)

1 as the temperature increases (up to 40oC) the % of mould increases (1)

2 • no (growth of) mould at {0oC / below 20oC} (1)

(iii) Explain why there was no mould growing on the bread kept at 60 °C.

(2)

enzymes don't work (at 60oC) / enzymes are denatured (1)

• active site shape changed so can't fit with substrate (1)

(c) Figure 9 shows some part-baked bread in a sealed bag.

The gas in the bag is nitrogen, which prevents the bread from going mouldy.

Figure 9

If the bag is opened, the bread goes mouldy within days.

State why the bread goes mouldy.

(1)

Oxygen (allows mould to grow) / mould (spores) can enter the bag

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(d) Explain why keeping food in a fridge slows down the growth of mould.

(2)

too cold (1)

• (for) enzymes to work effectively (1)

(Total for Question 5 = 10 marks)

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6 (a) Figure 10 shows a single-celled pond organism (*Amoeba proteus*).

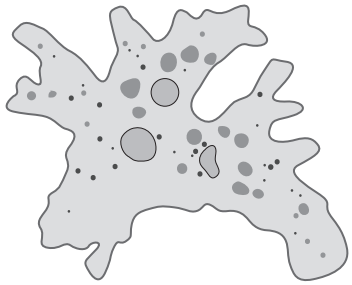

Figure 10

(i) Which row of the table allows the net diffusion of oxygen into *Amoeba proteus*?

(1)

		concentration of oxygen in water in ppm	concentration of oxygen in *Amoeba proteus* in ppm
☒	**A**	4	4
☒	**B**	10	10
☒	**C**	4	10
☒	**D**	10	4

(ii) *Amoeba proteus* uses oxygen for aerobic respiration.

Complete the equation for aerobic respiration.

(1)

glucose + oxygen → carbon dioxide + water (+ energy is released)

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(b) Humans breathe faster when they exercise.

(i) Which **two** changes allow the rate of respiration in the muscle to increase?

(1)

		heart rate	amount of glucose delivered to the muscles
☒	**A**	increases	increases
☒	**B**	increases	decreases
☒	**C**	decreases	increases
☒	**D**	decreases	decreases

(ii) Figure 11 shows breathing data for a human at rest and when running at 5 metres per second on a running machine.

activity	mean number of breaths per minute	mean volume of air in one breath in dm^3	mean volume of air breathed in dm^3 per minute
at rest	5.0	0.8	4.0
running at 5 metres per second	24.7	2.7	?

Figure 11

Calculate the mean volume of air breathed per minute when running at 5 metres per second.

Give your answer to one decimal place.

(2)

Evaluation
(24.7 x 2.7) = 66.69 (1)

rounded to one decimal place:
66.7

..... dm^3 per minute

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(iii) Devise an investigation to compare the mean number of breaths per minute for men, with the mean number of breaths per minute for women, when running at 5 metres per second on a running machine.

(4)

a factor to control about the groups e.g. same age / same BMI (range) (1)

• a factor to control about the environment where the test takes place e.g. in the same room / same type of running machine (1)

• measure breathing rate / count breaths in set time (1)

• calculations of means (1)

(c) Whilst running, the leg muscles of an athlete tightened up, causing cramp.

Name the product of anaerobic respiration that can cause cramp.

(1)

lactic acid

(Total for Question 6 = 10 marks)

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7 Figure 12 shows how the leaves are arranged on a plant.

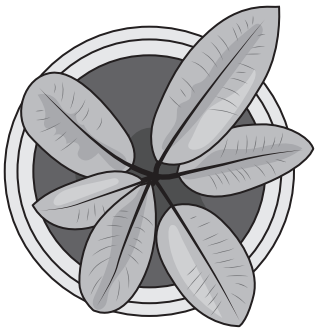


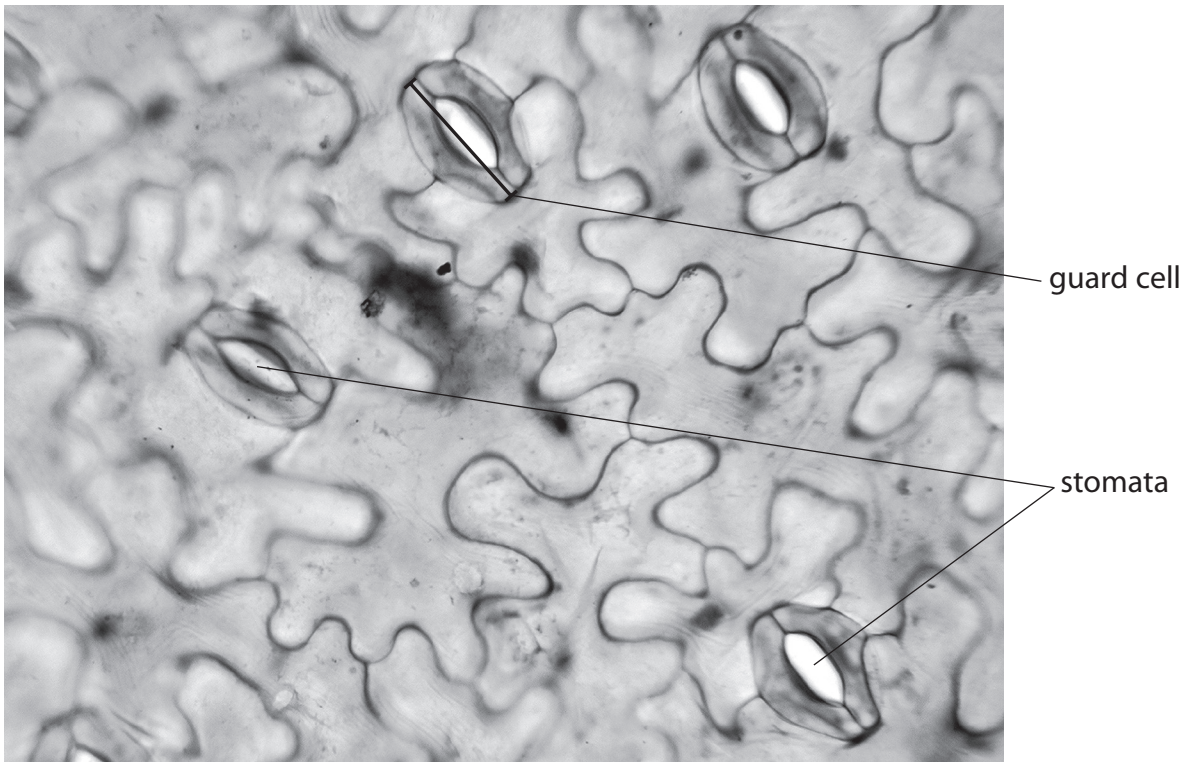
Figure 12

(a) Which reason explains why the leaves are arranged in this way?

(1)

- ☒ **A** the upper leaves allow more light to reach the lower leaves
- ☒ **B** the leaves do not need stomata
- ☒ **C** the phloem in the leaves will absorb more water
- ☒ **D** more insects will be attracted to the plant to eat the leaves

(b) Figure 13 shows guard cells and stomata on the lower surface of a leaf.



(Source: © Rattiya Thongdumhyu/Shutterstock)

Figure 13

Measure the length of the line on the labelled guard cell in mm.

The actual length of the labelled guard cell is 0.05 mm.

Calculate the magnification of this image.

measurement
20 mm (1)

(3)

substitution
20 ÷ 0.05 (1)

evaluation
400 (times)

magnification .....

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(c) Figure 14 shows the number of stomata per mm^2 on the lower surface of leaves from plants growing in soils with different water content.

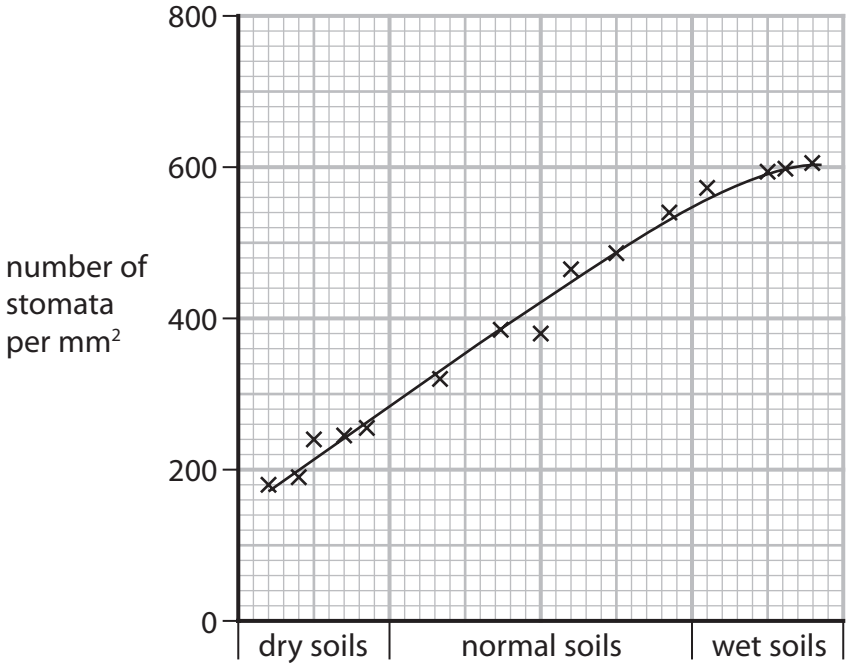

Figure 14

Explain the difference in the number of stomata per mm^2 on the leaves of the plants grown in dry and wet soils.

(2)

there are fewer stomata in plants in dry soils

• (so) less water is lost by plants in dry soils / (because) plants lose water through stomata

*(d) Figure 15a shows a plant that has been placed on its side.

Figure 15b shows the same plant after 5 days.

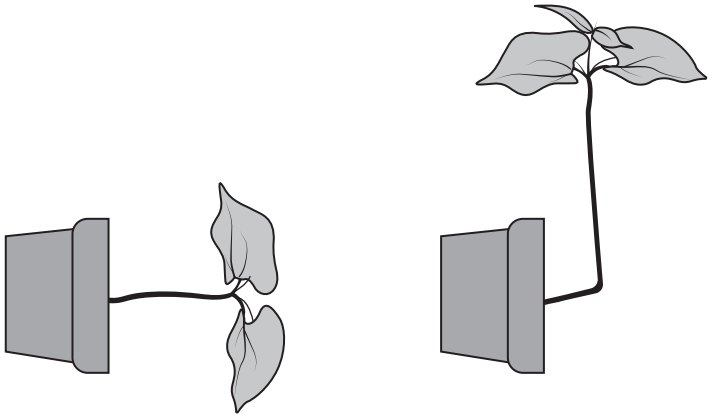

Figure 15a **Figure 15b**

Explain why the growth of the plant has changed.

(6)

Observations
- the plant stem bends
- the stem is longer/taller
- the plant is now growing upwards / towards light
- plant has more leaves

explanations
- plant hormone / auxin
- more hormone / auxin on shaded side
- cell elongation (on shaded side)
- (positive) phototropism
- (negative) gravitropism
- more cells / cell division
- growing towards light
- so (the leaves) are not in shade (e.g. of other plants)
- to absorb more light
- for photosynthesis

(Total for Question 7 = 12 marks)

8 Figure 16 shows an area of woodland with some small plants growing in the ground between the trees.

(Source: © Maksym Holovinov/Shutterstock)

Figure 16

(a) The leaves of the small plants are green.

Describe how these plants make glucose.

(2)

have chlorophyll / chloroplasts (1)

• (by) photosynthesis (1)

(b) Name a group of organisms that break down the dead leaves and release mineral ions into the soil.

(1)

bacteria / fungi / decomposers / prokaryotes

(c) The mineral ions are absorbed from the soil into the roots of plants.

Describe how these mineral ions are transported from the roots to the leaves of the plants.

(2)

(dissolved) in water (1)

• diffusion through the root
(1)

(d) A scientist recorded the mean light intensity and the mean number of small plants per m^2 for six 25 m^2 areas of the woodland.

Figure 17 shows the results.

area of woodland	mean light intensity in lux	mean number of small plants per m^2
A	1500	2.7
B	1300	1.6
C	1000	1.1
D	800	0.6
E	550	0.3
F	350	0.1

Figure 17

(i) Explain the effect of light intensity on the number of small plants per m^2.

(2)

as light intensity decreases the number of (small) plants (per m2) decreases (1)

• because the (small) plants will not be able to photosynthesise enough
(1)

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(ii) State **one** variable the scientist should have controlled to make sure the light intensity measurements could be compared.

(1)

same time of day (1)

• same meter (1)

(e) The scientist selects an area near the edge of the woodland where many stinging nettles are growing.

This area is partly shaded by the trees.

Describe how the scientist should use a belt transect to investigate how light intensity affects the growth of stinging nettles.

(3)

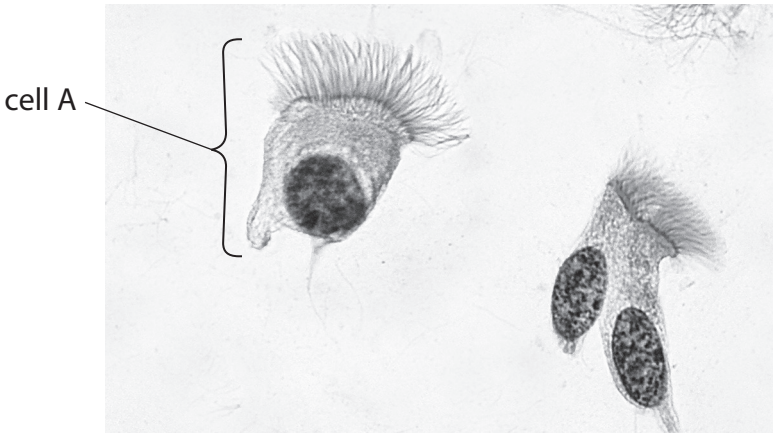
tape measure to measure along the transect (1)

• measure light intensity at different distances (from the wood) (1)

• measure the stinging nettles {along the transect / at different light intensities} (1)

(Total for Question 8 = 11 marks)

9 (a) Figure 18 shows ciliated epithelial cells from the airways of a human as seen using a light microscope.



(Source: © Jose Luis Calvo/Shutterstock)

Figure 18

(i) Draw the cell labelled A in the box below.

Label **three** parts of this cell on your diagram.

(4)

a diagram of the cell that reflects its shape and some of the structures (1)

• with any three cell structures from {nucleus / cytoplasm / membrane / cilia} (3)

(ii) State the function of the ciliated epithelial cells in the airways of the human breathing system.

(1)

to {move/waft} {mucus / bacteria / dust} (1)

(b) Figure 19 shows equipment used to investigate the rate of respiration in maggots.

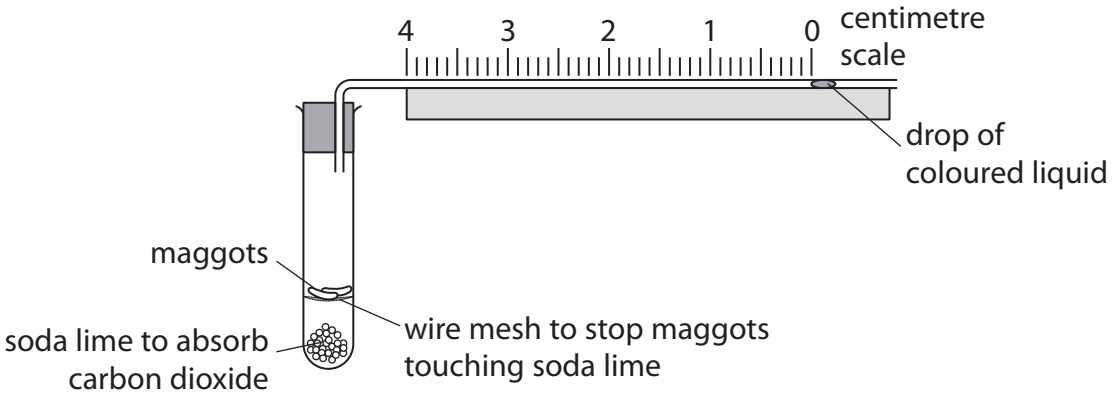


Figure 19

As the maggots respire, the drop of coloured liquid moves towards the test tube.

Figure 20 shows the position of the drop of coloured liquid after ten minutes.

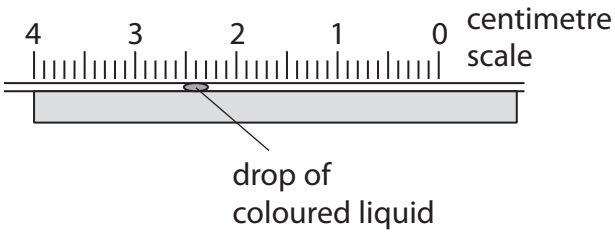


Figure 20

Use information from Figures 19 and 20 to calculate the mean rate of respiration of the maggots in mm per minute.

(2)

measurement
(2.5 – 0 =) 2.5 (cm) (1)

calculation
(25 ÷ 10 =) 2.5 (mm per minute)

..... mm per minute

*(c) Explain how alveoli in human lungs are adapted for gas exchange.

Include the names of the gases that are being exchanged.

(6)

General points about gas exchange
- air is breathed in and out of the lungs
- oxygen is absorbed (into blood)
- carbon dioxide is released (from blood)
- by diffusion

Adaptations of alveoli for gas exchange

- breathing maintains high concentration of oxygen in alveoli / lungs.
- breathing maintains low concentration of carbon dioxide in alveoli / lungs.

- many alveoli
- large surface area
- so that more oxygen is absorbed / more carbon dioxide is released

- are moist
- so oxygen /carbon dioxide can dissolve / is able to move across into the blood

- surrounded by (network of) capillaries blood vessels
- has a (good) blood supply / (many) red blood cells
- keeps oxygen concentration low in blood
- keeps carbon dioxide concentration high in blood
- to absorb oxygen (quickly)
- to remove carbon dioxide (quickly)

- membranes / alveolar walls / cells are thin
- membranes / alveolar walls / cells are permeable
- allows oxygen / carbon dioxide to move through

(Total for Question 9 = 13 marks)

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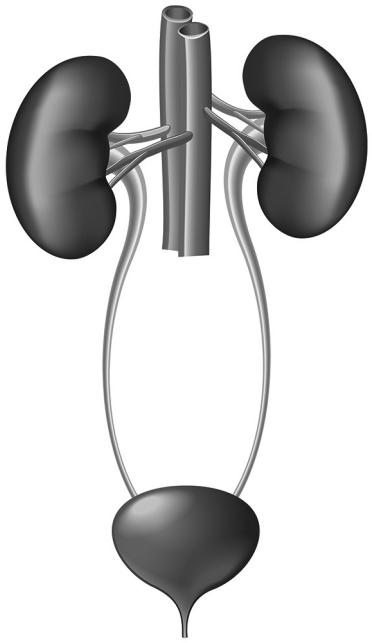
10 Figure 21 shows the human urinary system.



(Source: © La Gorda/Shutterstock)

Figure 21

(a) Urine is made by removing water, urea and salts from the blood.

Use the letter X to label where urine is made.

a labelled line X to either kidney

(1)

(b) Which substance is converted to urea in the liver?

(1)

- ☒ **A** amino acids
- ☒ **B** sugars
- ☒ **C** lipids
- ☒ **D** potassium ions

(c) A patient cannot remove enough urea from the blood when making urine.

Figure 22 shows a dialysis machine attached to the arm of this patient.

Their blood is pumped out of their arm, passed through the dialysis machine, and then put back into the patient.

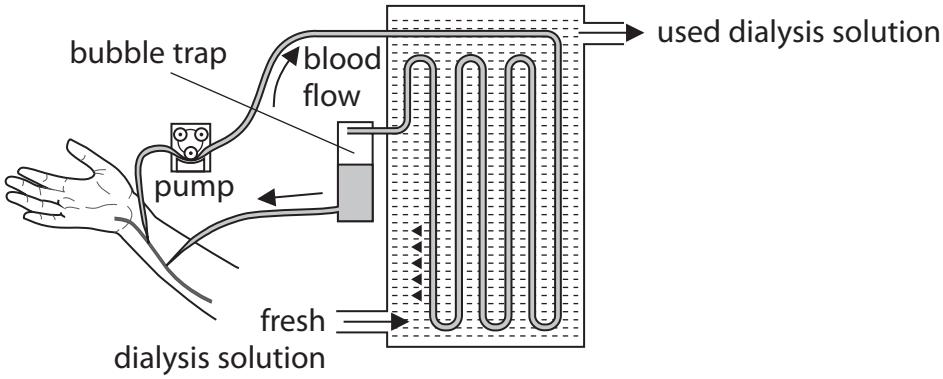


Figure 22

(i) Describe what happens to urea as the blood passes through the dialysis machine.

(2)

blood is filtered (in a dialysis machine) (1)

• urea moves {out of the blood / into dialysis solution} (1)

(ii) Two patients need to have dialysis treatment.

Patient A needs this treatment three times a week.

Patient B needs this treatment once a week.

Give **one** reason why patient B needs dialysis treatment less often than patient A.

(1)

patient B has {kidney failure / disease} which is less advanced than patient A (1)

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(d) Describe how to test for glucose in the dialysis fluid.

(3)

add Benedict's solution (to some dialysis fluid) (1)

• {heat / boil / put in water bath} (1)

• see if it turns {green / yellow / orange / red} (1)

(e) Urease is an enzyme that breaks down urea into smaller molecules.

Explain why urease will not break down starch into smaller molecules.

(3)

enzymes are specific (1)

• their shape is complementary to their substrate (1)

• so starch will not fit into the active site (of urease) (1)

(Total for Question 10 = 11 marks)

TOTAL FOR PAPER = 100 MARKS

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