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

Afternoon (Time: 1 hour 45 minutes) | Paper Reference **1BI0/2H**

# Biology

## Paper 2

**Higher 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.

*Turn over* ▶

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P 6 2 0 7 2 A 0 1 2 8

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** (a) Figure 1 shows the sources of pollution and different levels of water pollution in a river.

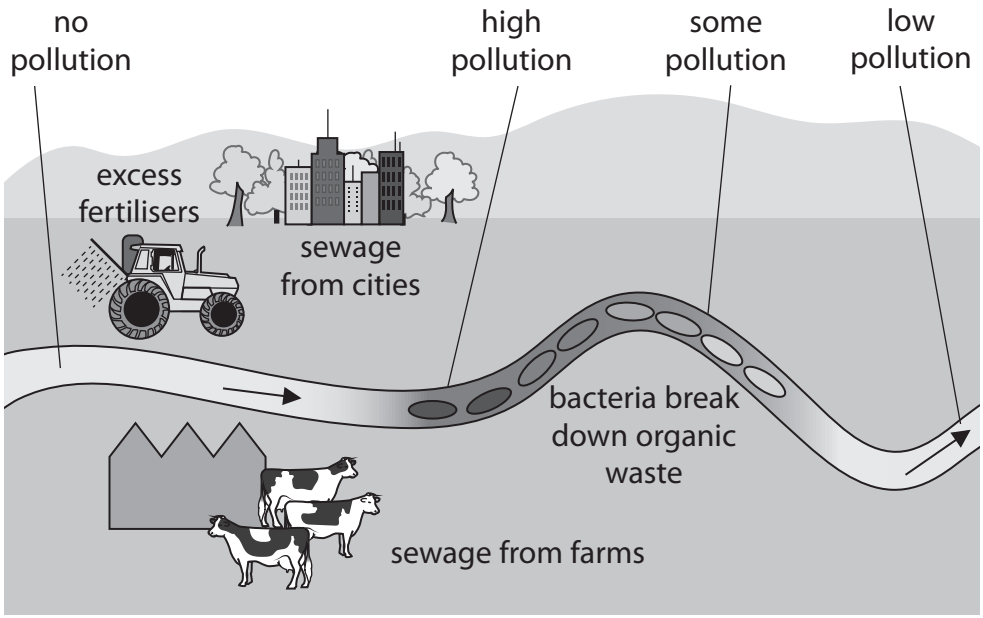


**Figure 1**

(i) Which part of the river will have the largest number of bloodworms?

**(1)**

☒ **A** no pollution

☒ **B** high pollution

☒ **C** some pollution

☒ **D** low pollution

(ii) Give the names of the **two** indicator species from the box which provide evidence for clean water.

| | | |
|---|---|---|
| | blackspot fungus | lichen |
| freshwater shrimp | sludgeworm | stonefly |

**(2)**

1 .....

2 .....

(b) Explain why sewage pollution in the river can decrease the oxygen levels in the water.

**(2)**

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(c) (i) Excess fertilisers can cause a build-up of nitrates in the rivers and lakes.

State the name given to a build-up of nitrates in the lake.

**(1)**

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(ii) State why the build-up of nitrates is less likely to affect a river than a lake.

**(1)**

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**(Total for Question 1 = 7 marks)**

**2** Figure 2 shows the leaves and flowers of water lily plants (*Nymphaea odorata*) on a lake.



**Figure 2**

(a) Water lilies have stomata on the upper surface of the leaves.

Explain why water lilies have no stomata on the lower surface of the leaves.

**(2)**

(b) (i) The white petals of the water lily flowers cannot photosynthesise.

Which structure in leaf cells is the site of photosynthesis?

**(1)**

- ☒ **A** nucleus
- ☒ **B** vacuole
- ☒ **C** mitochondrion
- ☒ **D** chloroplast

(ii) Glucose is made by photosynthesis.

Glucose is converted to another sugar to be transported in the plant.

What is the name of this sugar?

**(1)**

- ☒ **A** glycerol
- ☒ **B** ribose
- ☒ **C** sucrose
- ☒ **D** starch

(iii) Describe how this sugar is transported from the leaves to the flowers of the water lily.

**(2)**

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(c) Figure 3 shows water lilies growing in a lake in Europe.



**Figure 3**

One water lily plant was brought from America 10 years ago and planted in the lake shown in Figure 3.

Explain why this non-indigenous plant now covers the whole surface of the lake.

**(3)**

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**(Total for Question 2 = 9 marks)**

**3** A slide of potato cells was viewed using a light microscope.

Figure 4 is a drawing of the slide showing starch grains in the potato cells.

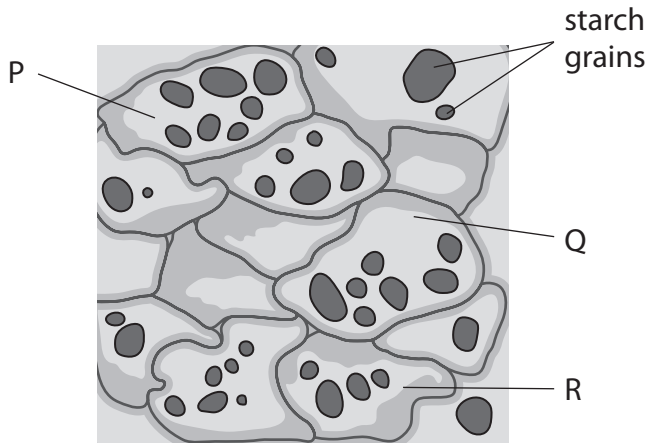


**Figure 4**

(a) (i) Calculate the mean number of starch grains in potato cells P, Q and R.

**(1)**

..... starch grains

(ii) Which structures are found in plant cells but are **not** found in animal cells?

**(1)**

☒ **A** cell membrane, nucleus, chloroplast

☒ **B** cell wall, cell membrane, cytoplasm

☒ **C** nucleus, large vacuole, chloroplast

☒ **D** cell wall, chloroplast, large vacuole

(b) A scientist investigated how the length of starch grains in potatoes changed when the potatoes were stored in the dark.

Figure 5 shows a potato after being stored in the dark.




**Figure 5**

Three potatoes were used in the investigation.

The length of starch grains in potato 1 were measured at the start.

The length of starch grains in potato 2 were measured after 5 weeks in the dark.

The length of starch grains in potato 3 were measured after 10 weeks in the dark.

Figure 6 shows the results.

| potato | time after placing in the dark in weeks | mean length of starch grains in μm |
|---|---|---|
| 1 | 0 | 64 |
| 2 | 5 | 50 |
| 3 | 10 | 30 |

**Figure 6**

(i) Calculate the percentage difference in the mean length of starch grains in potato 2 at 5 weeks and in potato 3 at 10 weeks.

**(2)**

.....%

(ii) State **two** variables the scientist should have controlled to improve this investigation.

**(2)**

1 .....

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2 .....

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(iii) The starch grains in the potatoes became smaller as the starch was converted into glucose.

State why the potatoes need glucose.

**(1)**

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(iv) Describe how starch is broken down into glucose.

**(2)**

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**(Total for Question 3 = 9 marks)**

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**4** Figure 7 shows the world human population from 1800 to 2015.

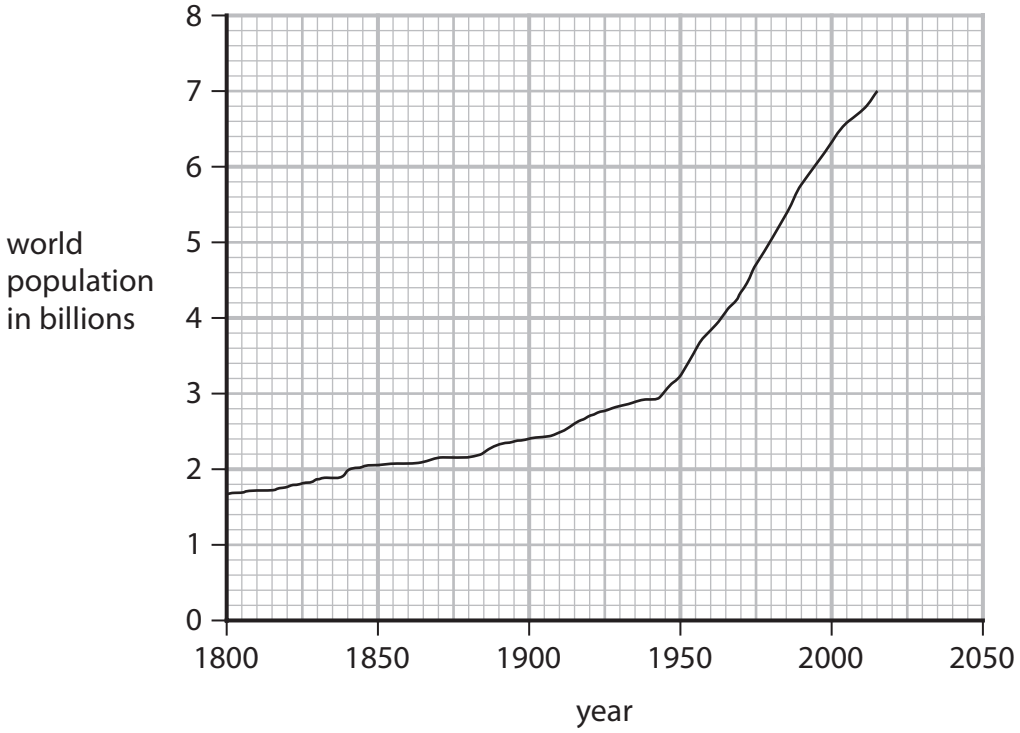


**Figure 7**

(a) In 2015, 13% of the world human population were classified as malnourished.

Calculate, using Figure 7, how many people were classified as malnourished in 2015.

**(2)**

..... billion

(b) Protein is an important nutrient.

Describe the laboratory test for protein.

**(2)**

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(c) Figure 8 shows the mass of meat eaten in the world from 1980 to 2010.

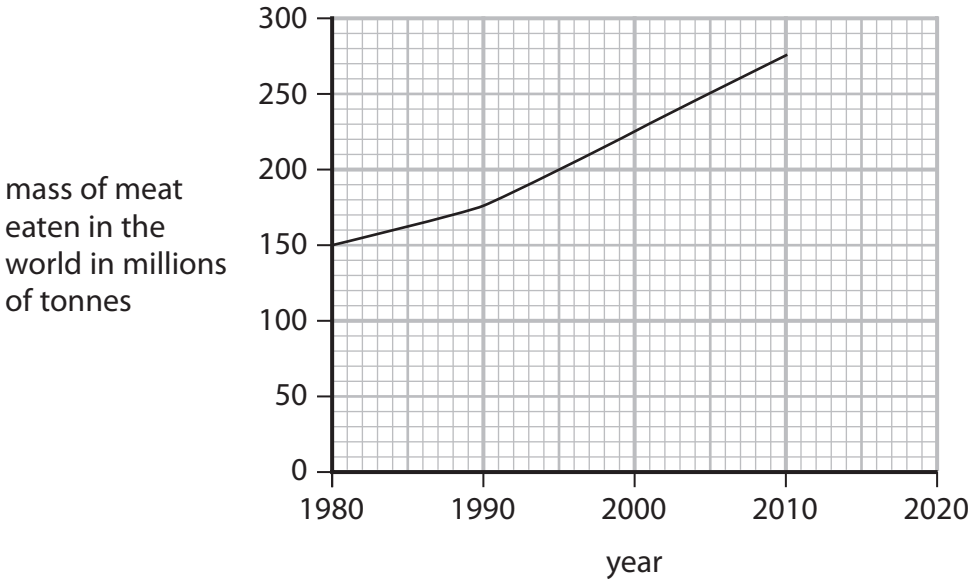


**Figure 8**

Calculate the rate of increase in the mass of meat eaten in the world from 2000 to 2010.

**(2)**

..... millions of tonnes per year

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(d) Figure 9 shows an energy pyramid.

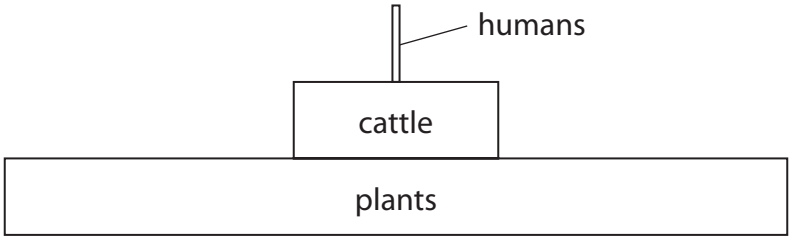


**Figure 9**

(i) Explain why the area labelled cattle is smaller than the area labelled plants.

**(2)**

(ii) The World Health Organisation uses this definition of food security.

*'When all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life'*

Explain how a large increase in the mass of meat eaten will decrease food security in the future.

**(3)**

**(Total for Question 4 = 11 marks)**

**5** Trypsin is a protease enzyme used in the manufacture of food for babies.

(a) (i) Which food group is digested by trypsin?

**(1)**

- ☒ **A** carbohydrates
- ☒ **B** lipids
- ☒ **C** fibre
- ☒ **D** proteins

(ii) The food is mashed before the trypsin is added.

Explain the advantage of mashing the food before adding the trypsin.

**(2)**

(b) A manufacturer of baby food wanted to find out the optimum pH for trypsin.

Equal volumes of different pH solutions were placed in six separate test tubes.

5 $cm^3$ of 1% trypsin solution was added to each test tube.

1.5 g of mashed food was placed in each test tube.

The time taken to digest the food was recorded.

(i) State **one** other variable that should be controlled in this investigation.

**(1)**

(ii) State how this variable could be controlled.

**(1)**

(c) The results are shown in Figure 10.

| pH | time taken to digest the food in minutes |
|---|---|
| 1 | 42 |
| 2 | 15 |
| 3 | 9 |
| 4 | 2 |
| 5 | 16 |
| 6 | 40 |

**Figure 10**

(i) Describe the trends shown in this data.

**(2)**

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(ii) At pH 4, the trypsin digested 1.5 g of mashed food at a rate of 0.8 g per minute.

Calculate the rate of digestion at pH 1.

Give your answer to one significant figure.

**(2)**

..... g per minute

(iii) Explain the difference in the rate of reaction at pH 1 and the rate of reaction at pH 4.

**(2)**

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**(Total for Question 5 = 11 marks)**

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**6** (a) Figure 11 shows the time taken for blood to clot at different temperatures.

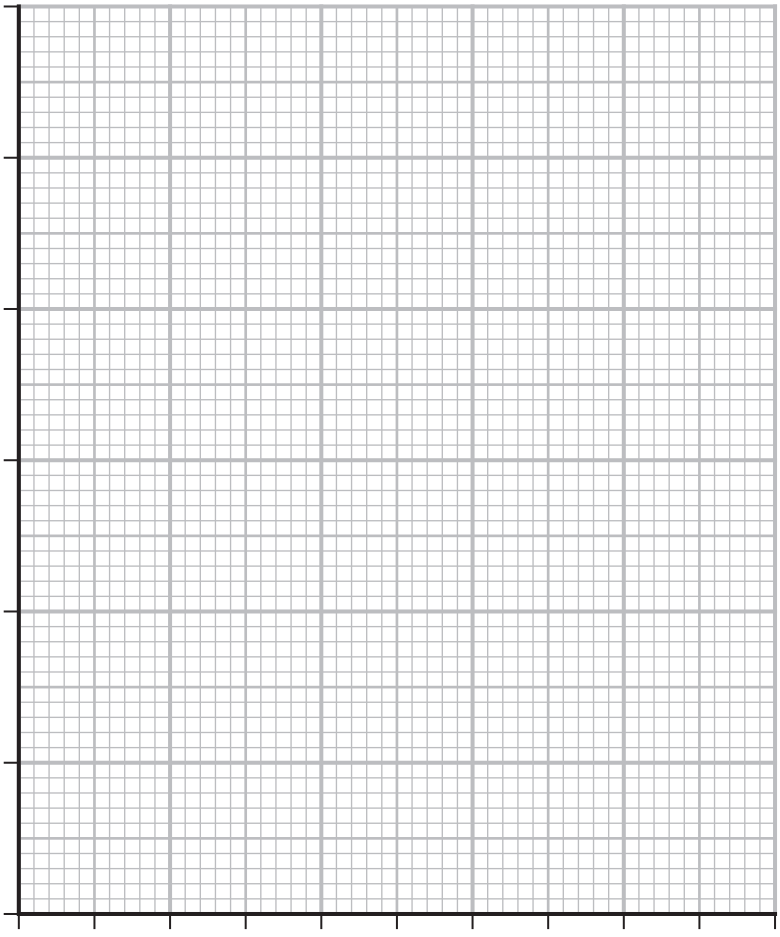
| temperature in °C | time taken for blood to clot in seconds |
|---|---|
| 5 | 90 |
| 15 | 70 |
| 25 | 55 |
| 35 | 40 |
| 45 | 110 |

**Figure 11**

(i) Draw a graph to show the data in Figure 11.

**(3)**

time taken for blood to clot in seconds



temperature in °C

(ii) Give **two** safety precautions that should be used when handling blood samples.

**(2)**

1 .....

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2 .....

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(b) (i) Which part of the blood causes blood to start clotting?

**(1)**

- ☒ **A** erythrocytes
- ☒ **B** lymphocytes
- ☒ **C** platelets
- ☒ **D** antibodies

(ii) Give **one** advantage of a blood clot forming.

**(1)**

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(c) Explain how **one** structure of a vein helps the blood return to the heart.

**(2)**

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**(Total for Question 6 = 9 marks)**

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**7** (a) A gardener decided to kill the dandelion plants growing in his lawn.

The gardener set up a trial to see which concentration of weed killer would kill the most dandelions and be most economical.

He counted the number of dandelion plants in six 1 $m^2$ areas of the lawn.

He made six different concentrations of weed killer solution.

He applied the solutions to each of the six different areas.

After two weeks, he counted the number of dandelion plants in each area.

The results are shown in Figure 12.

| concentration of weed killer solution (%) | number of dandelion plants in 1 $m^2$ | |
|---|---|---|
| | before applying weed killer | two weeks after applying weed killer |
| 0 | 9 | 9 |
| 20 | 9 | 9 |
| 40 | 7 | 5 |
| 60 | 8 | 2 |
| 80 | 8 | 0 |

**Figure 12**

(i) Give **one** variable the gardener should control when completing this trial.

**(1)**

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(ii) State and explain the conclusions the gardener can make based on his trial.

**(3)**

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(b) Some weed killers contain plant hormones.

Explain how plant hormones work as weed killers.

**(3)**

(c) Explain how phototropism is controlled in plant shoots.

**(3)**

**(Total for Question 7 = 10 marks)**

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**8** Figure 13 shows the heart rate of person A and person B.

Person A does not do any regular exercise.

Person B has been running regularly for one year.

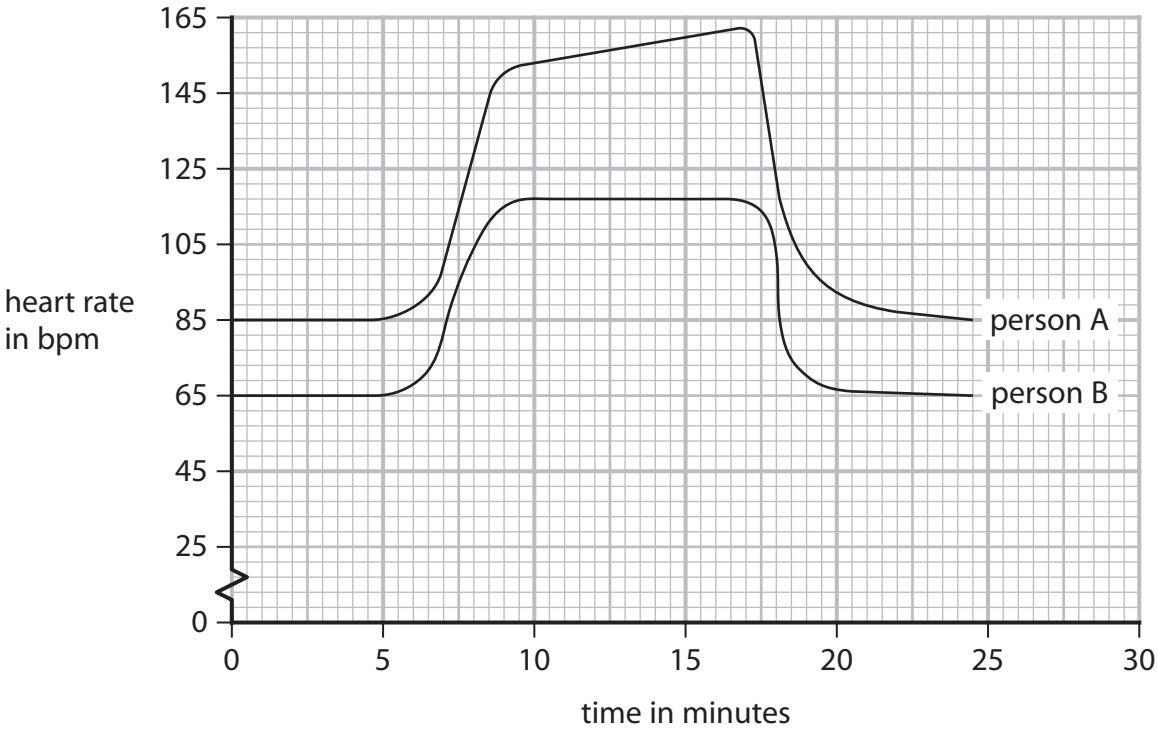


**Figure 13**

(a) Both people rested for the first 6 minutes, then did the same high intensity exercise for the next 12 minutes, then rested.

Compare the heart rates of person A with the heart rates of person B.

**(4)**

(b) The stroke volume for person B before exercising was 61 ml per beat.

Calculate the cardiac output for person B before exercising.

Give your answer in litres per minute.

**(3)**

..... litres per minute

(c) The cardiac output for person A during exercise was 5.5 litres per minute.

Explain why the heart rate for person A needed to be higher than the heart rate for person B during exercise.

**(3)**

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**(Total for Question 8 = 10 marks)**

**9** (a) Hyperthyroidism is caused by an overactive thyroid gland.

Figure 14 shows a person with a normal thyroid gland and a person with hyperthyroidism.

normal hyperthyroidism



**Figure 14**

(i) State **one** effect of hyperthyroidism on the thyroid gland.

**(1)**

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(ii) The thyroid gland is part of the

**(1)**

☒ **A** circulatory system

☒ **B** digestive system

☒ **C** endocrine system

☒ **D** urinary system

(b) Explain how negative feedback, involving the thyroid gland, controls metabolic rate.

**(4)**

*(c) Explain how hormones control the menstrual cycle.

**(6)**

**(Total for Question 9 = 12 marks)**

**10** (a) A person with kidney disease may need kidney dialysis treatment.

Figure 15 shows an experiment to show how a dialysis membrane works.

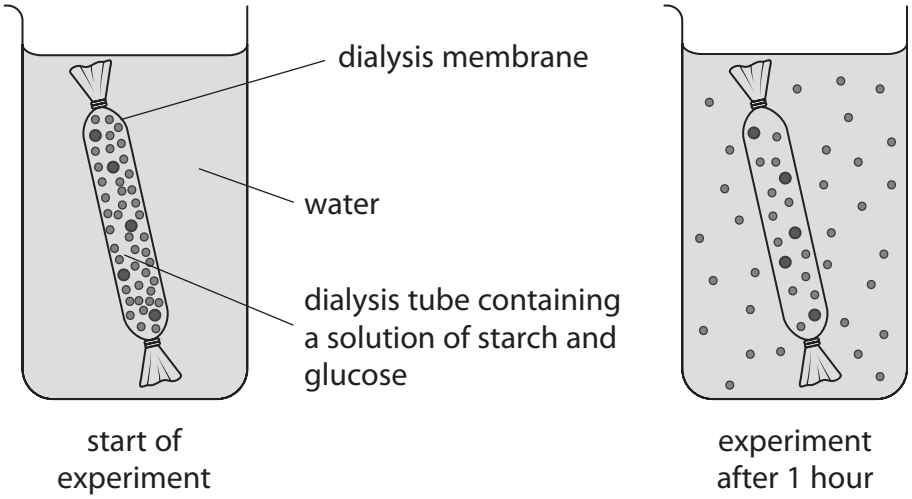


**Figure 15**

(i) Describe the method that would be used to find out what is present in the solution in the beaker, after one hour.

**(4)**

(ii) Explain how this experiment represents a simple model of kidney dialysis treatment.

**(2)**

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*(b) The nephrons in the kidney remove unwanted substances from the blood.

Figure 16 shows the structure of a nephron.

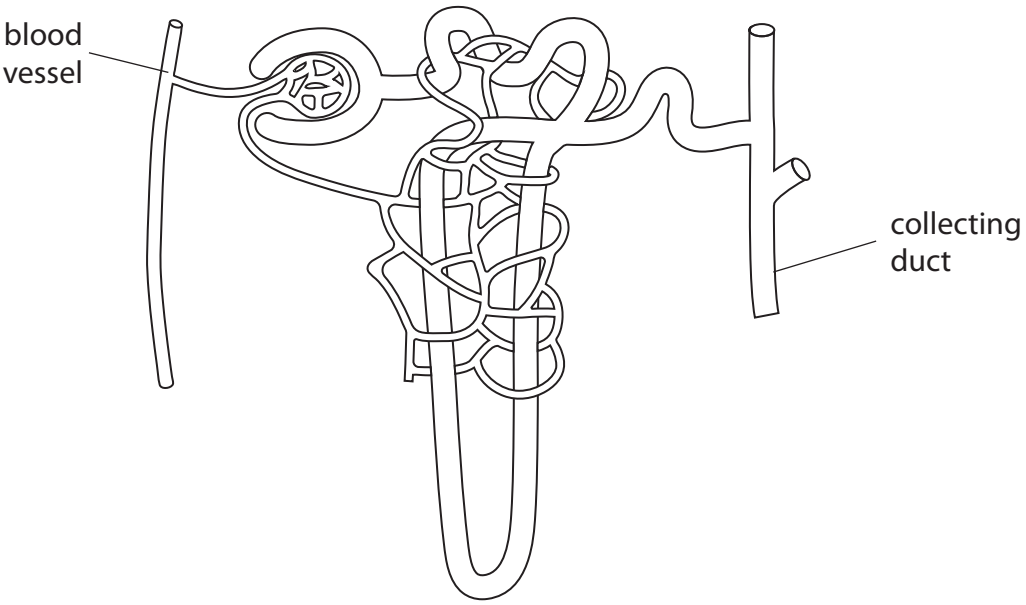


**Figure 16**

Explain how substances are exchanged between the blood entering the nephron and the filtrate leaving the collecting duct.

Include reference to named structures of the nephron in your answer.

**(6)**

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**(Total for Question 10 = 12 marks)**

**TOTAL FOR PAPER = 100 MARKS**

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