Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

# GCSE
# COMBINED SCIENCE: TRILOGY

**F**

## Foundation Tier
## Biology Paper 1F

Tuesday 13 May 2025 Afternoon Time allowed: 1 hour 15 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 | |
| **TOTAL** | |

**Information**
- The maximum mark for this paper is 70.
- 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.

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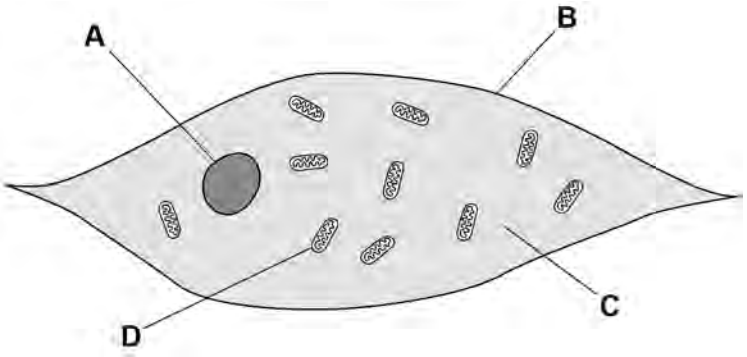
**0 1** This question is about cells.

**Figure 1** shows a muscle cell.

**Figure 1**




**0 1 . 1** The nucleus and cytoplasm are parts of a muscle cell.

Draw **one** line from each part of the muscle cell to the correct label from **Figure 1**.

**[2 marks]**

| Part of the muscle cell | Label from Figure 1 |
|---|---|
| | A |
| Cytoplasm | B |
| Nucleus | C |
| | D |

*Do not write outside the box*

**0 1 . 2** What is the function of the nucleus?

**[1 mark]**

**0 1 . 3** What part of a cell controls the movement of substances into the cell?

**[1 mark]**

**Question 1 continues on the next page**

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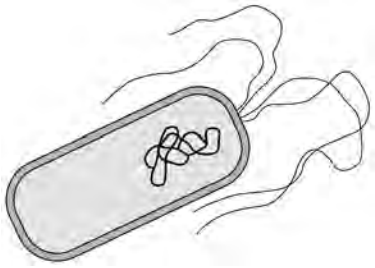
**Figure 2** shows a bacterial cell.

**Figure 2**



**0 1 . 4** What type of cell is the bacterial cell in **Figure 2**?

**[1 mark]**

Tick (✓) **one** box.

A fungal cell ☐

A prokaryotic cell ☐

A sperm cell ☐

**0 1 . 5** Which are **two** features of bacterial cells?

**[2 marks]**

Tick (✓) **two** boxes.

Bacterial cells are larger than animal cells. ☐

Bacterial cells contain a loop of DNA. ☐

Bacterial cells contain a nucleus. ☐

Bacterial cells contain chloroplasts. ☐

Bacterial cells have a cell wall. ☐

Do not write outside the box

Stem cells are cells that are **not** specialised.

Stem cells can be collected from human bone marrow.

**0 1 . 6** What type of stem cells are found in bone marrow?

**[1 mark]**

Tick (✓) **one** box.

Adult stem cells ☐

Embryonic stem cells ☐

Meristem cells ☐

**0 1 . 7** Which process produces stem cells in humans?

**[1 mark]**

Tick (✓) **one** box.

Digestion ☐

Mitosis ☐

Respiration ☐

**Question 1 continues on the next page**

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**0 1 . 8** Stem cells can be used to produce blood cells.

A blood transfusion is when a patient is given blood cells.

**Table 1** compares two different methods of providing blood cells that can be given to a patient.

**Table 1**

| Blood cells produced from stem cells in a laboratory | Blood cells from a blood donation |
|---|---|
| • A small sample of blood is taken from a person.<br>• All of the new blood cells can function for 120 days.<br>• The stem cells from the blood sample can produce unlimited quantities of blood cells. | • 470 $cm^3$ of blood is collected from a person.<br>• The cells can function for between 1 and 120 days. |

A scientist stated:

'Blood cells produced from stem cells are better to use for a blood transfusion than blood cells from a donation.'

Suggest **two** reasons that support the scientist's statement.

**[2 marks]**

1 _____

_____

2 _____

_____

11

*Do not write outside the box*

**Turn over for the next question**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

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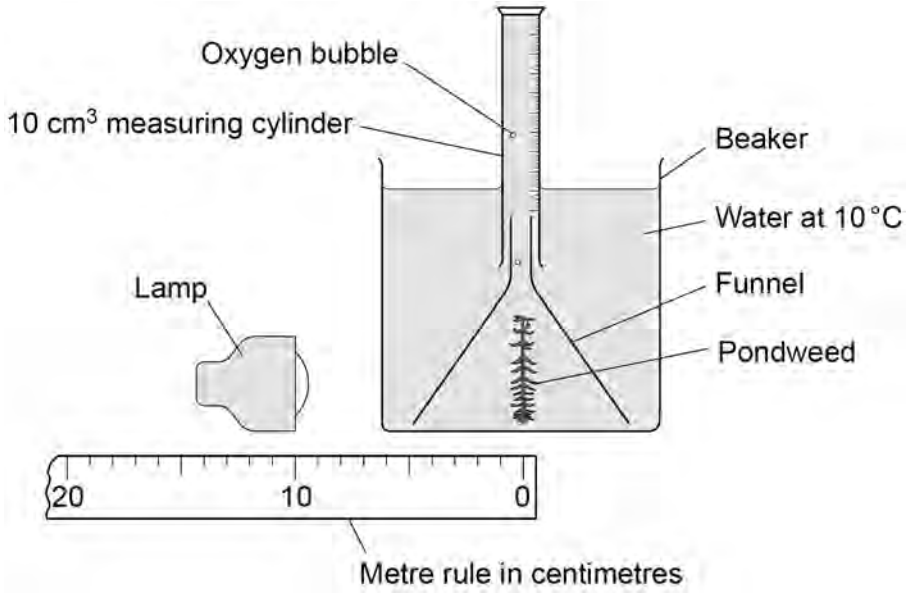
**0 2** Photosynthesis is important for plant growth.

A student used pondweed to investigate photosynthesis.

**Figure 3** shows the apparatus 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 1 hour, record the volume of oxygen collected in the measuring cylinder.

4. Repeat steps 1 to 3 a further four times, placing the lamp at different distances from the pondweed.

*Do not write outside the box*

**0 2 . 1** What are **two** control variables the student should use in the investigation?

**[2 marks]**

Tick (✓) **two** boxes.

The distance of the lamp from the pondweed. ☐

The length of the pondweed. ☐

The size of the beaker. ☐

The temperature of the water. ☐

The volume of oxygen collected. ☐

**Table 2** shows the results.

**Table 2**

| Distance of the lamp from the pondweed in cm | Volume of oxygen in $cm^3$ |
|---|---|
| 10 | |
| 20 | 1.0 |
| 30 | 0.4 |
| 40 | 0.2 |
| 50 | 0.0 |

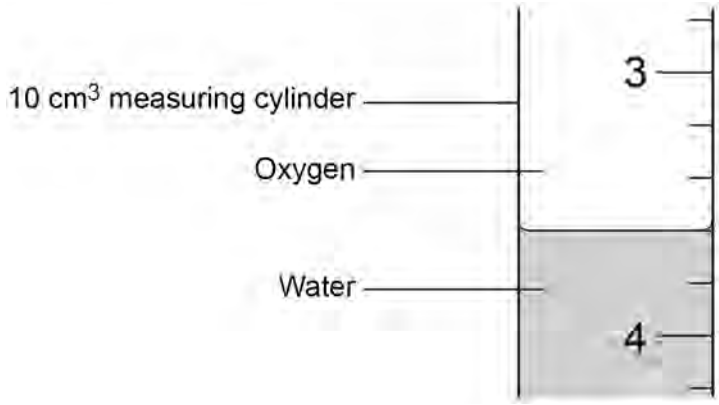
**0 2 . 2** Describe the trend shown in **Table 2**.

**[1 mark]**

Do not write outside the box

**0 2 . 3** **Figure 4** shows the volume of oxygen when the lamp was 10 cm from the pondweed.

**Figure 4**




What volume of oxygen is shown in **Figure 4**?

**[1 mark]**

Volume = _____ $cm^3$

*Do not write outside the box*

**0 2 . 4** The student repeated the investigation using a measuring cylinder with smaller intervals of 0.1 $cm^3$.

What did using smaller intervals improve?

**[1 mark]**

Tick (✓) **one** box.

Accuracy ☐

Repeatability ☐

Reproducibility ☐

**0 2 . 5** The student did the investigation at 10 °C.

The student repeated the investigation at 20 °C.

Complete the sentence.

Choose the answer from the box.

**[2 marks]**

| **smaller** | **the same** | **greater** |
|---|---|---|

Compared to the results at 10 °C, the volumes of oxygen collected

in one hour at 20 °C would be _____.

Give a reason for your answer.

_____

_____

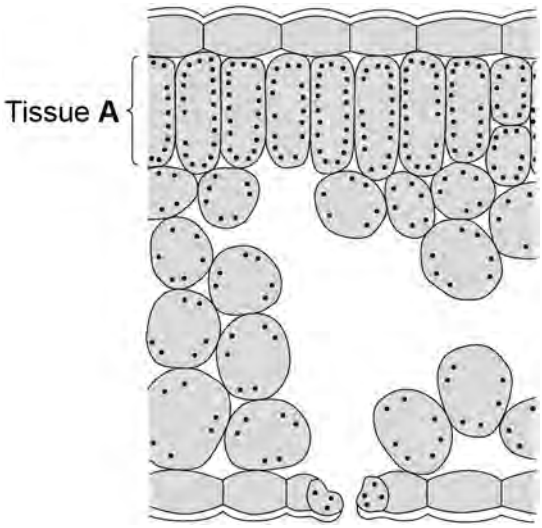
**Turn over ►**

*Do not write outside the box*

Photosynthesis is important for apple trees.

**Figure 5** shows a section through the leaf of an apple tree.

**Figure 5**




**0 2 . 6** What is tissue **A**?

**[1 mark]**

Tick (✓) **one** box.

Epidermis ☐

Palisade mesophyll ☐

Spongy mesophyll ☐

**0 2 . 7** The cells in tissue **A** contain chloroplasts.

What is the name of the green chemical in chloroplasts?

**[1 mark]**

_____

*Do not write outside the box*

Apple scab is a disease of apple trees.

Apple scab is caused by a fungus.

**Figure 6** shows a leaf from an apple tree infected with apple scab fungus.

**Figure 6**

**0 2 . 8** How could the fungal infection be removed from the tree?

**[1 mark]**

Tick (✓) **one** box.

Destroy the affected leaves. ☐

Spray the affected leaves with antibiotics. ☐

Use an antitoxin on the affected leaves. ☐

**Question 2 continues on the next page**

Do not write outside the box

**0 2 . 9** Infection with apple scab fungus decreases the number of chloroplasts in the leaves.

Explain why apple trees with apple scab fungus produce smaller apples than apple trees that are **not** infected.

**[3 marks]**

13

*Do not write outside the box*

**0 3** A student investigated the effect of concentration of salt solution on the mass of potato cubes.

This is the method used.

1. Cut a piece of potato into four cubes.

2. Record the mass of each cube.

3. Put each cube into a different beaker.

4. Pour a different concentration of salt solution into each beaker.

5. After 1 hour, remove each cube.

6. Record the mass of each cube.

**0 3 . 1** Suggest **two** improvements to the investigation.

**[2 marks]**

1 _____

_____

2 _____

_____

**Question 3 continues on the next page**

*Do not write outside the box*

The student improved the investigation.

**Table 3** shows the results.

**Table 3**

| **Concentration of salt solution in mol/dm$^3$** | **Mass of potato cube at the start in grams** | **Mass of potato cube after one hour in grams** | **Change in mass in grams** |
|---|---|---|---|
| 0.0 | 30.6 | 30.7 | +0.1 |
| 0.5 | 30.8 | 30.8 | 0.0 |
| 1.0 | 30.8 | 30.7 | –0.1 |
| 2.0 | 30.5 | 30.3 | –0.2 |

**0 3 . 2** What was the concentration of the solution inside the potato cells?

**[1 mark]**

Tick (✓) **one** box.

0.0 mol/dm$^3$ ☐

0.5 mol/dm$^3$ ☐

1.0 mol/dm$^3$ ☐

2.0 mol/dm$^3$ ☐

*Do not write outside the box*

**0 3 . 3** Changes in mass of the potato cubes are due to water moving into and out of the cells.

What is the name of the process that allows water to move into and out of cells?

**[1 mark]**

Tick (✓) **one** box.

Active transport ☐

Osmosis ☐

Respiration ☐

**Question 3 continues on the next page**

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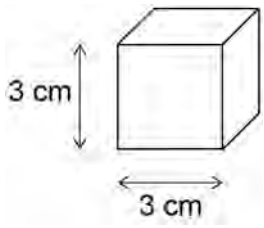
**0 3 . 4** **Figure 7** shows one of the potato cubes.

**Figure 7**




Calculate the surface area of the potato cube.

Give the unit.

**[3 marks]**

Surface area = _____ Unit _____

**0 3 . 5** The student then investigated the effect of **surface area** on the change in mass of a piece of potato.

Describe how the student could increase the surface area of the piece of potato shown in **Figure 7**.

**[1 mark]**

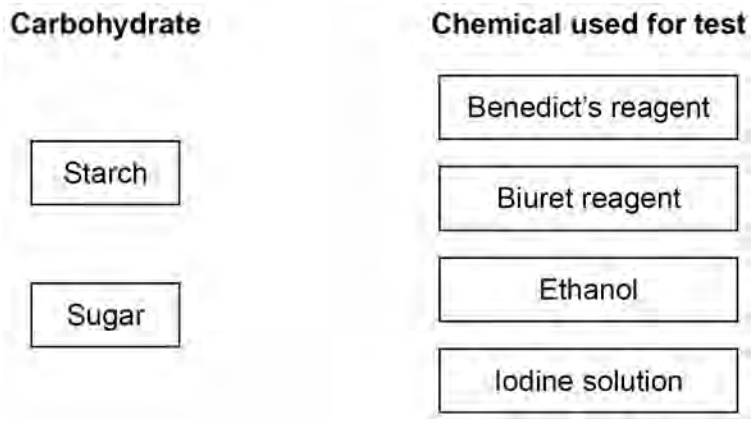
Do not write outside the box

Potatoes contain varying amounts of carbohydrates and proteins.

Starch and sugar are different types of carbohydrate.

**0 3 . 6** Draw **one** line from each carbohydrate to the chemical used to test for the carbohydrate.

**[2 marks]**




**0 3 . 7** A potato was tested for protein, sugar and starch.

**Table 4** shows the results.

**Table 4**

| | Test for protein | Test for sugar | Test for starch |
|---|---|---|---|
| **Result** | Blue | Red | Blue-black |

Which substances were found in the potato?

**[1 mark]**

Tick (✓) **one** box.

Protein and starch ☐

Protein and sugar ☐

Sugar and starch ☐

11

**Turn over ►**

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**ANSWER IN THE SPACES PROVIDED**

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**0 4** This question is about exercise.

**0 4 . 1** Which **two** substances do muscles need during exercise?

**[2 marks]**

Tick (✓) **two** boxes.

- Carbon dioxide ☐
- Glucose ☐
- Lactic acid ☐
- Oxygen ☐
- Urea ☐

**Question 4 continues on the next page**

*Do not write outside the box*

Two people exercised on running machines.

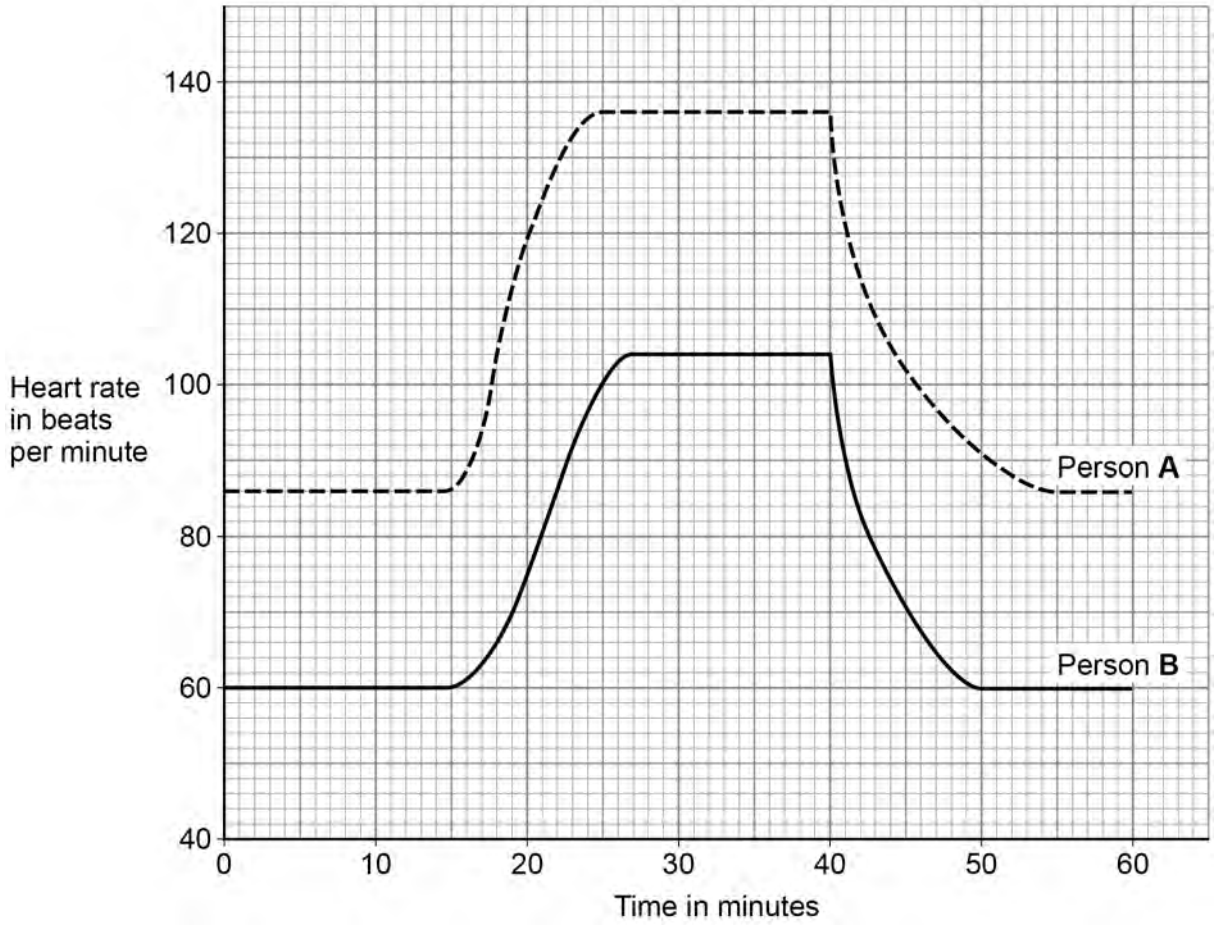
The two people ran at the same speed.

Each person's heart rate was monitored:

- before exercising
- while exercising
- after they stopped exercising.

**Figure 8** shows the results.

**Figure 8**




**0 4 . 2** How many minutes did person **B** exercise for?

**[2 marks]**

Number of minutes = _____

*Do not write outside the box*

**0 4 . 3** Calculate the percentage increase in heart rate for person **B** during the exercise.

Use the equation:

$$\text{percentage increase} = \frac{\text{maximum heart rate} - \text{resting heart rate}}{\text{resting heart rate}} \times 100$$

Give your answer to 2 significant figures.

**[3 marks]**

Percentage increase (2 significant figures) = _____ %

**0 4 . 4** A student stated:

'Person **B** is fitter than person **A**.'

Give **two** pieces of evidence to support the student's statement.

Use **Figure 8**.

**[2 marks]**

1 _____

2 _____

**Question 4 continues on the next page**

*Do not write outside the box*

Immediately after exercise, the concentration of lactic acid in the blood of the two people was measured.

**Table 5** shows the results.

**Table 5**

| | **Concentration of lactic acid in arbitrary units** |
|---|---|
| Person **A** | 22 |
| Person **B** | 4 |

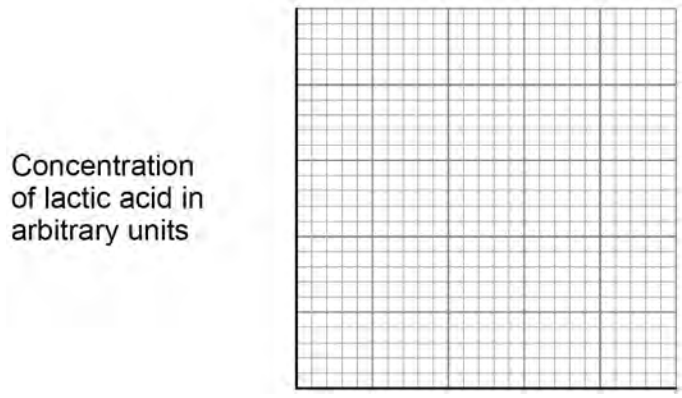
**0 4 . 5** Complete the bar chart in **Figure 9**.

You should:

- use a suitable scale for the *y*-axis
- plot the data from **Table 5**
- label each bar.

**[3 marks]**

**Figure 9**



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**0 4 . 6** The concentration of lactic acid in the blood of person **A** is proportional to the intensity of the exercise.

Which symbol means 'proportional to'?

**[1 mark]**

Tick (✓) **one** box.

~ ☐

> ☐

∝ ☐

13

**Turn over for the next question**

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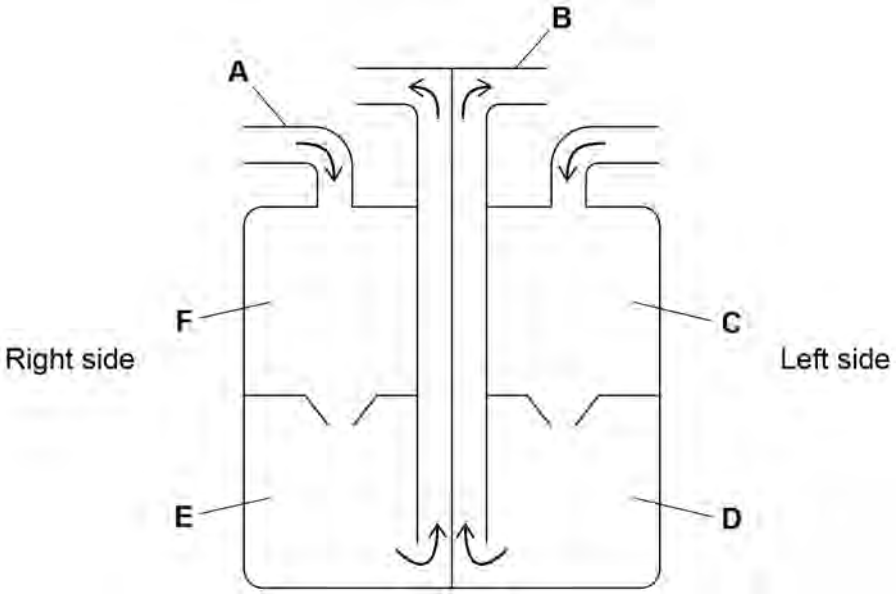
**0 5** The heart is an organ that pumps blood around the body.

**Figure 10** is a model of the heart and shows the direction of blood flow.

**Figure 10**




**0 5 . 1** Draw **one** line from each blood vessel shown in **Figure 10** to the name of the blood vessel.

**[2 marks]**

| Blood vessel | Name |
|---|---|
| | Aorta |
| A | Pulmonary artery |
| B | Pulmonary vein |
| | Vena cava |

*Do not write outside the box*

**0 5 . 2** Heart rate is controlled by a group of cells.

The group of cells acts as a pacemaker.

Where would the pacemaker be located in **Figure 10**?

**[1 mark]**

Tick (✓) **one** box.

**C** ☐ **D** ☐ **E** ☐ **F** ☐

**0 5 . 3** Heart muscle cells contain many mitochondria.

Explain why heart muscle cells contain many mitochondria.

**[3 marks]**

**Question 5 continues on the next page**

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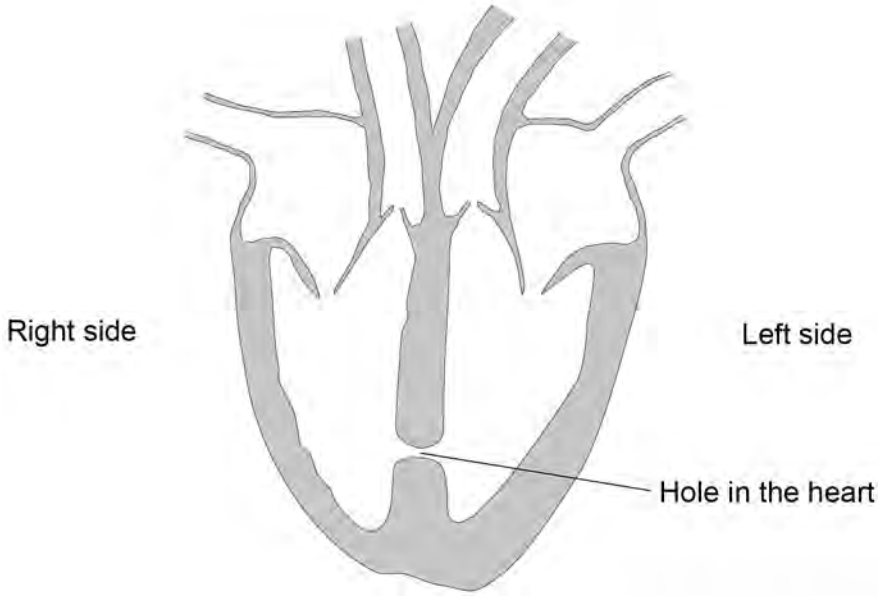
A small number of people are born with a 'hole in the heart'.

**Figure 11** shows the position of a hole in the heart.

**Figure 11**




**0 5 . 4** The hole allows some blood from the right side of the heart to mix with blood in the left side of the heart.

Suggest **two** symptoms of having a hole in the heart.

**[2 marks]**

1 _____

_____

2 _____

_____

Do not write outside the box

**0 5 . 5** In an operation to repair a hole in the heart:

- a flexible tube is inserted into a blood vessel and guided to the heart
- a mesh patch is passed down the tube
- the mesh patch covers the hole.

Heart tissue grows around the mesh and closes the hole.

Suggest **two** possible risks of this operation to repair a hole in the heart.

**[2 marks]**

1 _____

_____

2 _____

_____

10

**Turn over for the next question**

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**0 6** Chickenpox is an infectious disease that affects young children.

**0 6 . 1** One symptom of chickenpox is small blisters on the skin.

Suggest **one** way chickenpox spreads from an infected person to other people.

**[1 mark]**

**0 6 . 2** Chickenpox is caused by a type of pathogen that **cannot** be treated with antibiotics.

Give the reason why chickenpox **cannot** be treated with antibiotics.

**[1 mark]**

A vaccine that could be used to protect against chickenpox has been produced.

**0 6 . 3** What does a vaccine contain that causes a person to become immune to a disease?

**[1 mark]**

**0 6 . 4** Give **three** reasons why a new vaccine must be tested.

**[3 marks]**

1

2

3

**0 6 . 5** Explain how a vaccine for chickenpox gives immunity against the disease.

You should refer to how the body responds to:

- the vaccine
- chickenpox pathogens that enter the body after vaccination.

**[6 marks]**

Extra Space

12

**END OF QUESTIONS**

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**ANSWER IN THE SPACES PROVIDED**

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| Question number | **Additional page, if required.**<br>**Write the question numbers in the left-hand margin.** |
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**ANSWER IN THE SPACES PROVIDED**