

**Organisation – GCSE Biology Paper 1**

1. No.1

0 1

Plants are made of cells, tissues and organs.

0 1

. 1

Which part of a plant is the largest?

**[1 mark]**Tick (✓) **one** box.

A guard cell

☐

A leaf

☒

A root hair

☐

Students investigated the effect of concentration of salt solution on the mass of pieces of potato.

This is the method used.

1. Cut two pieces of potato to the same size.
2. Record the mass of each piece of potato.
3. Place one piece of potato into a beaker containing a dilute salt solution.
4. Place the other piece of potato into a beaker containing a concentrated salt solution.
5. After 20 minutes, remove each piece of potato from its solution.
6. Record the change in mass of each piece of potato.
7. Repeat steps 1 to 6 two more times.

**Table 1** shows the results.

**Table 1**

| Solution                   | Change in mass of piece of potato in grams |        |        |      |
|----------------------------|--------------------------------------------|--------|--------|------|
|                            | Test 1                                     | Test 2 | Test 3 | Mean |
| Dilute salt solution       | 1.1                                        | 1.1    | 1.4    | X    |
| Concentrated salt solution | -7.2                                       | -6.8   | -32.4  | -7.0 |

0 1 . 2

Calculate mean value **X** in **Table 1**.

[2 marks]

$$(1.1 + 1.1 + 1.4) \div 3 = \frac{3.6}{3} = 1.2$$

X = 1.2 gramsThere is an anomalous result for the concentrated salt solution in **Table 1**.

0 1 . 3

Draw a ring around the anomalous result in **Table 1**.

[1 mark]

-32.4

0 1 . 4

What did the students do with the anomalous result when calculating the mean in **Table 1**?

[1 mark]

The anomalous result was not used in the calculation of the mean

0 1 . 5

What name is given to a variable that is kept the same during an investigation?

[1 mark]

Tick (✓) **one** box.

Control variable

☒

Dependent variable

☐

Independent variable

☐

0 1 . 6

One variable the students kept the same during the investigation was the size of the pieces of potato.

Which other variable did the students keep the same?

[1 mark]

Tick (✓) **one** box.

Change in mass of pieces of potato

☐

*- it was changing with time*

Concentration of salt solution

☐

*- It was not constant*

Time in the salt solution

☒

0 1 . 7

The pieces of potato in the concentrated salt solution decreased in mass.

Complete the sentence.

Choose the answer from the box.

[1 mark]

excretion

osmosis

respiration

Water moved out of the potato by the process of osmosis.

0 1 . 8

The potato cells have a partially permeable membrane.

Which particles can pass through a partially permeable membrane?

[1 mark]

Tick (✓) **one** box.

No particles

☐

Some particles

☒

All particles

☐

*-only particles that are smaller  
than pores on the cell membrane  
can pass*

0 1 . 9

How could the students improve their investigation?

[1 mark]

Tick (✓) **one** box.

Boil the pieces of potato at the start.

☐*-makes results invalid*

Leave the skin on some pieces of potato.

☐*-makes results invalid*

Use more concentrations of salt solution.

☒*-gives reliable results*

1

2. No.5

0 5

This question is about food and digestion.

0 5

. 1

Proteins are needed to make new body cells by mitosis.

Give **one** reason why a person needs new body cells.

[1 mark]

To replace old cells  
To grow

0 5

. 2

What are proteins made of?

[1 mark]

Tick (✓) **one** box.

Amino acids

☒

- basic unit of proteins

Fatty acids

☐

- monomers of lipids

Glucose

☐

- basic unit of carbohydrates

Starch

☐

- polysaccharide

0 5

. 3

Which chemical is used to test for protein in food?

[1 mark]

Tick (✓) **one** box.

Benedict's reagent

☐

- tests simple sugar

Biuret reagent

☒

- tests proteins

Ethanol

☐

- tests lipids

0 5 4

What colour would be seen in a positive test for protein?

[1 mark]

Tick (✓) **one** box.

- Black ☐ - positive test for (iodine test) starch
- Purple ☒
- Red ☐ - positive test for simple sugar
- White ☐ - false - no food tests give white colour

Enzymes break down food molecules in the human body.

0 5 5

Characteristics of enzymes are linked to their function.

Draw **one** line from each characteristic to its effect on enzyme function.

[2 marks]

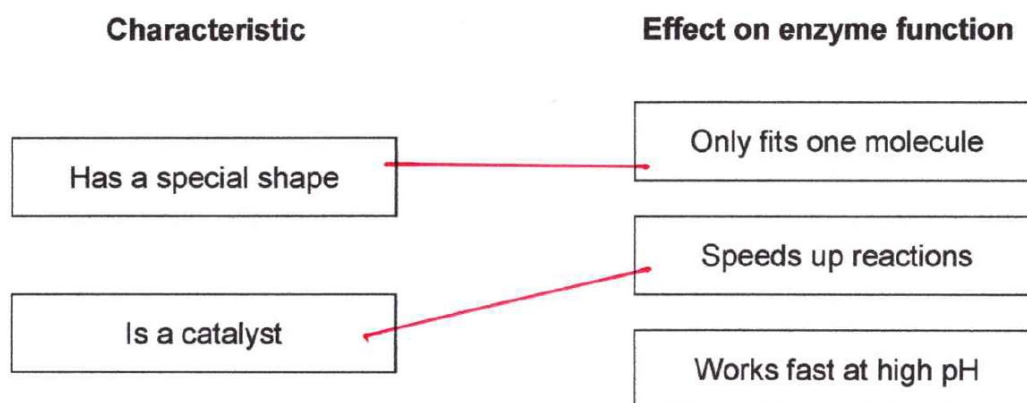
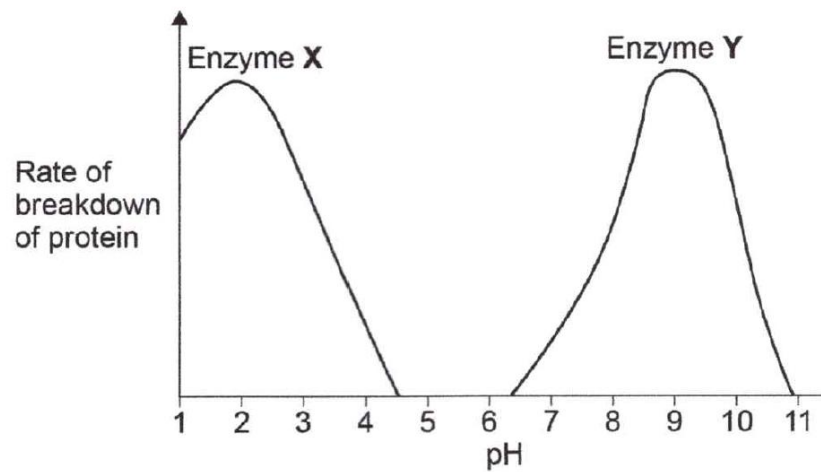


Figure 3 shows how pH affects the rate of breakdown of protein.

Figure 3



0 5 . 6 Which pH does enzyme Y work fastest at?

[1 mark]

pH = 9

At pH 9, rate of enzyme activity is maximum (optimal)

0 5 . 7 Explain why enzyme X works best in the stomach.

[2 marks]

At pH 2, enzyme X has the maximum rate of breakdown of protein into amino acids. The stomach has a pH of 2 which is the optimal pH for enzyme X. Stomach produces HCl.

05.8

Complete the sentences.

Choose answers from the box.

[2 marks]

active site

antigen

glucose

starch

substrate

Enzyme Y does **not** break down protein at pH 6 because the shape of the enzyme has changed.

The part of the enzyme that changes shape is

the active site.

The change in shape means the enzyme cannot bind to

the substrate.

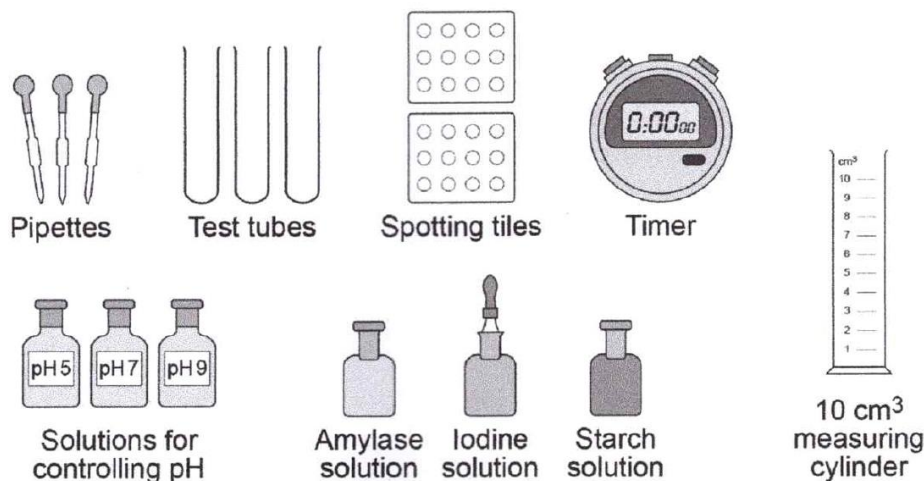
05.9

Amylase is an enzyme which breaks down starch.

A student investigated the effect of pH on the rate of starch breakdown by amylase.

Figure 4 shows some of the apparatus the student used.

Figure 4



Describe a method to investigate the effect of pH on the rate of starch breakdown by amylase.

You should include the apparatus shown in Figure 4.

[6 marks]

Add 3 cm<sup>3</sup> of starch solution to spotting tile. Then add drops of iodine solution using pipette to the starch solution. Then add solutions for controlling pH, label them each as pH 7, pH 5, and pH 9. Then add amylase solution to the spotting tile with starch solution at different each pH. Then start a timer and measure how long it takes for the colour of the starch solution to change. At start, all the starch solution turns blue black. The optimum pH of amylase is the one where starch solution will change colour the fastest.

Amylase breaks down starch into maltose. If starch is absent, iodine solution will stay brown (orange). Then repeat procedure for each pH and get an average of results. The volume and concentration of amylase and starch solution should be same in all the set-ups.

- Record time it takes for the mixture to remain orange at regular intervals.
- Remove a drop mixture at regular intervals using a pipette.

## 3. No.6

06

A root is a plant organ.

Plant roots contain many different types of tissue.

06

.1

What is a tissue?

[1 mark]

A group of similar cells that perform a specific role.

06

.2

Tissue in the tip of a plant root contains stem cells.

Stem cells can differentiate into any type of cell.

Name the type of tissue in plants that contains stem cells.

[1 mark]

meristem tissue

In the past many drugs were extracted from plants.

06

.3

Aspirin is a painkiller.

Which plant does aspirin originate from?

[1 mark]

Willow

Scientists have extracted chemical **A** from the deadly nightshade plant.

Chemical **A** can be used as a painkiller.

**Table 5** shows information about where chemical **A** is found.

**Table 5**

| Part of deadly nightshade plant | Mass of chemical A in 100 g of plant tissue in grams |
|---------------------------------|------------------------------------------------------|
| Roots                           | 1.3                                                  |
| Leaves                          | 1.2                                                  |
| Berries                         | 0.7                                                  |

**0 6 . 4**

The scientists usually extract chemical **A** from the berries of the deadly nightshade plant.

Suggest **one** reason why berries are used instead of leaves or roots.

**[1 mark]**

*The berries are easier to access.*

A deadly nightshade plant has chlorosis (yellow leaves).

The mass of chemical **A** found in the **leaves** of the plant is 60% of the mass shown in **Table 5**.

0 6 . 5

Calculate the mass of chemical **A** in 200 g of the **leaves** with chlorosis.

Give your answer in mg.

[4 marks]

$$\text{Mass of chemical A in leaves} = \frac{60}{100} \times 1.2 = 0.72\text{g}$$

$$0.72 \times 2 = 1.44\text{g}$$

$$1000\text{mg} = 1\text{g}$$

$$1.44 \times 1000\text{mg} = 1440\text{mg}$$

Mass of chemical **A** = 1440 mg

0 6 . 6

Suggest **one** reason why the leaves of the deadly nightshade plant have chlorosis.

[1 mark]

lack of chlorophyll

deficiency of magnesium ions

Chemical **A** has **not** been tested in large-scale clinical trials in the UK.

0 6 . 7

It is important for drugs to be tested in clinical trials before the drugs are approved for use by the public.

Give **two** reasons why.

[2 marks]

- 1 To check if it is safe to use on humans'  
To establish its efficacy
- 2 To check dosage

There are many online reports making claims about the effects of chemical **A**.

Some of these reports are biased.

0 6 . 8

Suggest **one** reason why a report making claims about the effects of chemical **A** may be biased.

[1 mark]

The companies may be writing to get  
financial gain.

06.9

How can scientists be sure that claims about new drugs are valid?

[1 mark]

Tick (✓) **one** box.

Advertise the claims on social media.

☐

Ask an international company to produce the drug.

☐

Have the claims peer reviewed.

☒

Publish the claims in a newspaper.

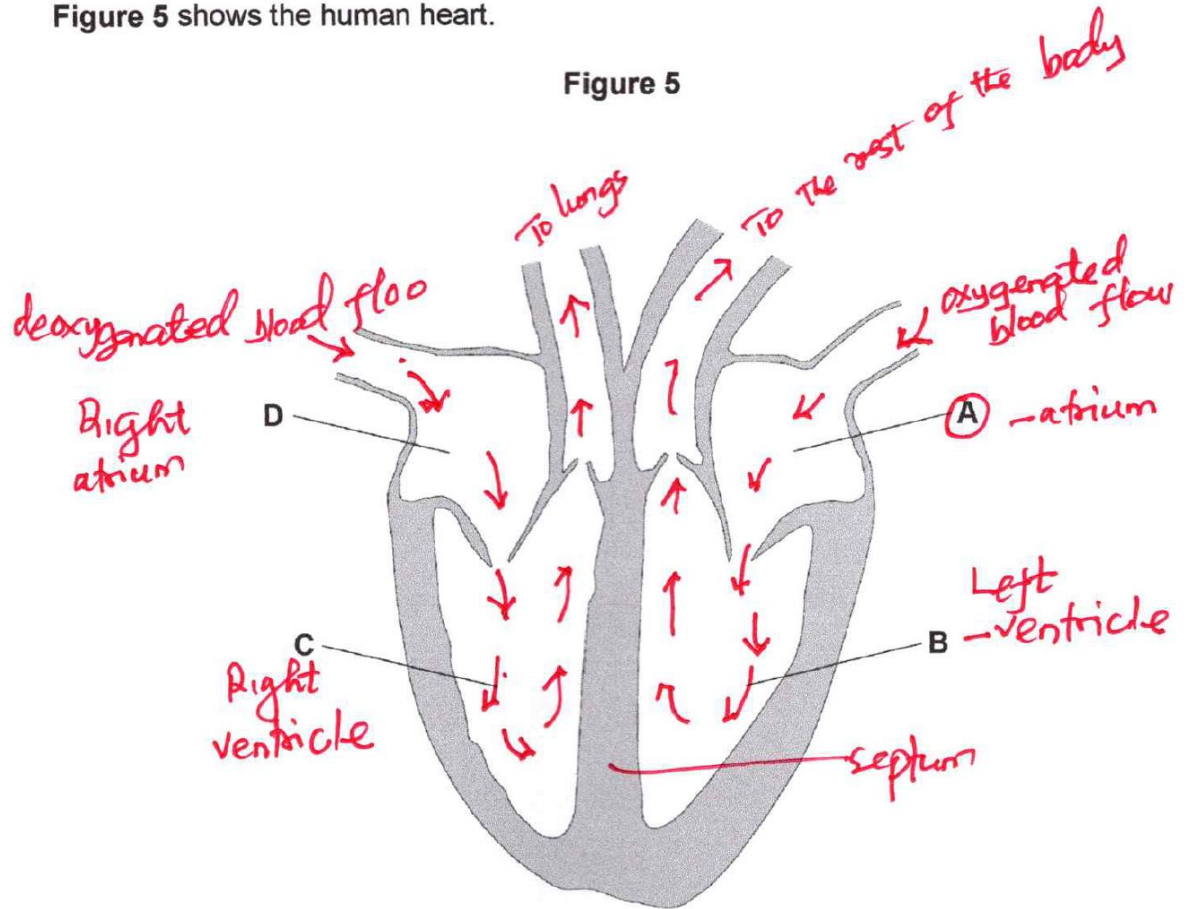
☐

4. No.7

0 7

This question is about the circulatory system.

Figure 5 shows the human heart.



0 7 . 1

Which part of the heart receives oxygenated blood from the lungs?

[1 mark]

Tick (✓) **one** box.

|   |                                     |   |                          |   |                          |   |                          |
|---|-------------------------------------|---|--------------------------|---|--------------------------|---|--------------------------|
| A | <input checked="" type="checkbox"/> | B | <input type="checkbox"/> | C | <input type="checkbox"/> | D | <input type="checkbox"/> |
|---|-------------------------------------|---|--------------------------|---|--------------------------|---|--------------------------|

0 7 . 2

Which part of the heart pumps deoxygenated blood to the lungs?

[1 mark]

Tick (✓) **one** box.

|   |                          |   |                          |   |                                     |   |                          |
|---|--------------------------|---|--------------------------|---|-------------------------------------|---|--------------------------|
| A | <input type="checkbox"/> | B | <input type="checkbox"/> | C | <input checked="" type="checkbox"/> | D | <input type="checkbox"/> |
|---|--------------------------|---|--------------------------|---|-------------------------------------|---|--------------------------|

0 7 . 3 A group of cells called the pacemaker controls the resting heart rate.

Where in the heart is the pacemaker found?

[1 mark]

Tick (✓) **one** box.

Left atrium

☐

Left ventricle

☐

Right atrium

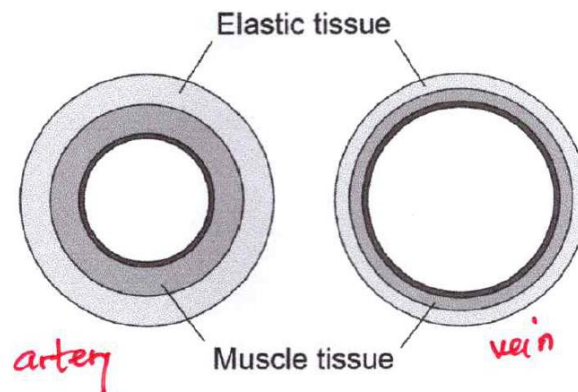
☒

Right ventricle

☐

0 7 . 4 Figure 6 shows a cross section of an artery and of a vein.

Figure 6



Describe **two** ways that the structure of an artery is different from the structure of a vein.

[2 marks]

- 1 Artery has thicker muscular wall than vein  
Artery has <sup>no</sup> valves while veins have valves.
- 2 Artery has a narrow lumen than a vein

07.5

In coronary heart disease, the coronary arteries become narrower.

A build-up of fatty material can cause a blockage in a coronary artery.

**Table 6** shows how a blockage in a coronary artery affects blood flow.

**Table 6**

| Percentage (%) of coronary artery that is blocked | Blood flow in cm <sup>3</sup> /minute |
|---------------------------------------------------|---------------------------------------|
| 0                                                 | 100 ✓                                 |
| 10                                                | 64 ✓                                  |
| 20                                                | 42 ✓                                  |
| 50                                                | 8 ✓                                   |
| 80                                                | 2                                     |

Describe the trend shown in **Table 6**.

[1 mark]

As the percentage of the coronary that is blocked increases, blood flow decreases.

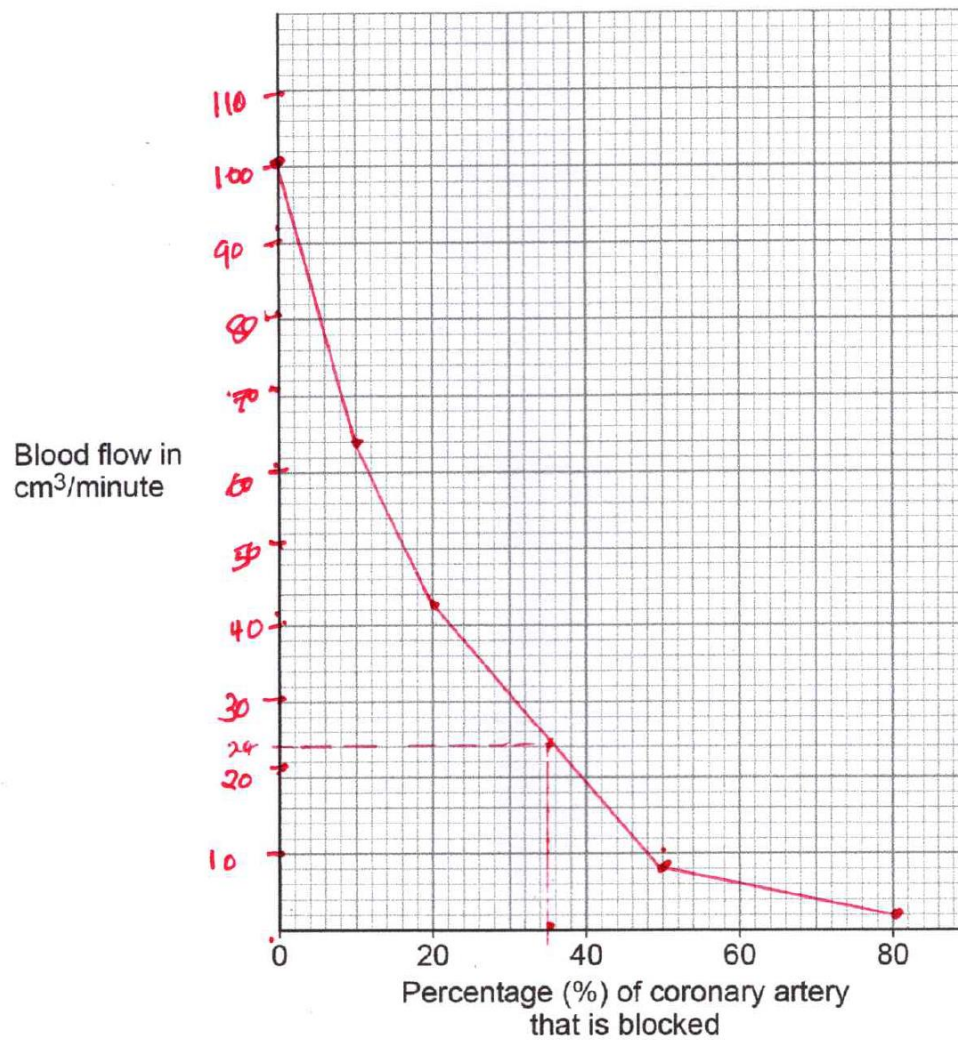
07.6

Complete **Figure 7**.

You should:

- use a suitable scale for the y-axis
- plot the data from **Table 6**
- draw a line of best fit.

[4 marks]

**Figure 7**

07.7

Predict the blood flow in a coronary artery with a 35% blockage.

Use **Figure 7**.

[1 mark]

Blood flow = 24  $\text{cm}^3/\text{minute}$

07.8

Explain the effect of a partly blocked coronary artery on the human body.

[6 marks]

- Blockage of coronary arteries reduce blood flow to heart muscle. This reduces oxygen supply to heart muscle cells. So, less aerobic respiration takes place at the heart muscle cells. So, less energy is produced for muscle contraction.
- Less muscle contraction means there will be reduced exchange of gases at the lungs. So, less carbon dioxide is removed from body cells. This results in tiredness.
  - Build up of carbon dioxide in cells makes them acidic. This causes breathlessness.
  - Reduced oxygen uptake forces cells to respire anaerobically thereby producing more carbon dioxide and lactic acid.
- Accumulation of lactic acid causes fatigue.

07.9

There are different treatments for a blockage in a coronary artery.

Explain how **one** treatment for a blockage in a coronary artery works.

[2 marks]

Insert stent into blocked coronary artery to open it. The diseased part of the heart may also be replaced <sup>with</sup> a healthy one.

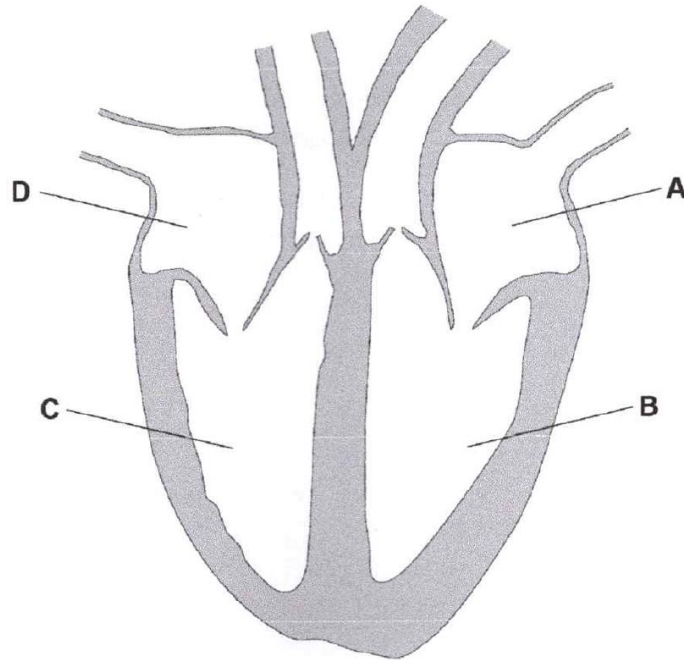
5. No.2

0 2

This question is about the circulatory system.

Figure 1 shows the human heart.

Figure 1



0 2 . 1

Which part of the heart receives oxygenated blood from the lungs?

[1 mark]

Tick (✓) **one** box.

A

☒

B

☐

C

☐

D

☐

pulmonary vein  
(receives blood)  
from lungs

L. ventricle  
(pumps blood)  
(out of body)

R. ventricle  
(pumps blood)  
to lungs

R. atrium  
(receives blood from  
vena cava)

0 2 . 2

Which part of the heart pumps deoxygenated blood to the lungs?

[1 mark]

Tick (✓) **one** box.

A

☐

B

☐

C

☒

D

☐

0 2 . 3

A group of cells called the pacemaker controls the resting heart rate.

Where in the heart is the pacemaker found?

[1 mark]

Tick (✓) **one** box.

Left atrium

☒

Left ventricle

☐

Right atrium

☐

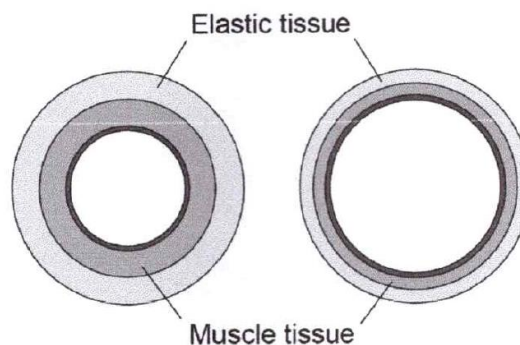
Right ventricle

☐

0 2 . 4

Figure 2 shows a cross section of an artery and of a vein.

Figure 2



Describe **two** ways that the structure of an artery is different from the structure of a vein.

[2 marks]

- 1 Artery has thicker elastic tissue than veins.  
Artery does not have valves but veins have valves
- 2 Artery has narrow lumen than the veins

**0 2 5**

In coronary heart disease, the coronary arteries become narrower.

A build-up of fatty material can cause a blockage in a coronary artery.

**Table 2** shows how a blockage in a coronary artery affects blood flow.

**Table 2**

| Percentage (%) of coronary artery that is blocked | Blood flow in cm <sup>3</sup> /minute |
|---------------------------------------------------|---------------------------------------|
| 0                                                 | 100 ✓                                 |
| 10                                                | 64 ✓                                  |
| 20                                                | 42 ✓                                  |
| 50                                                | 8 ✓                                   |
| 80                                                | 2                                     |

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

[1 mark]

As the percentage of the coronary artery that is blocked increases, blood flow decreases.

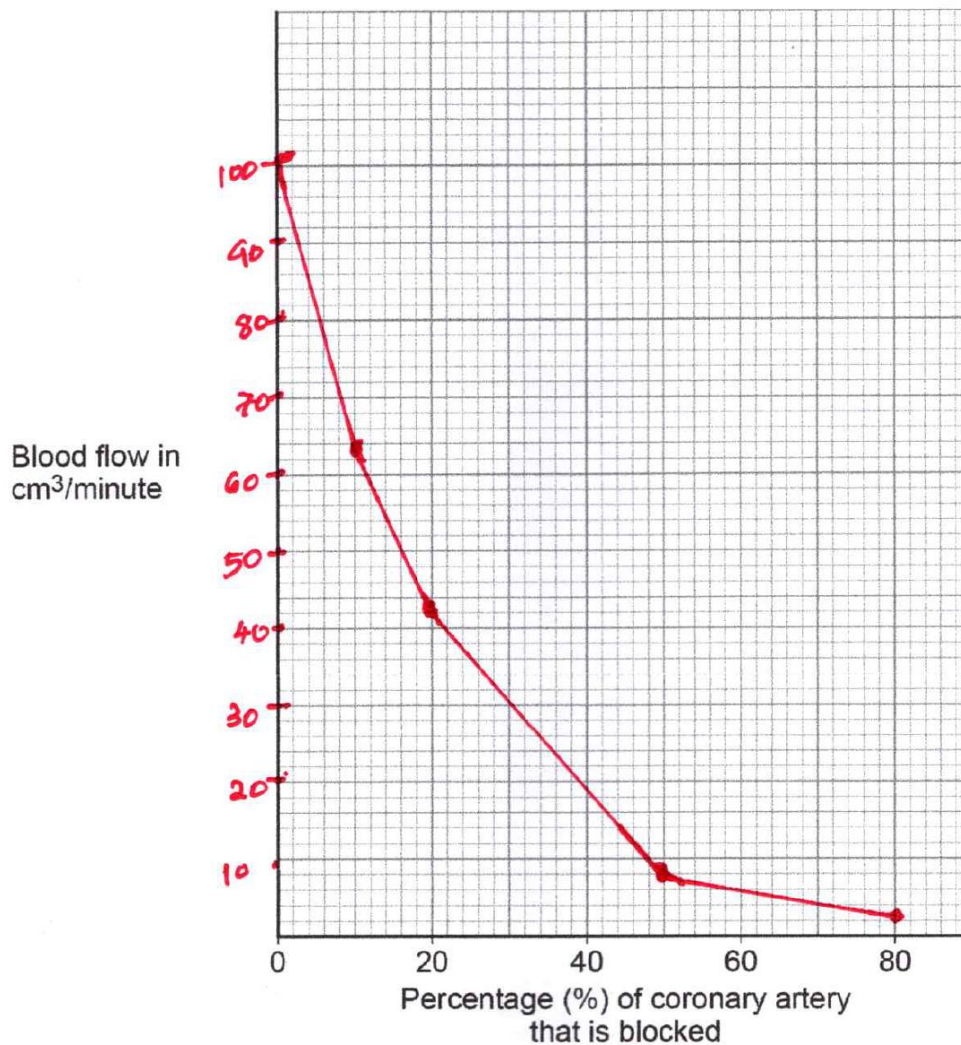
0 2 . 6 Complete Figure 3.

You should:

- use a suitable scale for the y-axis
- plot the data from **Table 2**
- draw a line of best fit.

[4 marks]

Figure 3



0 2 . 7 Predict the blood flow in a coronary artery with a 35% blockage.

Use Figure 3.

[1 mark]

Blood flow = \_\_\_\_\_ cm³/minute

0 2 . 8

Explain the effect of a partly blocked coronary artery on the human body.

[6 marks]

- Blockage in coronary artery reduces blood flow to heart muscle. This reduces supply of oxygen and glucose to the heart muscle.
- So, <sup>aerobic</sup> respiration in heart muscle cells will be reduced. This makes heart muscle cells to respire anaerobically to produce less energy.
- Anaerobic respiration at the heart cells generate lactic acid which cause muscle fatigue.
- When less energy is produced in muscle cells, heart muscle will contract less. This will make blood flow to be slow so that less carbon dioxide is removed from body cells.

0 2 . 9

There are different treatments for a blockage in a coronary artery.

Explain how **one** treatment for a blockage in a coronary artery works.

[2 marks]

- Insert stent to open the blocked coronary artery.
- Reduce blood cholesterol.

6. No.4

0 4

This question is about exercise.

0 4

1

During vigorous exercise, anaerobic respiration occurs in a person's body.

Explain **two** effects of anaerobic respiration on the person's body.

[4 marks]

1 Muscle fatigue - anaerobic respiration produces lactic acid that needs oxygen to breakdown. Accumulation of lactic acid causes pain in muscles

2 Weaker muscle contractions - anaerobic respiration produces less energy for muscle contraction.

0 4

2

Design an investigation to show the effect of different types of exercise on the heart rate of athletes.

[6 marks]

- Test a group of athletes of same sex, same age, and same health status. Use two different types of each exercise for each athlete.
- Record heart rate of each athlete before and after the exercise. Then calculate mean heart rate for each athlete for each type of exercise that they do.
- Compare mean increase in heart rates for each type of exercise.
- The athletes must get rest before they start each exercise. Each type of exercise will have a different increase in heart rate.

Anabolic steroids are drugs.

Anabolic steroids:

- increase muscle mass in humans
- are banned in most competitive sports.

Some athletes take anabolic steroids to improve their performance in sport.

0 4 . 3

Explain how taking anabolic steroids could improve an athlete's performance.

[2 marks]

Anabolic steroids makes an athlete stronger.  
They help build more muscle mass. This  
cause stronger muscle contractions.

Scientists use monoclonal antibodies to test for the presence of anabolic steroids in an athlete's urine.

To produce monoclonal antibodies, a mouse lymphocyte is combined with a tumour cell.

0 4 . 4

What type of cell is created when a mouse lymphocyte and a tumour cell combine?

[1 mark]

Tick (✓) **one** box.

Embryo

☐

- not related to monoclonal antibodies

Hybridoma

☒

Phagocyte

☐

-not related to monoclonal antibodies

Stem cell

☐

-not related to monoclonal antibodies.

0 4 . 5

Describe how scientists make monoclonal antibodies using the cell created when a mouse lymphocyte and a tumour cell combine.

[3 marks]

A cell is cloned to produce several identical cells. All these cells produce same antibody. Then, the antibodies are collected and purified.

0 4 . 6

What property makes a monoclonal antibody useful in detecting the presence of an anabolic steroid in urine?

[1 mark]

Tick (✓) one box.

A monoclonal antibody is quick and easy to produce.

-This cannot help to identify steroids in urine

☐

A monoclonal antibody is specific to only one person's urine.

Urine composition same in all humans.

☐

A monoclonal antibody only binds to the anabolic steroid.

- Complimentary to steroid.

☒

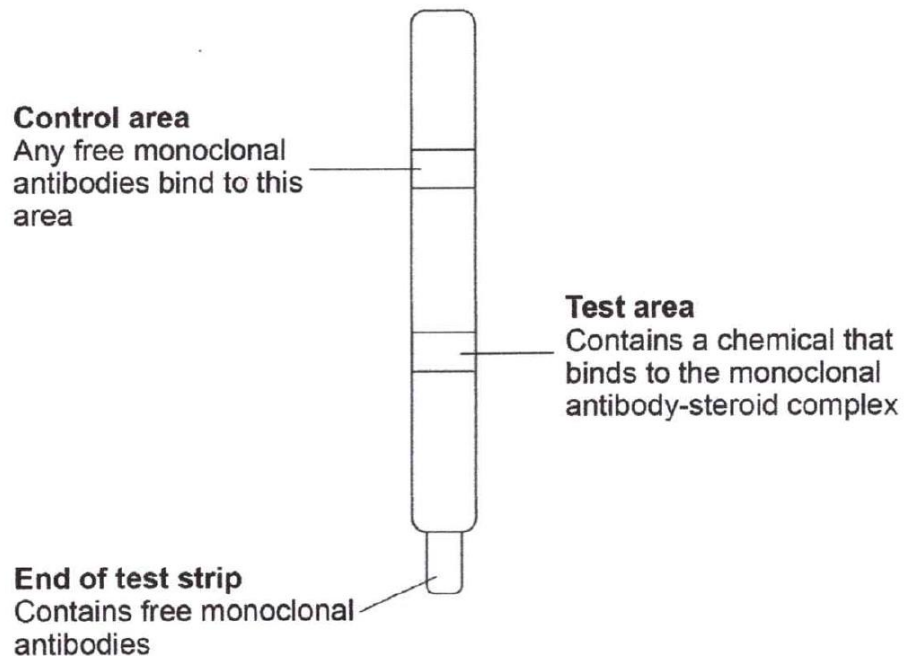
A monoclonal antibody can identify many different drugs at the same time.

No data available to support the claim

☐

**Figure 5** shows a test strip that can detect the presence of an anabolic steroid in an athlete's urine.

**Figure 5**



The end of the test strip is dipped in urine.

The urine moves up through the test strip.

The test area and the control area contain a dye.

The dye turns blue when monoclonal antibodies bind to it.

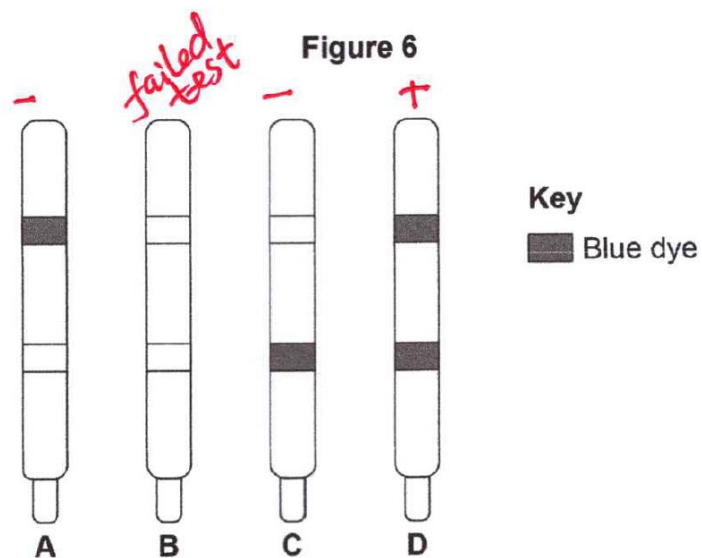
0 4 . 7

Suggest the purpose of the control area in the test strip.

[1 mark]

*To show that the test is working.*

Figure 6 shows the urine test results of four athletes.



0 4 . 8

Describe the evidence in **Figure 6** that shows the test for athlete **B** has **not** worked.

Suggest **one** reason why the test did **not** work.

[2 marks]

Evidence no blue dye in control area.

Reason The free monoclonal antibodies did not move up the test strip.

0 4 . 9

Which athlete has tested positive for anabolic steroids in their urine?

[1 mark]

Tick (✓) **one** box.

A ☐

*negative test*

B ☐

*negative test (failed test)*

C ☐

*negative test*

D ☒

*two strips of blue dye*