

AQA GCSE BIOLOGY TOPIC 2.2
(ANIMAL TISSUES, ORGANS & SYSTEMS) EXAM QUESTIONS

Q1.

Carbohydrates are needed as part of a balanced diet.

- (a) Which formula shows
glucose? Tick (✓) **one** box.

$C_6H_{12}O_6$

CO_2

H_2O

O_2

(1)

- (b) Which type of enzyme breaks down
starch? Tick (✓) **one** box.

Carbohydrase

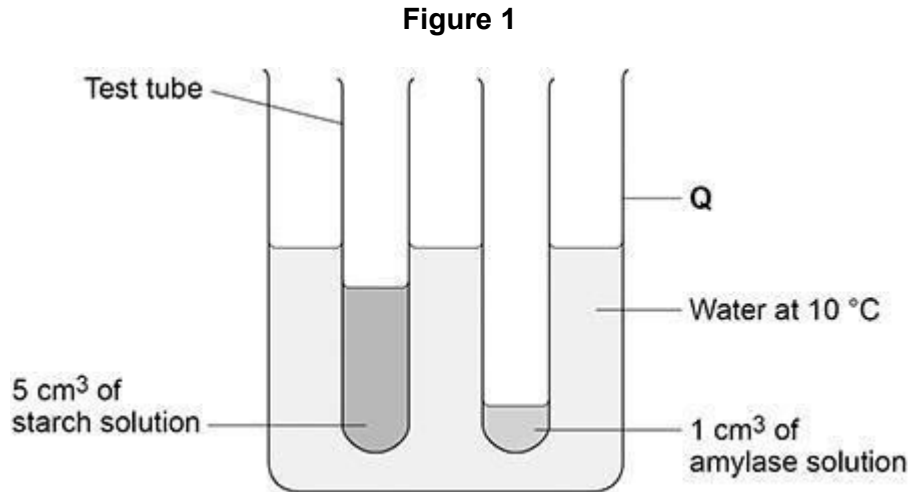
Lipase

Protease

(1)

A student investigated the effect of temperature on the activity of the enzyme
amylase.

Figure 1 shows the apparatus used.



This is the method used.

1. Set up the apparatus as shown in **Figure 1**.
2. After 5 minutes, pour the starch solution into the amylase solution and mix.
3. Remove one drop of the amylase-starch solution mixture and place onto a spotting tile.
4. Immediately add two drops of iodine solution to the amylase-starch solution mixture on the spotting tile.
5. Record the colour of the iodine solution added to the amylase-starch solution mixture.
6. Repeat steps 3 to 5 every minute until the iodine solution is yellow-brown.

(c) Name apparatus **Q** in **Figure 1**.

(1)

(d) Why were the starch solution and the amylase solution left for five minutes before mixing them together?

Tick (✓) **one** box.

So that both solutions could reach 10 °C

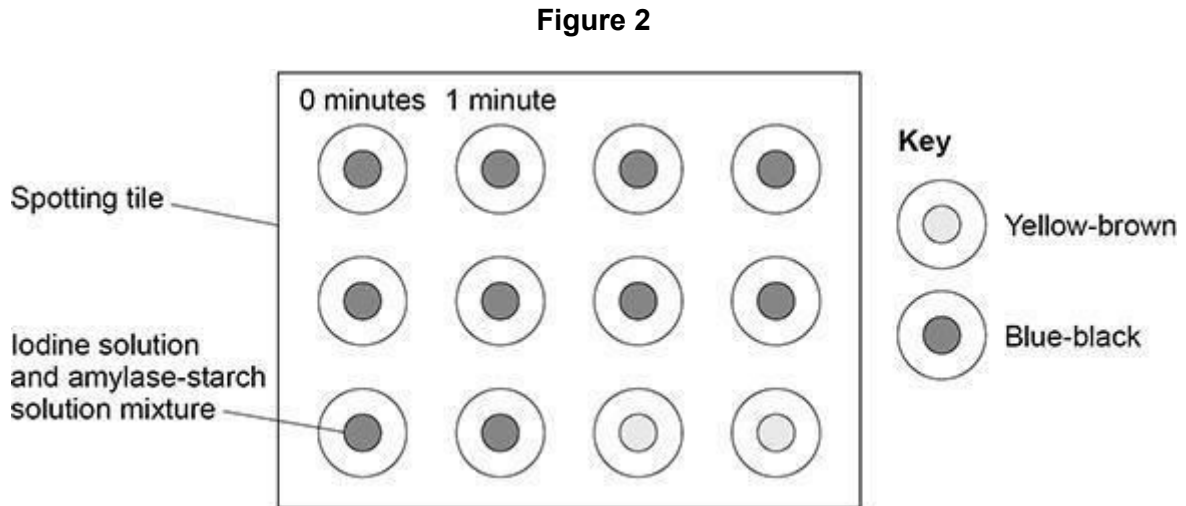
So that the student could calculate a mean

So that the student could repeat the investigation

So that the student had time to draw a table of results

(1)

Figure 2 shows the results.



- (e) How many minutes did it take until the iodine solution and amylase-starch solution mixture was yellow-brown?

Use **Figure 2**.

_____ minutes

(1)

- (f) How could a more accurate time be obtained? Tick (✓) **one** box.

Add more iodine solution to the spotting tile.

Test the mixture with iodine solution every 30 seconds.

Test the mixture with iodine solution for more time.

Use two drops of amylase-starch solution mixture in each test.

(1)

The student repeated the investigation at five different temperatures.

The table below shows the results.

Temperature in °C	Time taken until iodine solution and mixture was yellow-brown in minutes

20	5
35	2
50	7
65	12
80	Remained blue-black

(g) Which temperature did the enzyme work quickest at?

Tick (✓) **one** box.

20 °C

35 °C

50 °C

65 °C

(1)

(h) Explain why the iodine solution remained blue-black in the investigation at 80 °C.

(2)

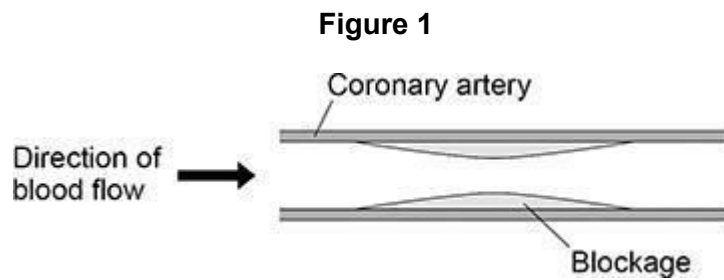
(Total 9 marks)

Q2.

A high cholesterol concentration in the blood can lead to blockages inside arteries.

The coronary arteries supply blood to the heart muscle.

Figure 1 shows a coronary artery with a blockage.



(a) Why could the blockage in **Figure 1** cause cells in the heart to die?

(2)

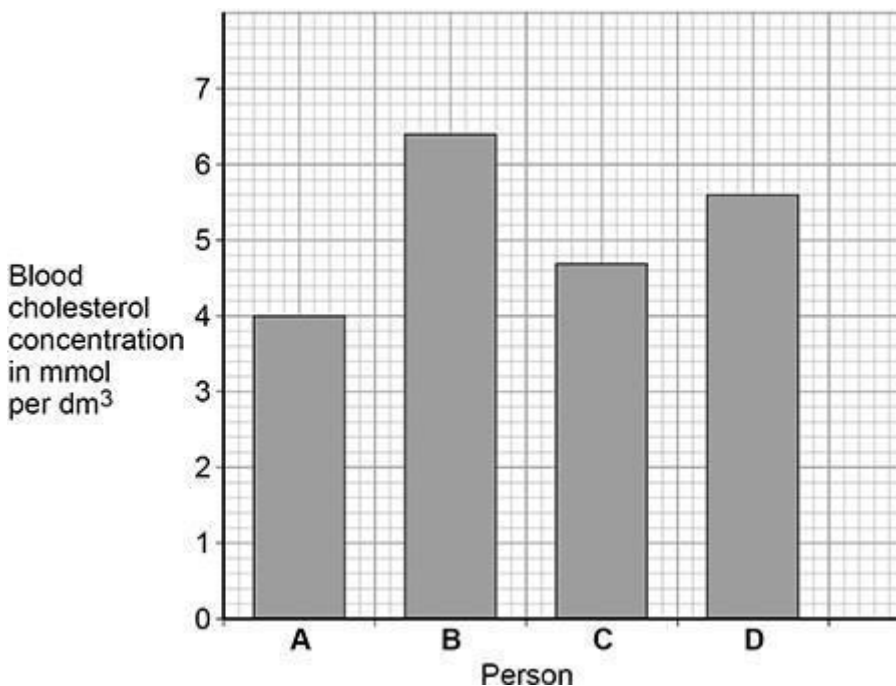
Doctors can measure the concentration of cholesterol in the blood.

The table below shows four different blood cholesterol categories.

Blood cholesterol concentration in mmol per dm ³	Cholesterol category
<4.6	Low
4.6–5.0	Normal
5.1–6.1	Medium
6.2 and above	High

Figure 2 shows the blood cholesterol concentration of four people.

Figure 2



(b) Which person is in the medium cholesterol category? Tick (✓) **one** box.

A B C D

(1)

(c) Which person is most at risk of having a heart attack? Tick (✓) **one** box.

A B C D

(1)

(d) Give a reason for your answer to part (c).

(1)

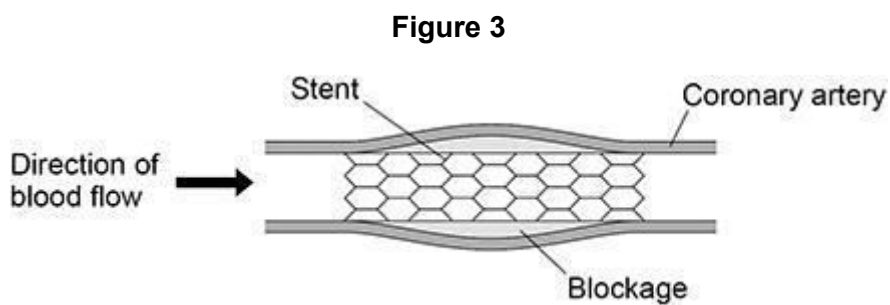
(e) The blood cholesterol concentration of person **D** is greater than the blood cholesterol concentration of person **A**.

Calculate how many times greater. Use **Figure 2**.

Number of times greater = _____

(2)

Figure 3 shows how a stent can be used to treat a person with a blockage in a coronary artery.



(f) Explain how a stent works as a treatment for a person with a blockage in a coronary artery.

(2)

Patients are given anti-clotting drugs after they have a stent fitted.

The drugs help to prevent clots forming in the blood.

(g) Which part of the blood starts the blood clotting process? Tick (✓) **one** box.

Antibodies	<input type="checkbox"/>
Plasma	<input type="checkbox"/>
Platelets	<input type="checkbox"/>
Red blood cells	<input type="checkbox"/>

(1)



- (h) When a stent is fitted the doctor gives the patient an injection of anti-clotting drugs.

The patient then takes one anti-clotting tablet every day. Anti-clotting drugs:

- are very effective
- can take a week to begin working fully
- have been used for over 60 years
- cost very little to make
- do **not** work effectively if the patient eats certain types of food.

The patient must have their blood tested every few weeks to check that the anti-clotting drugs are working.

Evaluate the use of anti-clotting drugs in patients who have had a stent fitted.

(4)

(Total 14 marks)

Q3.

Amylase is an enzyme that breaks down starch.

- (a) Amylase is a polymer of smaller molecules.

Name the type of smaller molecule.

(1)

(b) Name the **three** parts of the human digestive system that produce amylase.

- 1 _____
- 2 _____
- 3 _____

(2)

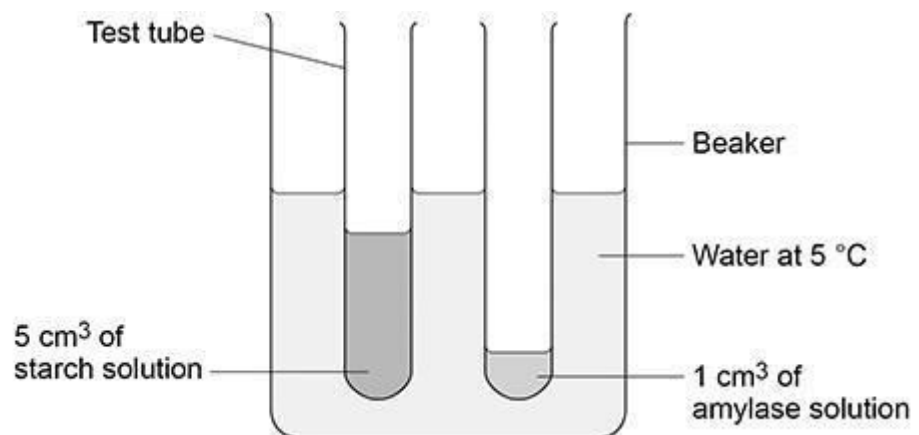
(c) Explain how amylase breaks down starch.

Answer in terms of the 'lock and key theory'.

(3)

A student investigated the effect of temperature on the activity of amylase.

The figure below shows the apparatus used.



This is the method used.

1. Set up the apparatus as shown in the figure above.
2. After 5 minutes, pour the starch solution into the amylase solution and mix.
3. Remove one drop of the starch-amylase mixture and place onto a spotting tile.
4. Immediately add two drops of iodine solution to the starch-amylase



mixture
on the spotting tile.

5. Record the colour of the iodine solution added to the starch-amylase mixture.
6. Repeat steps 3 to 5 every minute until the iodine solution stays yellow-brown.
7. Repeat steps 1 to 6 using water at different temperatures.

(d) Name **two** control variables the student used in the investigation.

1 _____

2 _____

(2)

(e) Why did the student leave the starch solution and amylase solution for 5 minutes before mixing them?

(1)

The table below shows the results of the investigation.

Temperature in °C	Time taken until iodine solution stays yellow-brown in minutes
5	did not become yellow-brown
20	5
35	2
50	7
65	14
80	did not become yellow-brown

(f) What conclusion can be made about the effect of temperature on amylase activity between 20 °C and 65 °C?

(1)

(g) Explain the results at 5 °C and at 80 °C.

Use the table above.

(5)

(h) The student investigated the effect of temperature on amylase activity.

Describe how the student could extend the investigation to determine the effect of a different factor on amylase activity.

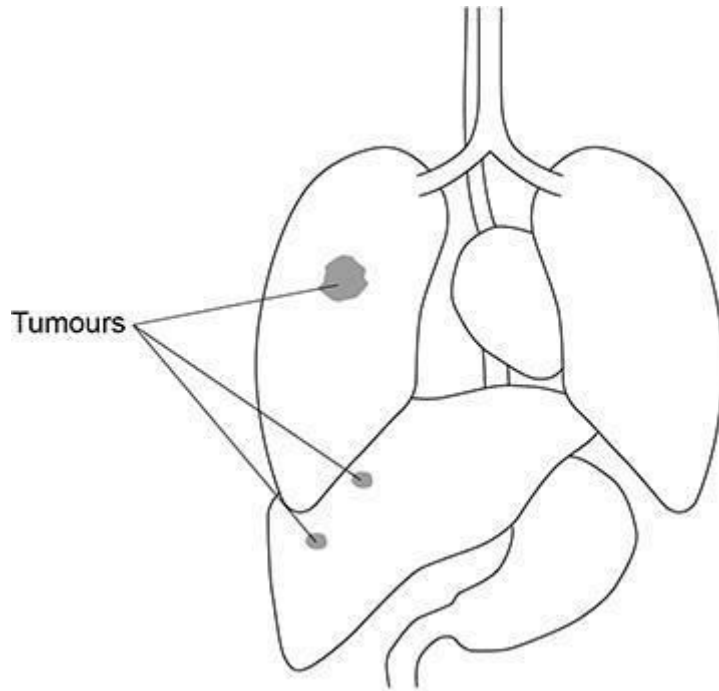
(2)

(Total 17 marks)

Q4.

Figure 1 shows where three of the same type of tumour were found in a patient.

Figure 1



Malignant tumours are cancers.

- (a) Describe what happens to cells when a tumour forms.

(1)

- (b) What evidence is there in **Figure 1** to suggest that the tumour in the lung is malignant?

(1)

- (c) Some types of cancer can cause the numbers of blood components in a person's body to fall to a dangerously low level.

A person with one of these types of cancer may experience symptoms such as:

- tiredness
- frequent infections
- bleeding that will not stop after the skin is cut.

Explain how a very low number of blood components in the body can cause these symptoms.

(6)

Some patients with a very low number of blood cells may be given a blood transfusion.

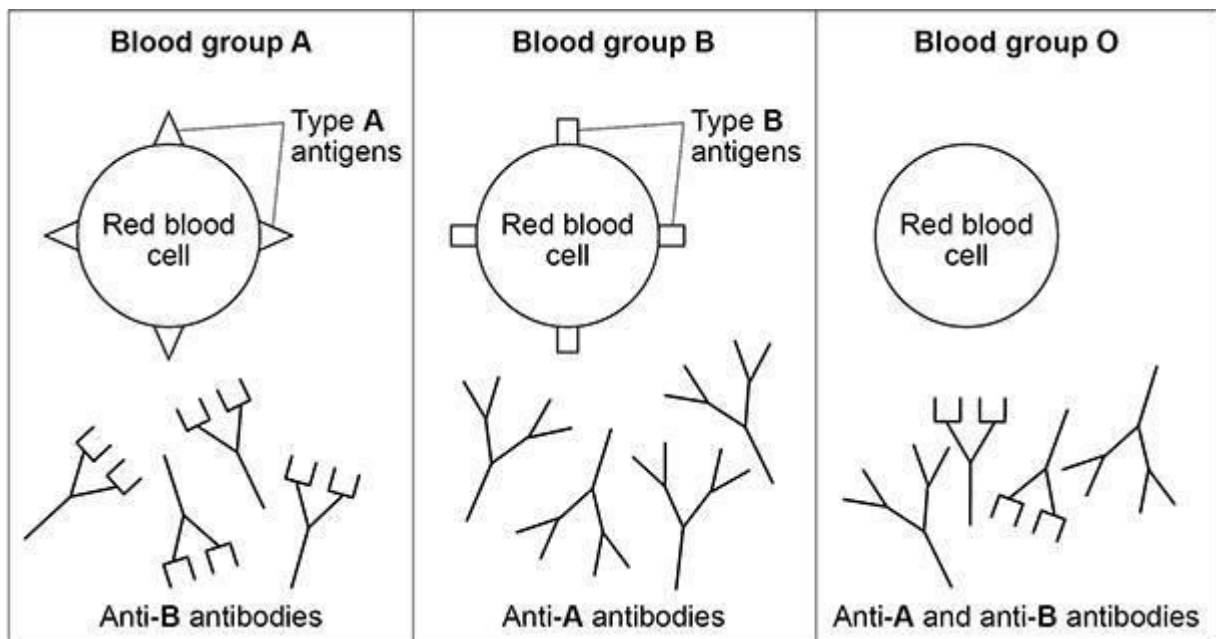
A blood transfusion is where a patient receives blood from a donor.

Different people have different blood groups.

Figure 2 shows:

- the red blood cells found in people with different blood groups
- the antibodies that can be made by people with different blood groups.

Figure 2



Antibodies can bind to antigens that have complementary shapes.

When antibodies bind to the antigens on red blood cells, many red blood cells begin to clump together.

Each red blood cell is about $8\ \mu\text{m}$ in diameter.

Many capillaries have an internal diameter of about $10\ \mu\text{m}$.

In one type of blood transfusion, **only** red blood cells from a donor are transferred to the patient.

- (d) It is dangerous for a patient with blood group **A** to receive red blood cells from a donor with blood group **B**.

Explain why.

(3)

- (e) Explain why blood group **O** red blood cells can be given to patients with any blood group.

(2)

- (f) The table below shows some of the risks associated with blood transfusions.

Risk	Probability of risk occurring
Allergic reaction	0.9 %
Hepatitis B infection	1 in (3×10^5)



Hepatitis C infection	6.7×10^{-7}
Kidney damage	1 in 70 000

Which risk has the **lowest** probability of occurring?

Tick (✓) **one** box.

Allergic reaction

Hepatitis B infection

Hepatitis C infection

Kidney damage

(1)

- (g) A person has a tumour blocking the tube leading from the gall bladder to the small intestine.

Explain why this person would have difficulty digesting fat.

(5)

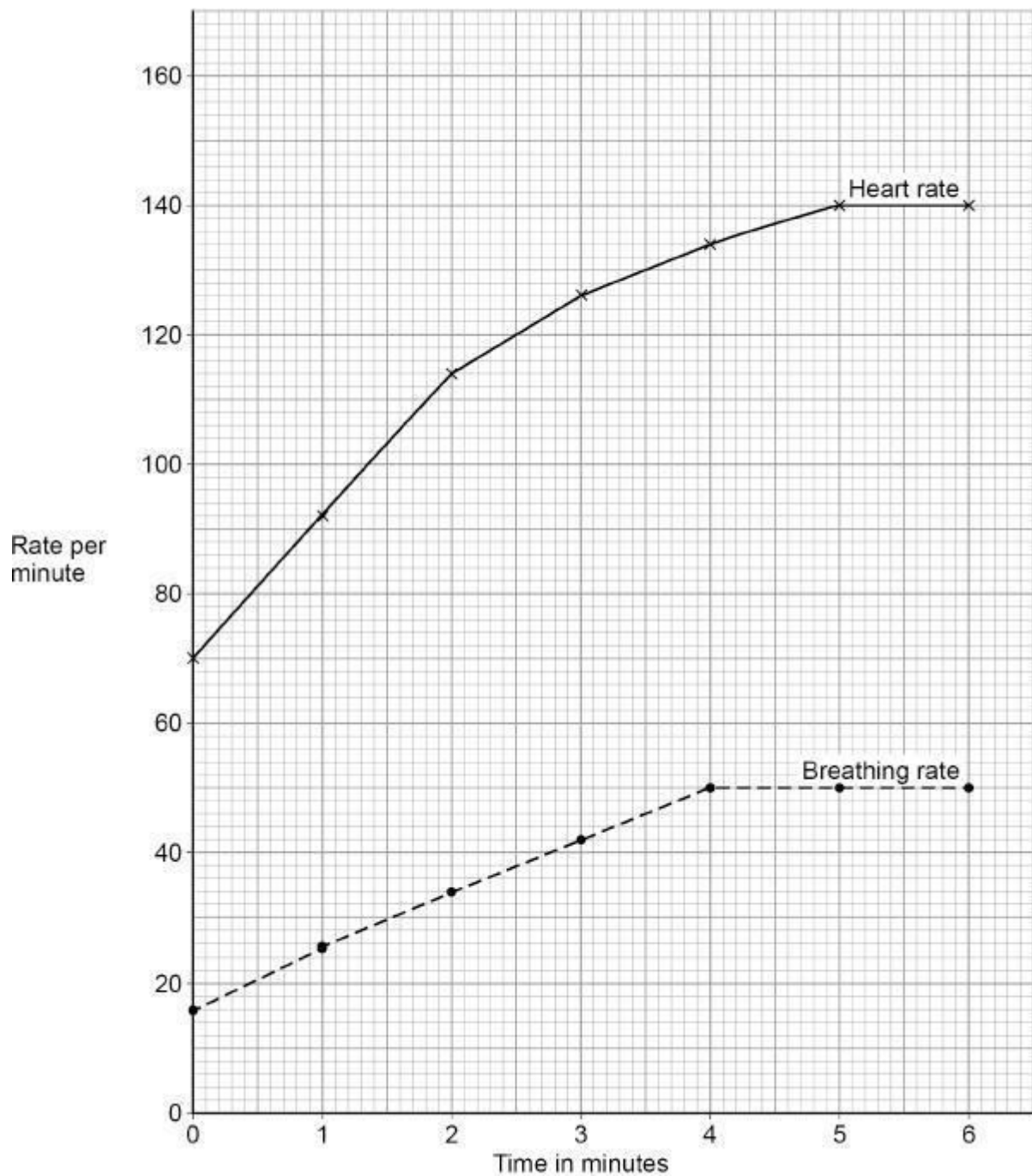
(Total 19 marks)

Q5.

A 45-year-old man exercised on a rowing machine for six minutes.

A fitness monitor recorded his heart rate and breathing rate every minute.

The graph below shows the results.



- (a) Describe the trend for breathing rate shown in graph. Use data from the graph in your answer.

(3)

- (b) The safe maximum heart rate for a person exercising can be calculated using the equation:

$$\text{safe maximum heart rate} = 220 - \text{age in years}$$

Calculate the safe maximum heart rate for the man.

$$\text{Safe maximum heart rate} = \underline{\hspace{2cm}} \text{ beats per minute}$$

(1)

- (c) What is the man's maximum heart rate? Use the graph above.

$$\text{Man's maximum heart rate} = \underline{\hspace{2cm}} \text{ beats per minute}$$

(1)

- (d) The man concluded that he was exercising at a safe heart rate. Give the reason for his conclusion.

Use your answers from part (b) and part (c)

(1)

- (e) Explain the ways the man's body has responded to the exercise.

Use information from the graph above.

(6)
(Total 12 marks)

Q6.

Blood is transported around the body in blood vessels.

- (a) Draw **one** line from each type of blood vessel to the structure of the blood vessel.

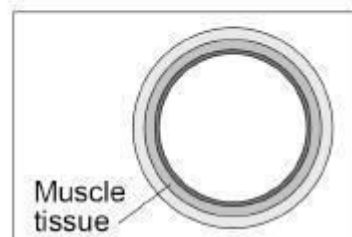
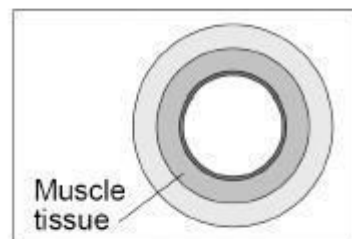
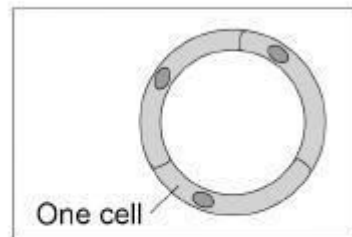
Type of blood vessel

Artery

Capillary

Vein

Structure of blood vessel

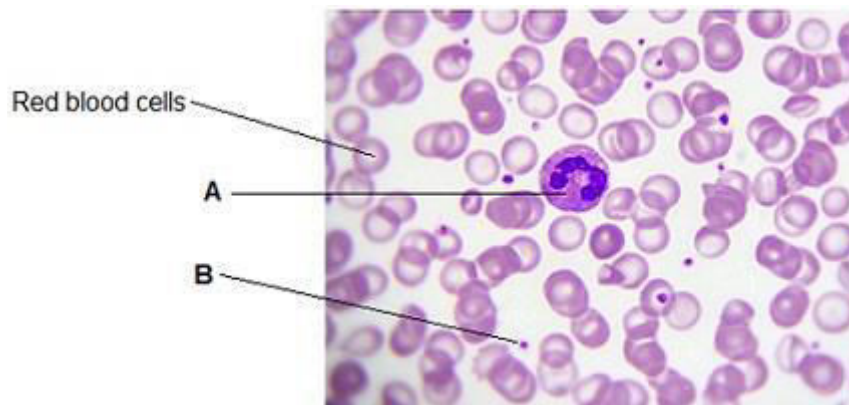


(2)

(b) Explain how the structure of an artery is related to its function.

(2)

The image below shows blood viewed through a microscope.



(c) Name **A** and **B** in the image.

A _____

B _____

(2)

(d) A red blood cell:

- has no nucleus
- contains a red pigment called haemoglobin.

Suggest how these adaptations help the red blood cell carry out its function.

No nucleus

Haemoglobin

(2)

- (e) The blood components are carried around the body in the liquid part of the blood.

What is the liquid part of the blood called? Tick (✓) **one** box.

Cell sap	<input type="checkbox"/>
Plasma	<input type="checkbox"/>
Saliva	<input type="checkbox"/>
Urine	<input type="checkbox"/>

(1)

The table below shows the results of a man's blood test.

Blood component	Patient results	Normal range
Red blood cells	4.8	4.5 to 6.5
Lymphocytes	2.6	1.0 to 4.0
Neutrophils	5.1	1.8 to 7.5
Platelets	50	140 to 400

- (f) Which component of the man's blood is **not** within the normal range?

(1)

- (g) Suggest a symptom the man might show.

(1)

(Total 11 marks)

Q7.

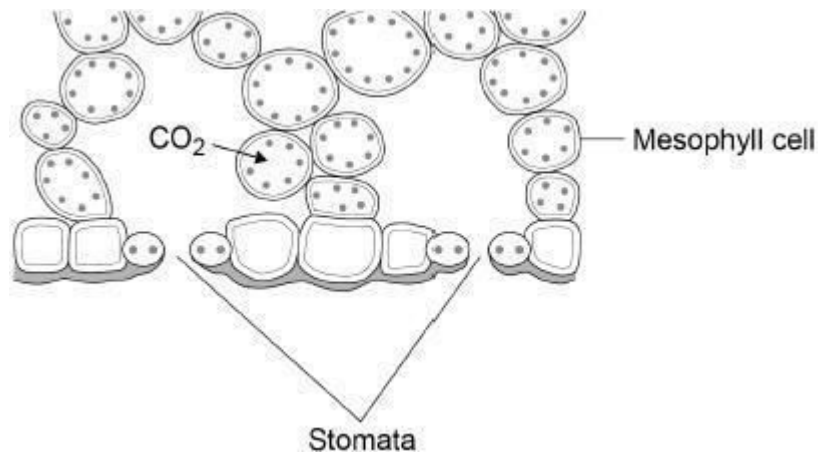
Diffusion is an important process in animals and plants.

(a) What is meant by the term diffusion?

(2)

(b) **Figure 1** shows part of a leaf.

Figure 1



Molecules of carbon dioxide diffuse from the air into the mesophyll cells.

Which **two** changes will increase the rate at which carbon dioxide diffuses into the mesophyll cells?

Tick (✓) **two** boxes.

- Decreased number of chloroplasts in the cells
- Decreased surface area of cells in contact with the air
- Increased carbon dioxide concentration in the air
- Increased number of stomata that are open

Increased oxygen concentration in the air

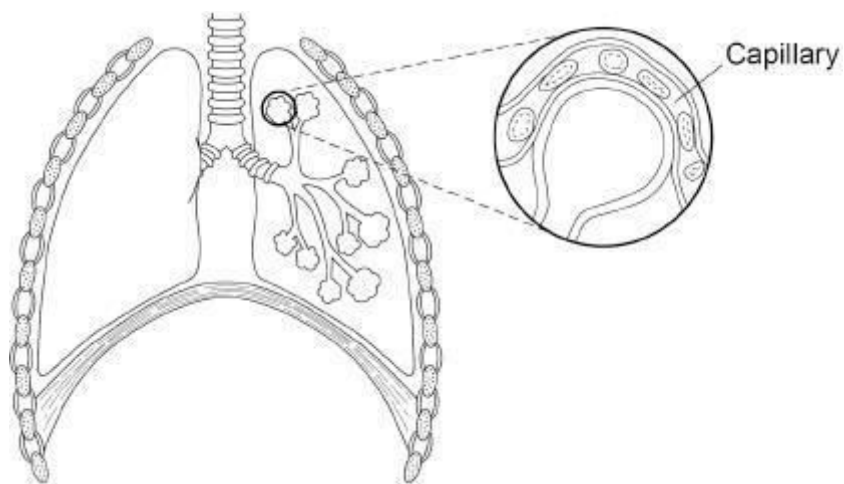


(2)

(c) Diffusion also happens in the human lungs.

Figure 2 shows the human breathing system.

Figure 2

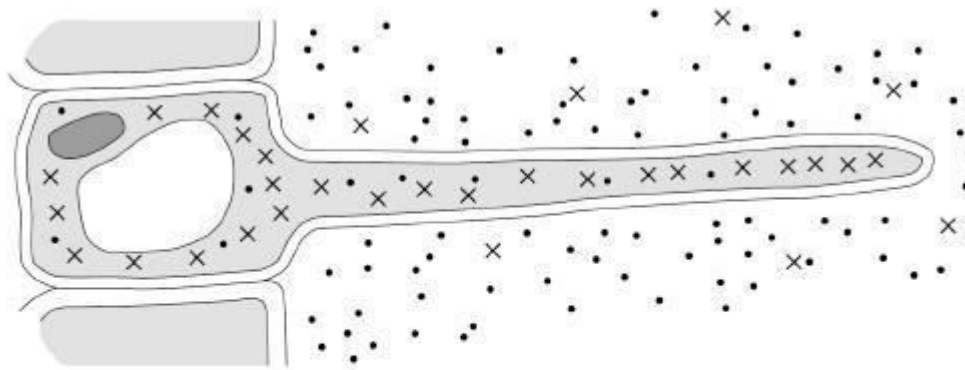


Explain how the human lungs are adapted for efficient exchange of gases by diffusion.

(6)

Figure 3 shows a root hair cell.

Figure 3



Key

•• Water molecules

×× Nitrate ions

(d) Name the process by which water molecules enter the root hair cell.

(1)

(e) Nitrate ions need a different method of transport into the root hair cell.

Explain how the nitrate ions in **Figure 3** are transported into the root hair cell.

Use information from **Figure 3** in your answer.

Name of process

Explanation

(3)

(Total 14 marks)

Q8.

Lipases break down lipids.

(a) Which **two** products are formed when lipids are broken down?

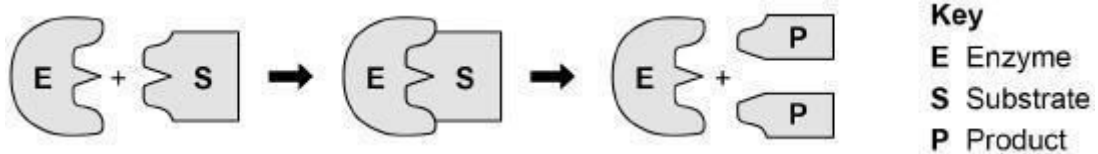
Tick (✓) **two** boxes.

- Amino acids
- Fatty acids
- Glucose
- Glycerol
- Glycogen

(2)

One model used to explain enzyme action is the 'lock and key theory'.

The diagram below shows a model of the theory.



(b) Explain the 'lock and key theory' of enzyme action.

Use information from the diagram above in your answer.

(3)

- (c) There are many different types of lipase in the human body.

Why does each different type of lipase act on only **one** specific type of lipid molecule?

Students investigated the presence of starch and glucose in the leaves of geranium plants.

This is the method used.

- 1 Place two identical geranium plants on a bench near a sunny window for two days.
- 2 After two days:
 - leave one plant near the window for two more days.
 - place one plant in a cupboard with no light for two more days.
- 3 Remove one leaf from each plant.
- 4 Crush each leaf to extract the liquid from the cells.
- 5 Test the liquid from each leaf for glucose and for starch.

(1)

- (d) Describe how the students would find out if the liquid from the leaf contained glucose.

(3)

- (e) Describe how the students would find out if the liquid from the leaf contained starch.

(2)



The table below shows the students' results.

Test	Leaf from plant kept in light for four days	Leaf from plant kept in light for two days and then no light for two days
Glucose	Strong positive	Weak positive
Starch	Positive	Negative

(f) Explain why the leaf in the light for four days contained both glucose and starch.

(2)

(g) Explain why the leaf left in a cupboard with no light for two days did contain glucose but did **not** contain starch.

(3)

(h) Suggest **one** way the students could develop the investigation to find out more about glucose and starch production in plants.

(1)

(Total 17 marks)

Q9.

Data from 'The Million Women' survey in the UK was collected for over 15 years.

Scientists analysed the data to study the effect of consuming alcohol on liver disease.

The scientists:

- included 400 000 women who regularly consumed alcohol
- included 400 000 women who did **not** consume alcohol
- excluded women who already had a liver disease.

(a) Age and gender were two factors controlled in this analysis. Many other factors were also controlled.

Suggest **two** other factors which the scientists would have controlled.

1 _____

2 _____

(2)

The data was analysed for:

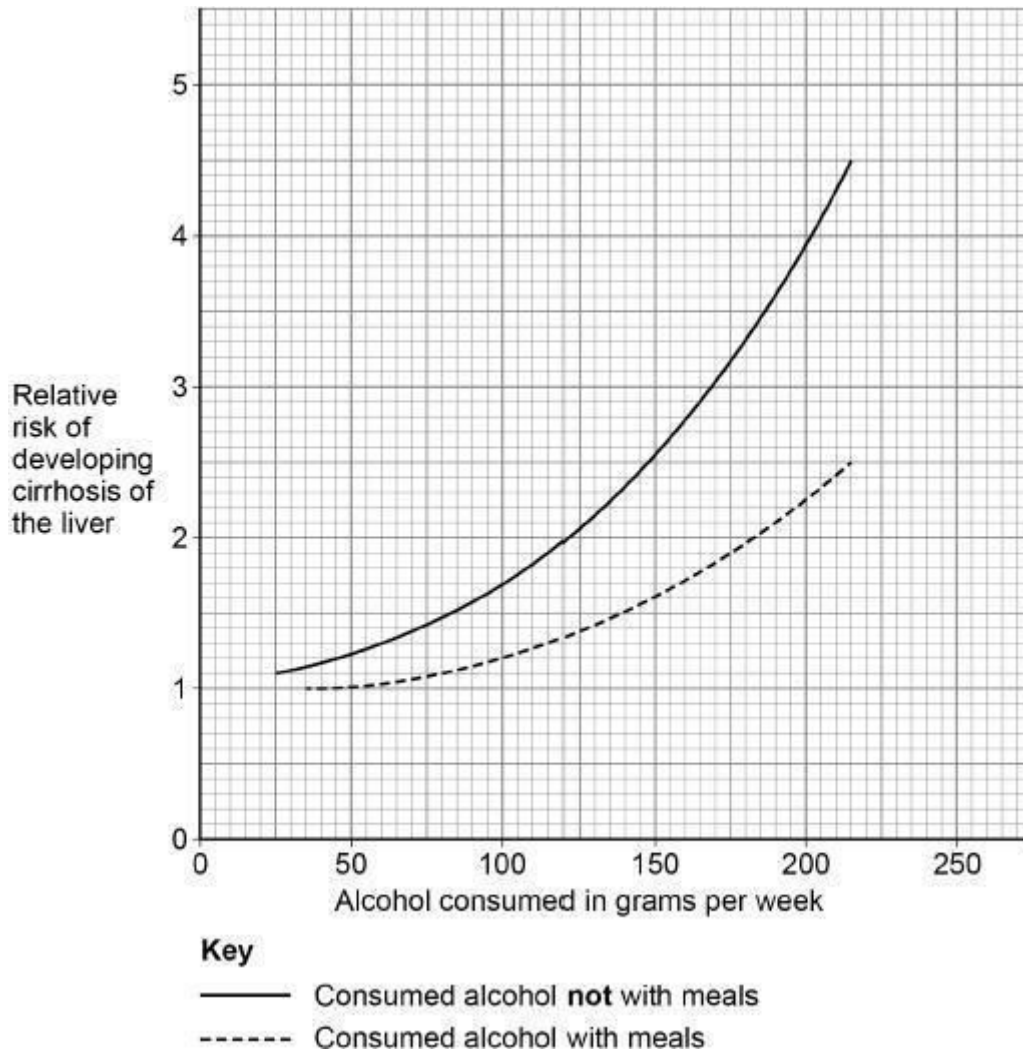
- women who drank alcohol with meals
- women who drank alcohol **not** with meals
- women who did **not** drink alcohol.

During the survey approximately 1500 women developed a liver disease called cirrhosis of the liver.

Scientists calculated the relative risk of developing cirrhosis of the liver for each group who consumed alcohol.

A relative risk of 1.0 means there was no statistical difference between the groups who did consume alcohol and the group who did **not** consume alcohol.

The below graph shows a summary of the results.



(b) A woman drinks 150 g of alcohol per week **not** with meals.

The woman decides to change to drinking 150 g of alcohol per week with meals.

Calculate the percentage decrease in relative risk of developing cirrhosis of the liver for this woman.

Percentage decrease = _____ %

(2)

(c) One glass of wine contains 12 g of alcohol.

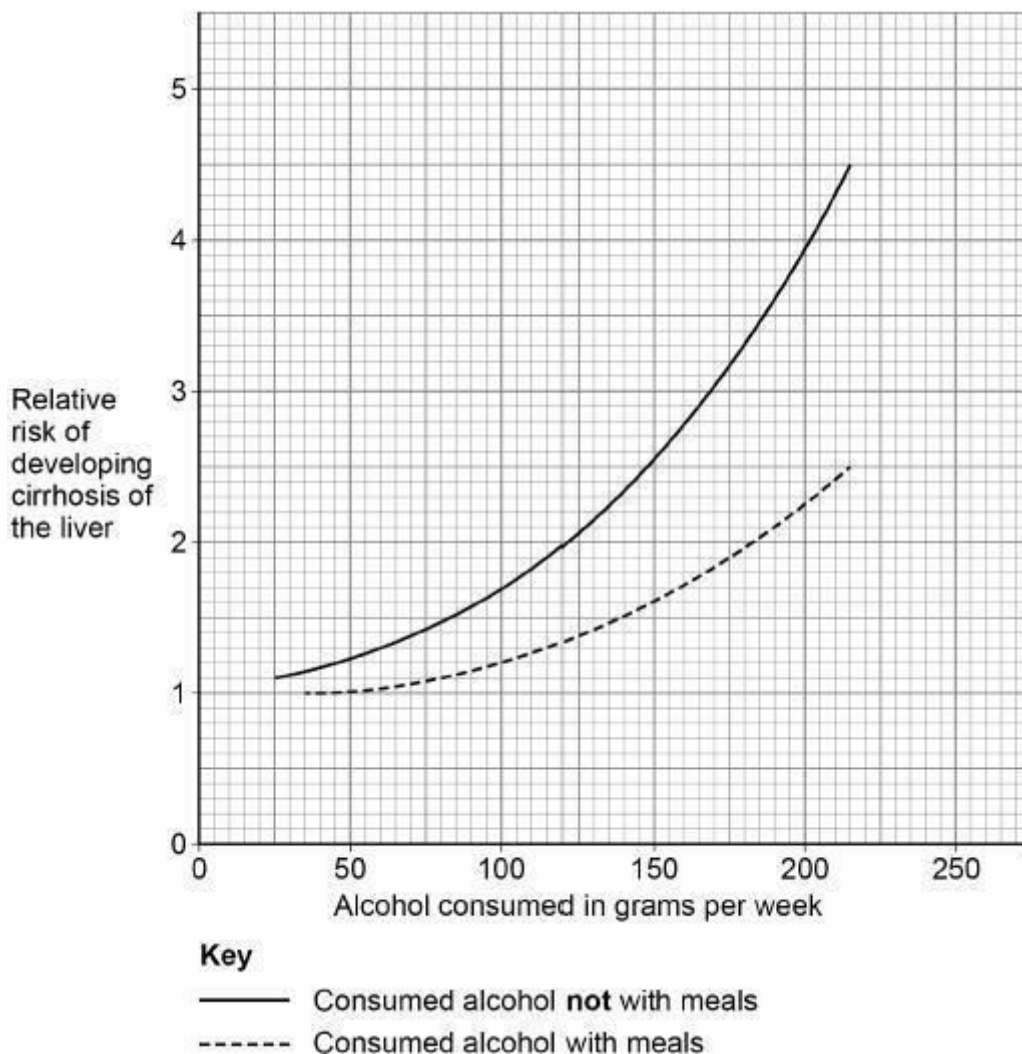
A different woman drinks two glasses of wine each day with her meals.

Calculate the relative risk of developing cirrhosis of the liver for this woman.

Relative risk = _____

(2)

The graph is repeated below.



(d) Consuming alcohol with meals instead of not with meals decreases the relative risk of developing cirrhosis of the liver.

Give **two** other conclusions about the relative risk of developing cirrhosis of the liver related to alcohol consumption.

Use data from the graph in your answer.

1 _____

2 _____

(2)

(e) Suggest **two** reasons why the data is considered to be valid.

1 _____

2 _____

(2)

(f) Suggest **one** aspect of the survey which might reduce validity.

(1)

(g) Cirrhosis of the liver leads to liver failure.

Describe the effects of liver failure on the human body.

(4)
(Total 15 marks)