

1)

Some people have a mutation in the gene coding for lipoprotein lipase.

The table below shows the mean concentration of some types of lipid in the blood of people without the mutation and in the blood of people with the mutation.

Type of lipid	Mean concentration of lipid in blood / mg dm ⁻³	
	People without the mutation	People with the mutation
Triglyceride	102	93
LDL cholesterol	121	111
HDL cholesterol	48	49
Total cholesterol	186	179

It has been suggested that people with this mutation may be more at risk of developing cardiovascular disease (CVD).

(i) Give **two** reasons why the information in the table does **not** support this suggestion.

(2)

(ii) Name the type of drug that could be given to people with this mutation, to reduce the risk of developing CVD.

(1)

(iii) State **one** health risk associated with using this type of drug.

(1)

2)

(a) Many cardiovascular diseases result from atherosclerosis.

Place a cross in the box next to the correct word or words to complete each of the following statements.

(i) Atherosclerosis usually results from the formation of plaques inside

A arteries

B capillaries

(1)

C veins

D ventricles

(ii) The plaques begin to form after damage to

A endothelial cells

B epidermal cells

(1)

C red blood cells

D white blood cells

(iii) These cells may be damaged due to

- A blood flowing slowly under low pressure
- B blood flowing quickly under low pressure (1)
- C blood flowing slowly under high pressure
- D blood flowing quickly under high pressure

(iv) The plaque consists of

- A carbohydrate deposits
- B fatty deposits (1)
- C plasma deposits
- D protein deposits

(v) The presence of a plaque in the vessels supplying blood to the brain could result in

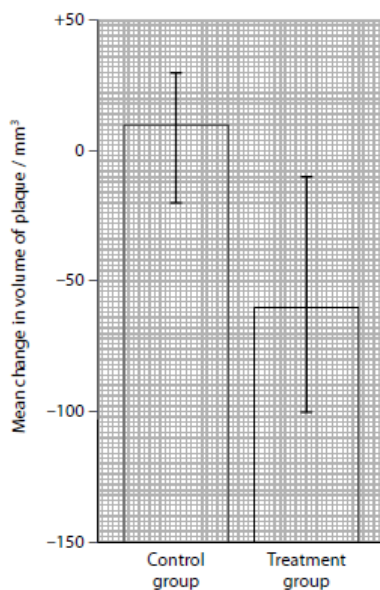
- A cancer (1)
- B a heart attack
- C kidney damage
- D a stroke

(b) A clinical trial was carried out to investigate the effect of a drug on the volume of plaques in patients with atherosclerosis.

Forty patients with atherosclerosis were divided into two groups of twenty. Each patient had the volume of their plaque determined. One group was the control group and the treatment group took the drug daily for two months.

At the end of the two months, the volume of the plaque in each patient was determined again. The mean change in volume of the plaque was calculated.

The results of the clinical trial are shown in the graph below.



(i) Using the information in the graph, describe what the results of this trial show. (2)

(ii) Suggest **two** reasons why the results of this trial do **not** indicate that this drug could be useful in treating patients with atherosclerosis. (2)

3)

Blood is carried around the body of many animals in different types of blood vessels. The structures of these blood vessels relate to their function.

(a) The table below refers to the structure of capillaries and veins. If the statement is correct, place a tick (✓) in the appropriate box and if the statement is incorrect, place a cross (✗) in the appropriate box. (3)

Type of blood vessel	Valves present along the length of the vessel	Wall consists of a single layer of cells	Endothelial cells present
Capillary			
Vein			

(b) Semilunar valves and elastic fibres are found in the aorta. For each of these structures, describe its location in the aorta and explain its function.

Semilunar valves (3)

Location

Function

Elastic fibres (3)

Location

Function

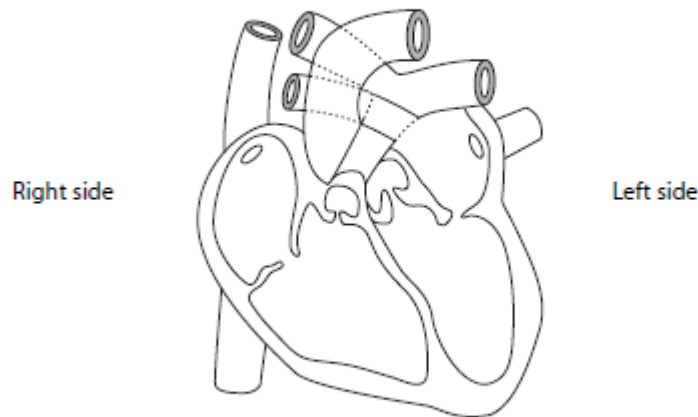
4)

Many animals have a heart and circulatory system.

(a) Give **one** reason why many animals have a circulatory system. (1)

(b) The diagram below shows a section through a mammalian heart.

On the diagram, draw arrows to show the flow of blood into and through the right side of the heart during one beat of the heart.



(3)

(c) Explain why a mammalian heart is divided into a right side and a left side.

(2)

5)

Thalassaemia is the name of a group of inherited blood disorders that affect the body's ability to produce haemoglobin in red blood cells. Red blood cells are produced in bone marrow.

Oxygen in the lungs binds to haemoglobin and is carried to the cells of the body to be used in respiration.

Beta thalassaemia is the result of a mutation in the gene coding for the β chain of haemoglobin. If a person inherits gene mutations from both parents, this person will show symptoms of anaemia and will require blood transfusions. Symptoms of anaemia include tiredness and breathlessness.

*(a) Using the information given above and your knowledge of gene mutation, suggest why a person with beta thalassaemia has symptoms of anaemia.

(4)

(b) If the phenotypes of the parents are known, the probabilities of having a child with beta thalassaemia, an unaffected child or a child who is a carrier, can be calculated.

Complete the table below to show the results of these calculations.

(4)

Parent 1	Parent 2	Probability of having a child with beta thalassaemia	Probability of having an unaffected child	Probability of having a child who is a carrier
Unaffected	carrier	no chance	50%	50%
Carrier	carrier			
Unaffected	has beta thalassaemia			
Carrier	has beta thalassaemia	50%	no chance	50%

(c) Gene therapy could potentially be used to treat beta thalassaemia.

Suggest how gene therapy could be carried out to treat this disorder.

(4)

6)

A high ratio of omega 6 to omega 3 has been linked to an increased risk of cardiovascular disease (CVD).

(i) High blood pressure is another factor that increases the risk of CVD.

Give **two** other dietary factors that increase the risk of CVD.

(1)

(ii) Omega 3 has been shown to lower blood pressure. Antihypertensives can also be used to lower blood pressure.

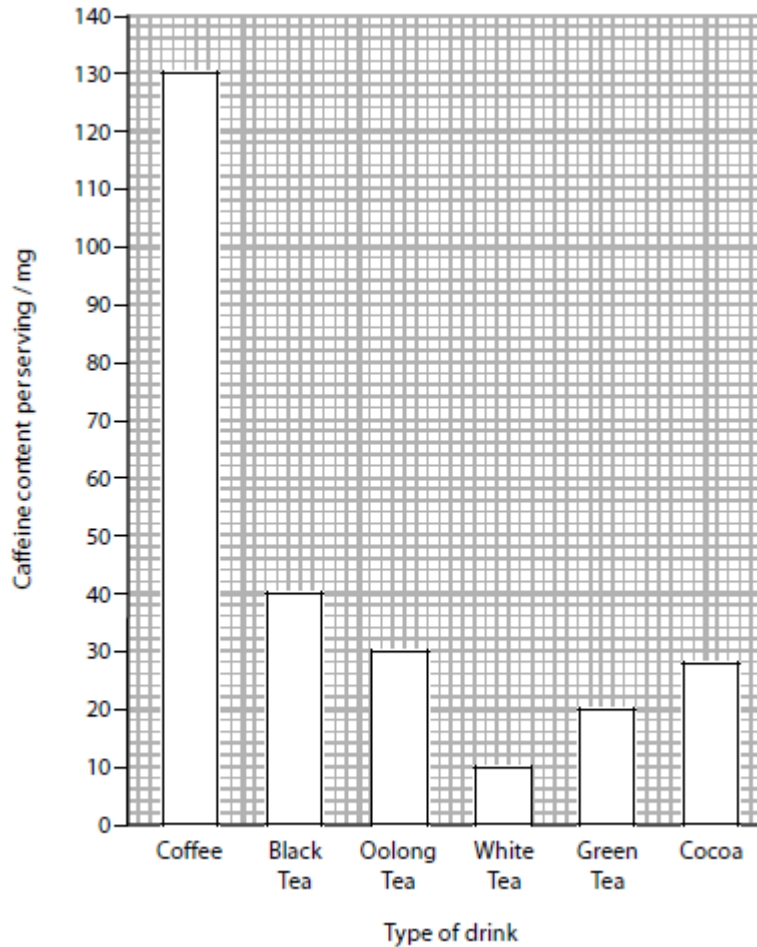
State **one** risk of using antihypertensives.

(1)

7)

A number of different drinks contain the drug caffeine. These drinks may be consumed to increase mental alertness. Caffeine also increases the heart rate and can interrupt sleep in some people.

A student found that certain drinks affected her sleep, so she carried out some research into the caffeine content of these drinks. The graph below shows the caffeine content of the drinks that the student researched.



(a) Using the information in the graph, describe the conclusions that the student could make about the caffeine content of these drinks. (3)

(b) A friend of the student suggested that herbal tea might have a lower caffeine content than these drinks. The student decided to use *Daphnia* to compare the caffeine content of herbal tea with the caffeine content of these other drinks.

(i) Describe an experiment that the student could perform, using *Daphnia*, to confirm that herbal tea has the lowest caffeine content. (4)

(ii) The friend did not agree with using *Daphnia* in this experiment. Give **one** ethical reason for the use of invertebrates and **one** ethical reason against the use of invertebrates in experiments of this type. (2)

Reason for the use of invertebrates

Reason against the use of invertebrates