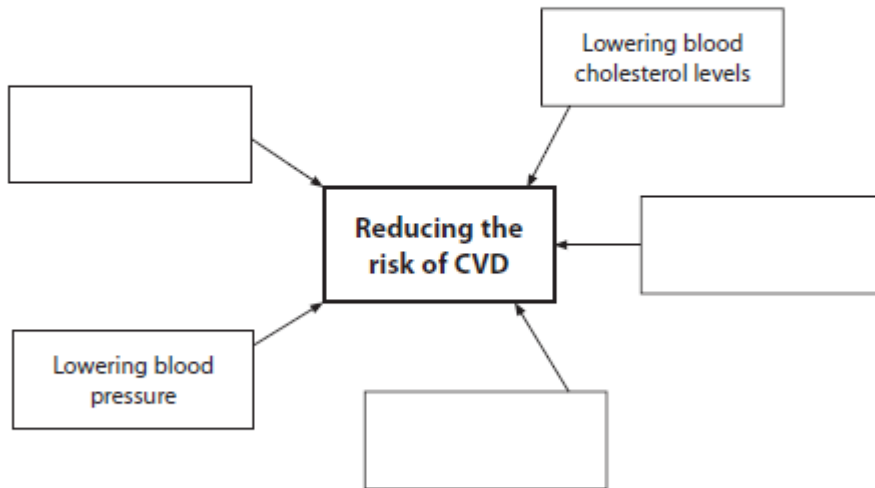


1)

The risk of developing cardiovascular disease (CVD) can be reduced in several ways. Lowering blood cholesterol levels and lowering blood pressure are two ways of reducing CVD.

- (a) (i) Complete the diagram below by giving three other ways in which the risk of CVD may be reduced. Write your answers in the empty boxes.

(3)



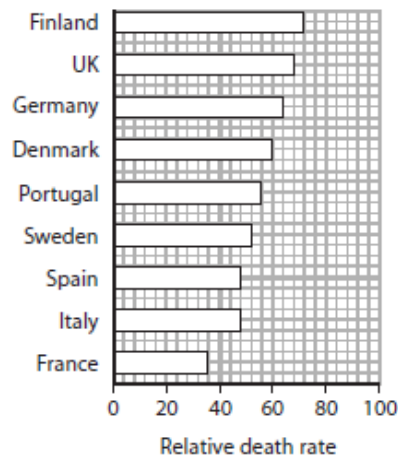
- (ii) Explain how lowering blood cholesterol levels can reduce the risk of CVD.

(2)

- (b) Risk calculators can be used to estimate the probability that a person will develop CVD. Many of these calculators start by asking for the age and gender of the person using them. Explain why information about age and gender is important in estimating the risk of developing CVD.

(2)

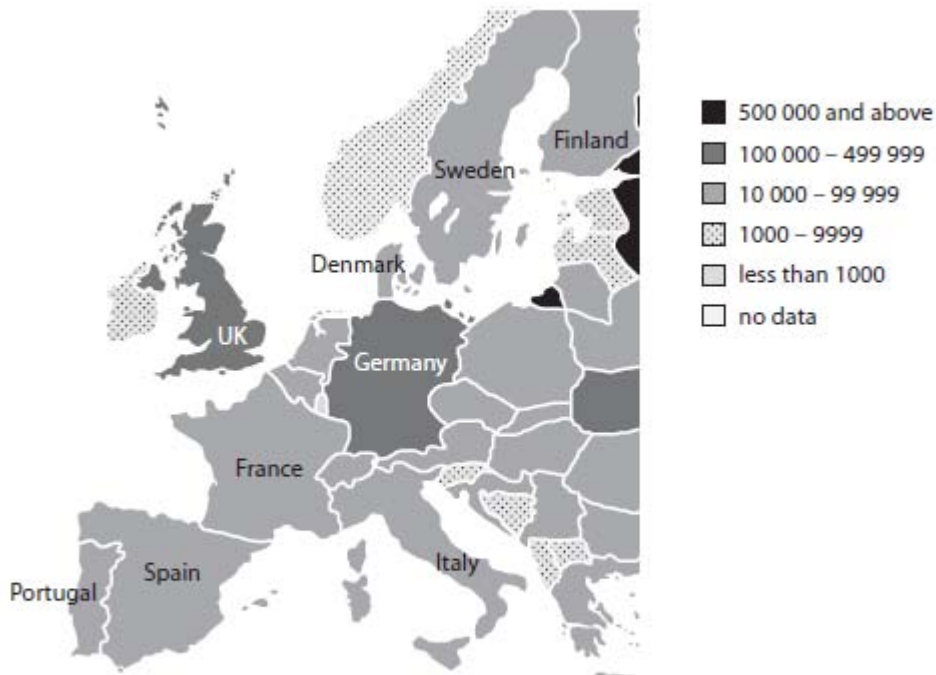
- (c) The graph below shows the relative death rate from CVD in some countries in Western Europe.



- (i) Compare the relative death rates from CVD in Finland, Denmark and Sweden.

(3)

- (ii) The map below shows the number of deaths from CVD in one year in Western Europe.



Describe **two** differences between the data presented in the map and the data shown in the graph.

(2)

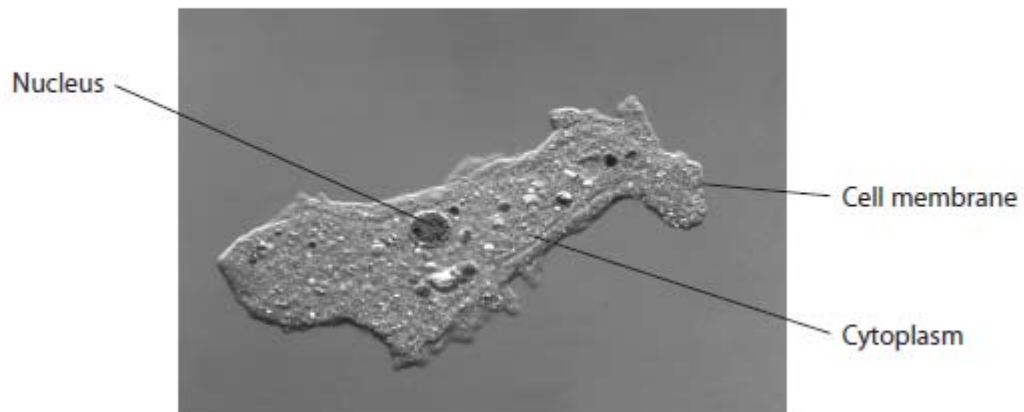
- (iii) Suggest **one** reason for the differences between the data presented in the map and the data shown in the graph.

(1)

2)

An amoeba is a single-celled organism that lives in water. Gas exchange in an amoeba occurs between the water and the cytoplasm.

The photograph below shows an amoeba, as seen using a microscope.



Magnification x800

Dr Jeremy Burgess / Science Photo Library

\*(a) Using the information shown in the photograph and your own knowledge, suggest how gas exchange occurs in an amoeba. (4)

(b) Suggest how oxygen passes from the cell membrane into the centre of an amoeba. (2)

3)

Cardiovascular disease (CVD) is responsible for many deaths.

\*(a) One cause of CVD is atherosclerosis. Describe how atherosclerosis develops. (4)

(b) A number of factors have been identified that increase the risk of CVD. One of these factors is genetic.

The genotype of some individuals causes them to be more at risk of developing CVD. One gene that influences this risk is the *KIF6* gene. Carriers of the 719 Arg allele of this gene are more at risk of CVD.

(i) Explain the meaning of the term **genotype**. (1)

(ii) Explain the meaning of the term **allele**. (1)

(c) Give **two** factors, other than genetic factors, that increase the risk of developing CVD. (1)

(d) Trials have shown that plant statin therapy is more effective in 719 Arg carriers than in non-carriers of this allele. Describe the risks of using plant statins to treat CVD. (2)

4)

Many animals, such as mammals, have a heart and circulation. This helps them to meet their requirements by overcoming the limitations of diffusion.

\*(a) Describe the structure of the mammalian heart. (5)

- (b) Giraffes are very tall mammals found roaming the plains of Africa. Two giraffes are shown in the photograph below.



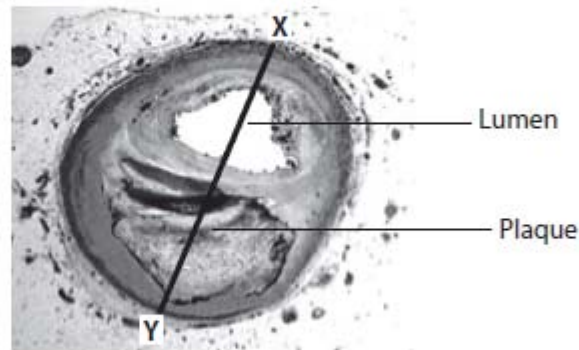
Using the information in the photograph and your own knowledge, explain the importance of the heart and circulation to the giraffe.

(4)

5)

Cardiovascular disease (CVD) is responsible for many deaths. One cause of CVD is atherosclerosis.

The photograph below shows a section through an artery with a plaque (atheroma) from a patient with CVD.



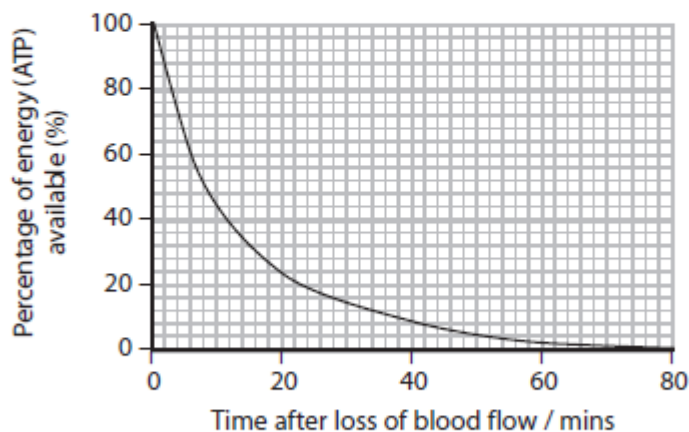
- (a) Calculate the increase in the thickness of the artery wall where the plaque is located. Take your measurements along the line labelled X and Y. Show your working.

Answer ..... (3)

- (b) The plaque often increases in size and can block the artery. If the artery supplying blood to the heart becomes blocked, blood no longer flows to the heart muscle cells. Shortly after the loss of blood flow, heart muscle cells stop contracting and start to die.

In the heart muscle cells, energy (ATP) is made available from respiration.

The graph below shows how the energy (ATP) available to heart muscle cells changes with time, after the loss of blood flow.



- (i) Using the information in the graph, describe how the energy (ATP) available to the heart muscle cells changes with time after the loss of blood flow.

(2)

(ii) Suggest why there are changes to the available energy (ATP) in the heart muscle cells following the loss of blood flow. (2)

(iii) About 8 minutes after the loss of blood flow, the heart muscle cells no longer contract. After about 20 minutes, the heart muscle cells begin to die. Using the information in the graph and your own knowledge, suggest explanations for the timings of these two events. (3)

(iv) If blood flow is restored within 30 minutes, most heart muscle cells will eventually recover. Suggest an explanation for this recovery. (2)

6)

A large number of doctors routinely prescribe drugs to treat patients who are over 80 and have high blood pressure.

(a) (i) Give the name of the type of drug that is used to treat high blood pressure. (1)

(ii) Explain why many patients, who are over 80 and have high blood pressure, are routinely prescribed with these drugs. (2)

---

(b) A study was carried out to investigate the benefit of treating patients who are over 80 and have high blood pressure.

Patients were randomly put into one of two groups, A and B. Each group contained 2000 patients.

Patients in group A were given two tablets each containing a different drug.

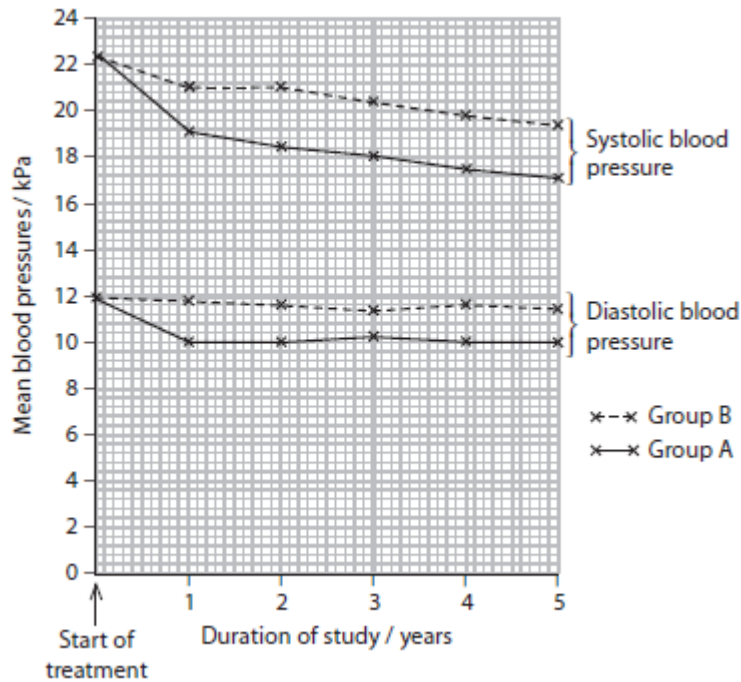
Patients in group B were given two tablets neither of which contained a drug.

The systolic and the diastolic pressure of each patient was measured. The systolic pressure is the maximum pressure when the heart contracts and the diastolic pressure is the minimum pressure when the heart relaxes.

The blood pressure of all patients was recorded over a period of five years.

The mean pressures were then calculated.

The graph below shows the results of this study.



- (i) Explain why the patients in group B were given two tablets that had no drugs in them. (2)
- (ii) Using the information in the graph, describe the results of this study. (3)
- (iii) Suggest why both the systolic and diastolic blood pressures were recorded in this study. (1)
- (iv) Suggest what else could have been recorded in this study to provide more evidence of other benefits of treating these patients with the drugs. (1)

7)

Read through the following passage on the cardiac cycle, then write on the dotted lines the most appropriate word or words to complete the passage.

The cardiac cycle consists of three stages: atrial systole, ventricular systole and

..... .

During atrial systole, the ..... contract and the

..... are relaxed. The ..... valves are open.

During ventricular systole, the ..... open as oxygenated blood is

forced out of the heart through the aorta to the body and through the pulmonary

..... to the lungs.

8)

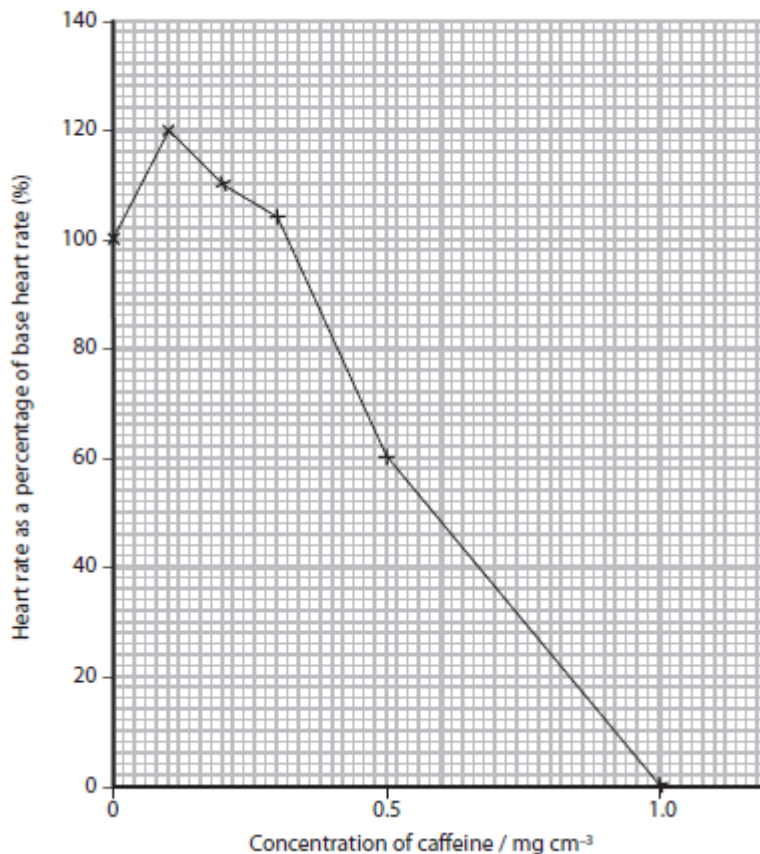
An investigation was carried out to study the effect of caffeine on the heart rate of a chicken embryo.

The heart from a chicken embryo was removed and placed in a glucose solution. The heart rate was determined and recorded as the base heart rate.

The experiment was repeated using glucose solutions containing five different concentrations of caffeine.

The heart rate was determined and recorded as a percentage of the base heart rate for each solution.

The graph below shows the results of this investigation.



- (a) (i) Suggest why glucose was included in the solutions. (2)
- (ii) Suggest how the caffeine solutions were prepared to obtain valid results. (1)
- (iii) State how these results could be made more reliable. (1)
- (iv) Using the information in the graph, describe the effect of caffeine on the heart rate of the chicken embryo. (3)
- (b) (i) Describe how this investigation could be carried out using *Daphnia* instead of chicken embryos. (4)
- (ii) Suggest **one** ethical issue in the use of chicken embryos in this investigation. (1)