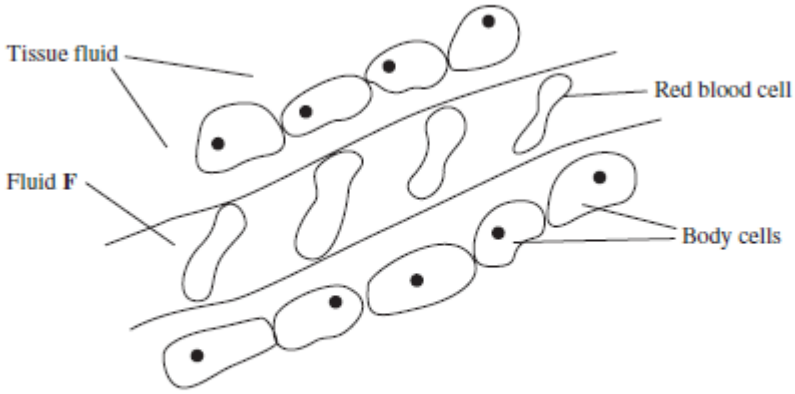
1)

The diagram shows tissue fluid and cells surrounding a capillary.



(a) Name fluid **F**.

.....

(1 mark)

(b) Give **one** way in which fluid **F** is different from tissue fluid.

.....

(1 mark)

(c) (i) The blood pressure is high at the start of the capillary. Explain how the left ventricle causes the blood to be at high pressure.

.....

.....

(1 mark)

(c) (ii) The blood pressure decreases along the length of the capillary. What causes this decrease in pressure?

.....

.....

(1 mark)

(d) In children, some diets may result in a low concentration of protein in fluid **F**. This can cause the accumulation of tissue fluid. Explain the link between a low concentration of protein in fluid **F** and the accumulation of tissue fluid.

.....

(3 marks)

2)

(a) Heath is a community of plants and animals. A student investigated the species diversity of plants in this community. The table shows her results.

Plant species	Number of plants per m^2
Heath rush	1
Bilberry	1
Sheep's sorrel	5
Ling	2
Bell heather	1
Heath bedstraw	8
Mat-grass	11

(a) (i) The index of diversity can be calculated from the formula

$$d = \frac{N(N-1)}{\Sigma n(n-1)}$$

where

d = index of diversity
N = total number of organisms of all species
n = total number of organisms of each species.

Use this formula to calculate the index of diversity for the plants on the heath. Show your working.

Answer .....

(2 marks)

(a) (ii) Explain why it may be more useful to calculate the index of diversity than to record only the number of species present.

.....

(2 marks)

(b) The demand for increased food production has led to areas of heath being used to grow wheat. Explain the effect of this on

(b) (i) the species diversity of plants

.....

(2 marks)

(b) (ii) the species diversity of animals.

.....

(2 marks)

3)

(a) Gas exchange in fish takes place in gills. Explain how **two** features of gills allow efficient gas exchange.

1 .....

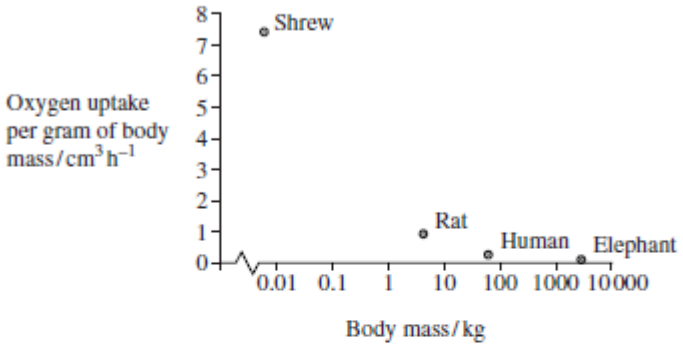
.....

2 .....

.....

(2 marks)

(b) A zoologist investigated the relationship between body mass and rate of oxygen uptake in four species of mammal. The results are shown in the graph.



(b) (i) The scale for plotting body mass is a logarithmic scale. Explain why a logarithmic scale was used to plot body mass.

.....

.....

(1 mark)

(b) (ii) Describe the relationship between body mass and oxygen uptake.

.....

.....

(1 mark)

(b) (iii) The zoologist measured oxygen uptake per gram of body mass. Explain why he measured oxygen uptake per gram of body mass.

.....

(2 marks)

(b) (iv) Heat from respiration helps mammals to maintain a constant body temperature. Use this information to explain the relationship between body mass and oxygen uptake shown in the graph.

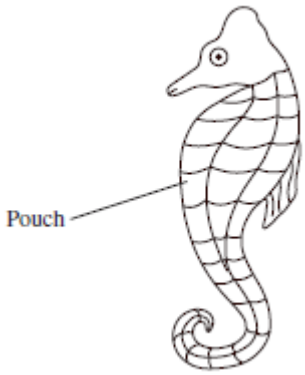
.....

(3 marks)

4)

The diagram shows a seahorse. A seahorse is a fish. Mating in seahorses begins with courtship behaviour. After this, the female transfers her unfertilised eggs to the male's pouch.

Most male fish fertilise eggs that have been released into the sea. However, a male seahorse fertilises the eggs while they are inside his pouch. The fertilised eggs stay in the pouch where they develop into young seahorses.



(a) Give **two** ways in which courtship behaviour increases the probability of successful mating.

1 .....

.....

2 .....

.....

(2 marks)

(b) Give **one** way in which reproduction in seahorses increases the probability of

(b) (i) fertilisation

.....

(1 mark)

(b) (ii) survival of young seahorses.

.....

(1 mark)

Scientists investigated the effect of total body length on the selection of a mate in one Australian species of seahorse. The scientists used head length as a measure of total body length.

(c) (i) Use the diagram to suggest why the scientists measured head length rather than total body length.

.....

.....

(1 mark)

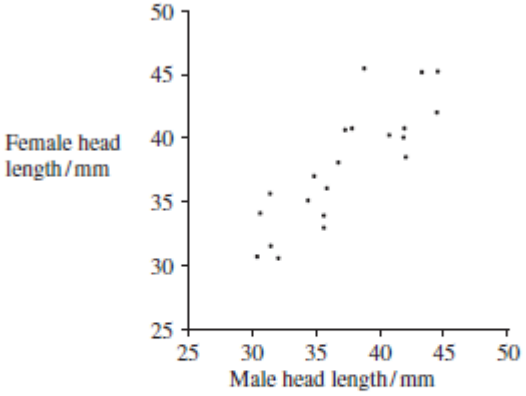
(c) (ii) Suggest why the scientists were able to use head length as a measure of total body length.

.....

.....

(1 mark)

The scientists measured the head lengths of the female and male of a number of pairs. The results are shown in the graph.



(d) The scientists concluded that total body length affects the selection of a mate. Explain how the results support this conclusion.

.....

.....

(1 mark)

(e) A female with a head length of 50 mm selected a mate. Explain how you could use the graph to predict the total head length of the mate selected.

.....

(2 marks)

(f) Scientists studied two species of North American seahorse. They thought that these two species are closely related. Describe how comparisons of biological molecules in these two species could be used to find out if they are closely related.

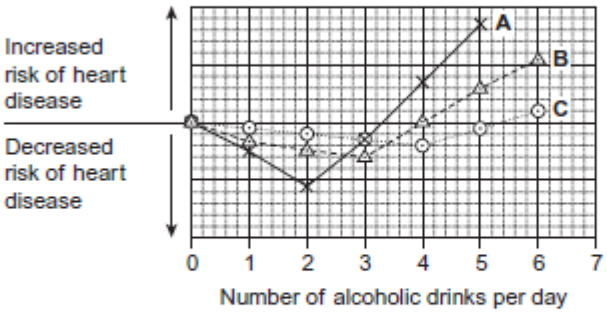
.....

(6 marks)

5)

Scientists compared the results of three investigations, **A**, **B** and **C**. These investigations were into the effect of drinking different amounts of alcohol on the risk of developing heart disease.

The graph shows the results of these investigations.



(a) Describe the relationship between increasing the number of alcoholic drinks per day and the risk of heart disease in investigation **A**.

.....

(2 marks)

(b) All the volunteers who took part in investigation **C** were aged between 40 and 50 years old. Explain how choosing volunteers of a similar age improved this investigation.

.....

(1 mark)

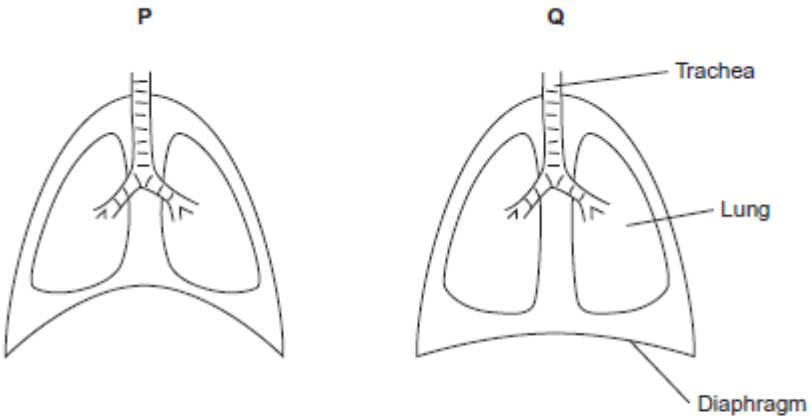
(c) A newspaper headline used the information in the graph to claim 'Alcohol is good for you.' Evaluate this claim.

.....

(3 marks)

6)

The diagram shows the position of the diaphragm at times **P** and **Q**.



(a) Describe what happens to the diaphragm between times **P** and **Q** to bring about the change in its shape.

.....

(2 marks)

(b) Air moves into the lungs between times **P** and **Q**. Explain how the diaphragm causes this.

.....

(3 marks)

(c) Describe how oxygen in air in the alveoli enters the blood in capillaries.

.....

(2 marks)

7)

Cyanide is a substance which affects respiration.
Use information in the question to explain the effect of cyanide on the uptake of sodium ions by the tissue.

.....

(3 marks)

8)

(a) The heart controls and coordinates the regular contraction of the atria and ventricles. Describe how.

.....

(5 marks)

(b) The diet of a person can increase the risk of coronary heart disease.
Explain how.

.....

(5 marks)