DIRECTORATE FOR QUALITY AND STANDARDS IN EDUCATION
Department for Curriculum Management and eLearning
Educational Assessment Unit
Annual Examinations for Secondary Schools 2011

Track

BIOLOGY – FORM 4
TIME: 1H 30MIN

NAME: _____ CLASS: _____

Question No.	Section A							Section B					
	1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	
Max mark	6	7	6	9	7	11	9	15	15	15	15	15	
Actual mark													**TOTAL MARK**

85% Theory Paper	15% Practical	100% Final Score

Section A

Answer ALL questions in this section.

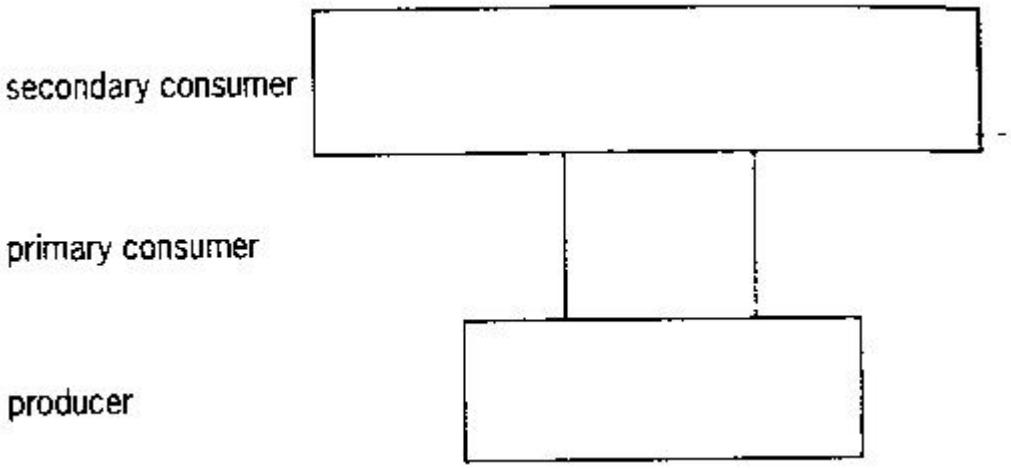
1. The steps in the following table describe the method used to show that a green leaf contains starch. The steps are not in the correct order. In the right hand column write numbers **1 to 6** to show the correct sequence of the steps.

Add Iodine solution	
Immerse leaf in boiling water for 1 minute	
Heat leaf in boiling ethanol	
Place plant in bright sunshine for 12 hours	
Place plant in darkness for 24 hours	
Remove leaf from plant	

(6 marks)

Total: 6 marks

2. The following diagram shows the pyramid of numbers for a food chain.



a. Give ONE reason why there are more secondary consumers than primary consumers in the pyramid.

_____ (1 mark)

b. A group of biology students were studying the following food chain

The students collected data showing the masses of the organisms concerned and the mean number of organisms. The data collected is shown in the table below.

Organism	Mean mass of organism (g)	Number of organisms (m^{-2})
Lupin	52	16
Aphid	0.002	5000
Ladybird	0.03	19

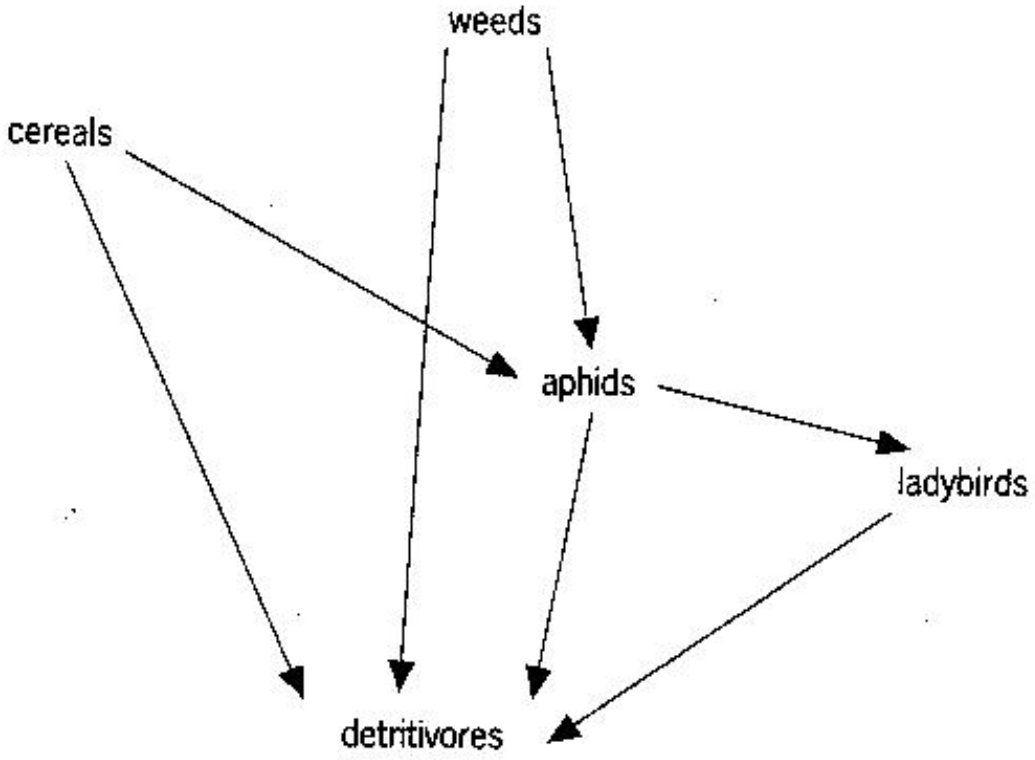
Use the data in the table to draw the

i. pyramid of numbers

ii. pyramid of biomass for this food chain.

(1, 1 mark)

c. The biology students also studied the following food web.



i. List TWO organisms from the food web whose population would increase when an insecticide is used in the area.

_____

ii. What happens to the number of cereals in the food web if a selective herbicide (specific for weeds) is used? Give a reason for your answer.

_____

_____

(2, 2 marks)

Total: 7 marks

3. The following table gives the contents of four test-tubes (A, B, C and D) that we... investigate the effect of bile salts and boiling on the activity of the enzyme lipas... experiment the lipid substrate used was full cream milk. The ✓ sign indicates the prese... the contents in the relevant test tube.

Contents	Test tube			
	A	**B**	**C**	**D**
Water	✓		✓	
Bile salts		✓		✓
Lipase	✓	✓		
Boiled lipase			✓	✓
Full cream milk	✓	✓	✓	✓
Universal indicator	✓	✓	✓	✓
Initial colour	green	green	green	green
Initial pH	7	7	7	7

a. Explain why after 30 minutes the contents of tubes A and B show a drop in pH indicating the presence of acidic conditions.

_____ (1 mark)

b. Which TWO test tubes should be compared to draw a conclusion about:

i. the effect of boiling on the activity of lipase _____ _____

ii. the effect of bile salts on the activity of lipase? _____ _____

(1, 1 mark)

c. No change in pH occurred in tube D. What conclusion can be drawn from this result?

_____ (1 mark)

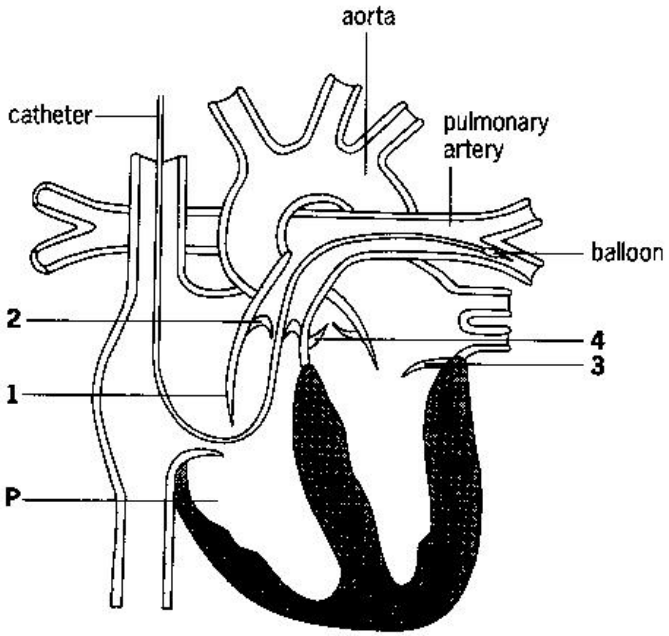
d. Where is lipase produced and where is it active?

Site of production: _____

Site of action: _____ (2 marks)

Total: 6 marks

4. A small tube called catheter can be inserted into the blood system through a vein. It is threaded through the vein and through the heart until its tip is in the pulmonary artery. A balloon at the tip can then be used to measure the pressure changes in the pulmonary artery. The following diagram shows a section through the heart with the catheter in place.



a. What happens to the blood pressure if the diameter of the arteries narrows?

_____ (1 mark)

b. Why is the wall of the part labelled P less muscular?

_____ (1 mark)

c. What type of blood flows through the chamber of the heart labelled P?

_____ (1 mark)

d. Explain why the strongest pulse is felt in the aorta.

_____ (1 mark)

e. The parts numbered 1, 2, 3 and 4 are the heart valves.

i. Name valves 2 and 4.

_____

ii. Which TWO valves are opened when blood is pumped out of the lower chambers of the heart?

_____

iii. Which TWO valves prevent blood flowing back from the lower chambers of the heart to the upper chambers of the heart during contraction?

_____

(1, 1, 1 mark)

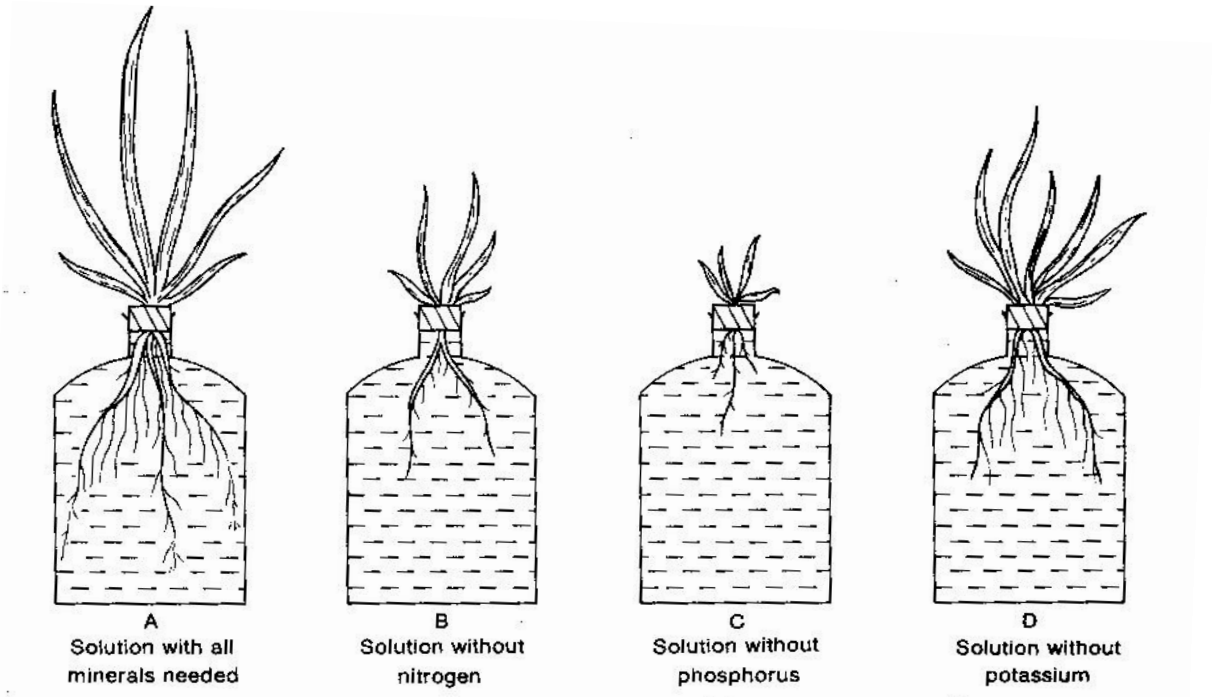
f. The pressure generated by the beating of the heart together with the elastic recoil of the arteries drives the blood out to the tissues. At the capillaries, some of the plasma across the capillary walls to form the tissue fluid. List TWO substances that are lacking in tissue fluid.

_____

_____ (2 marks)

Total: 9 marks

5. A biology student carried out an experiment to investigate the effect of mineral deficiencies on plant growth. Cereal plants of equal age and size were grown in four cultures (A, B, C and D). Solution A contained all known mineral nutrients in the correct proportions while each of the other cultures (B, C and D) lacked one mineral. The following diagram shows the apparatus set up for the experiment.



A quick-growing plant grown in dark bottles containing solutions of minerals

a. List TWO conditions (besides plant size and age) that need to be kept constant during this investigation.

_____

_____ (2 marks)

b. Describe TWO differences shown in the diagram between the plant in culture A as compared with the plants in cultures B, C and D.

_____

_____ (2 marks)

c. During the investigation air was bubbled in each of the four cultures. Explain the importance of this.

_____ (1 mark)

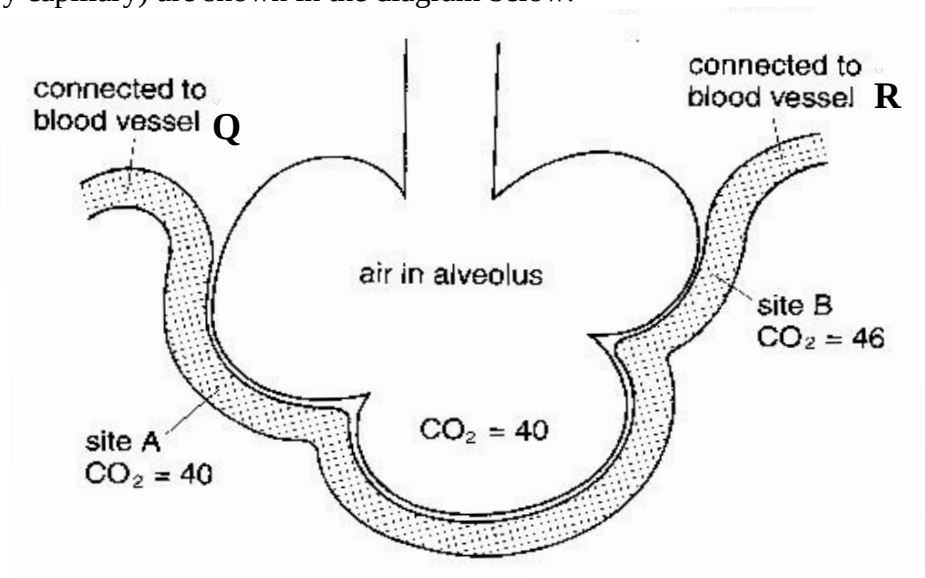
d. If a cereal plant was grown in a solution without the mineral magnesium, what would ... the leaves of the plant? Give a reason for your answer.

_____

_____ (2 marks)

Total: 7 marks

6. The relative concentrations (in units of carbon dioxide in the air in an alveolus and in the blood in a pulmonary capillary) are shown in the diagram below.



a. Name the TWO blood vessels Q and R.

Q: _____ **R**: _____ (1, 1 mark)

b. Explain why the rate and depth of breathing increases during exercise.

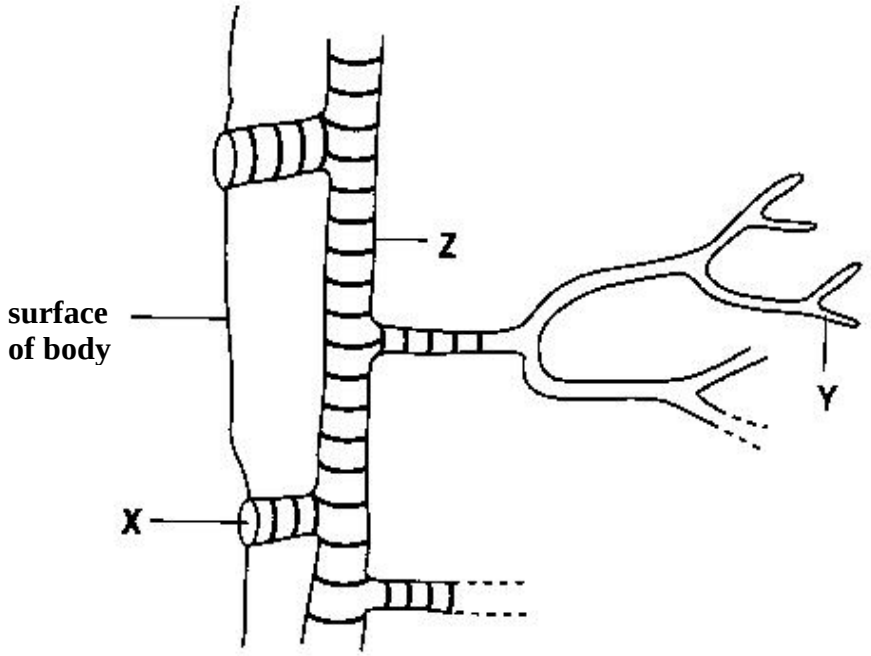
_____

_____ (2 marks)

c. What happens to the carbon dioxide concentration of arterial blood if a person holds the breath for a short time?

_____ (1 mark)

d. The following diagram shows part of the route taken by air to the cells in an insect.



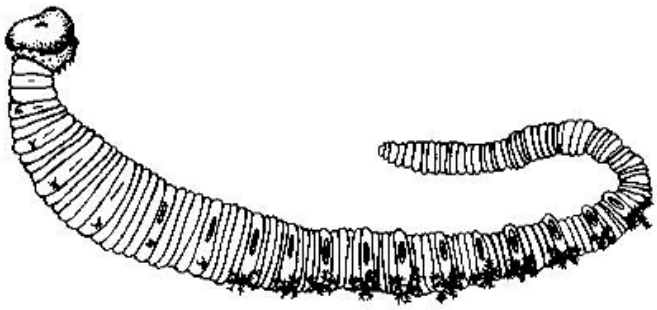
Name the parts labelled X and Y.

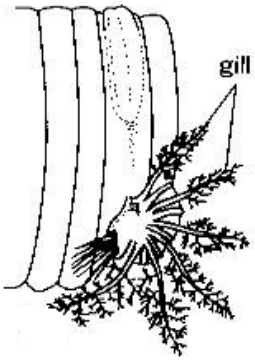
X: _____ **Y**: _____ (1, 1 mark)

e. In some insects the part labelled X may be surrounded by hairs. Suggest a reason for this.

_____ (1 mark)

f. There are many species of annelid worm. Some are very small, only a few millimetres in length, while others such as the lugworms are much larger. The following diagram shows a lugworm and part of one of its gills.





i. List ONE way (shown in the diagram) in which the structure of a lugworm gi[illegible]d for efficient gas exchange.

_____

ii. Explain why smaller species of annelid worms do not have gills.

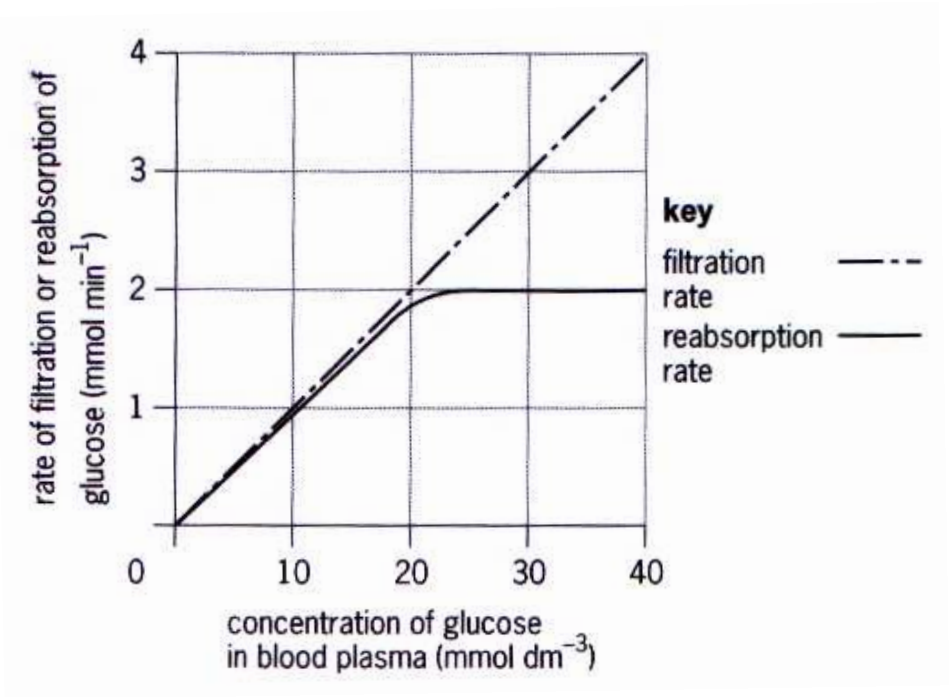
_____

_____

(1, 2 marks)

Total: 11 marks

7. The following graph shows how the filtration rate and the reabsorption rate of glucose in human nephrons vary with the concentration of glucose in the blood plasma.



a. From the graph determine the maximum rate of glucose reabsorption.

_____ (1 mark)

b. Describe the relationship between the filtration rate and the concentration of glucose in blood plasma.

_____

_____ (1 mark)

c. Describe the relationship between the reabsorption rate and the concentration of glucose in blood plasma.

_____

_____ (2 marks)

d. What happens to the glucose in a person where the concentration of glucose in the blood plasma exceeds (is higher) 20mmol/dm^{-3} ?

_____

_____ (2 marks)

e. Explain why eating extra protein may have a greater effect on the urea content of an adult than in a child.

_____

_____

_____ (3 marks)

Total: 9 marks

Section B

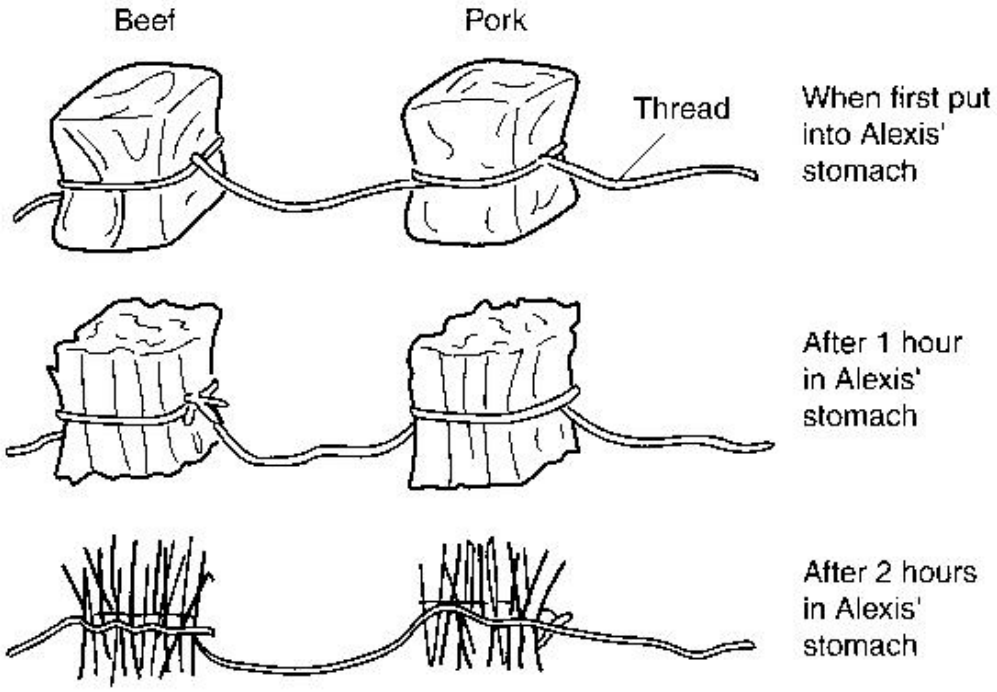
Answer question ONE and choose any other TWO. This section carries 45 marks.
Write the answers for section B on a foolscap.

1. Read the following passage and answer the questions that follow.

In 1822 a young man called Alexis St. Martin was accidentally injured by a shotgun. His abdomen and stomach were blasted open. He survived thanks to prompt treatment by a local doctor. His stomach did not fully heal and Alexis was left with an opening to his stomach which the doctor covered with a leather flap. The doctor carried out experiments that investigated digestion in the stomach.

a. Name the TWO tubes attached to the stomach. (2 marks)

b. In one experiment pieces of meat were tied to silk thread and pushed into Alexis' stomach. Meat is mainly protein. The following diagram shows what happened to the meat after some time.

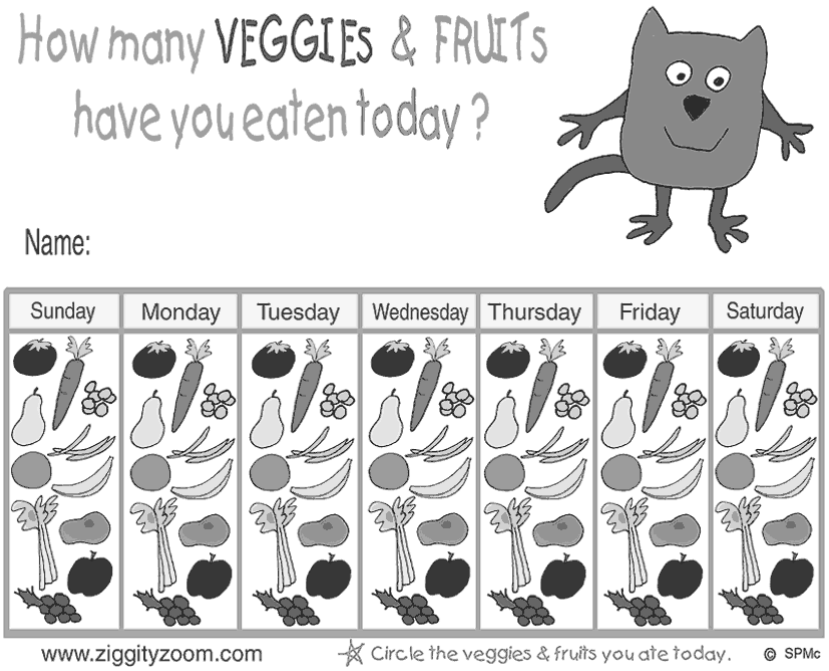


i. Describe and explain what happened to the meat. (2 marks)

ii. The doctor thought that if a piece of bread was lowered, he would have similar results to that of meat. State whether the doctor was right in his prediction. Give a reason for your answer. (3 marks)

iii. Explain how the bolus of food reaches the stomach, once swallowing takes pla

c. A primary school introduced the following poster to encourage young children to eat m
vegetables and fruits. List TWO benefits of adding fruits and vegetables in the diet of children.
(2 marks)



d. The stomach of sheep has four chambers.
   i. What is the advantage of this?
   ii. The first chamber in the stomach of sheep is the rumen. In sheep partially digested food can be returned to the mouth as cud for additional chewing and salivation. Cud chewing is an adaptation allowing ruminants to graze more quickly in the morning and then fully chew and digest food later in the day. Why is this beneficial to sheep?
   iii. Name the TWO types of teeth that grind and chew the cropped vegetation in sheep and explain how they are well adapted for their function in a herbivorous mammal like sheep.

(1, 1, 3 marks)
Total: 15 marks

2. Compare and contrast **each** of the following:

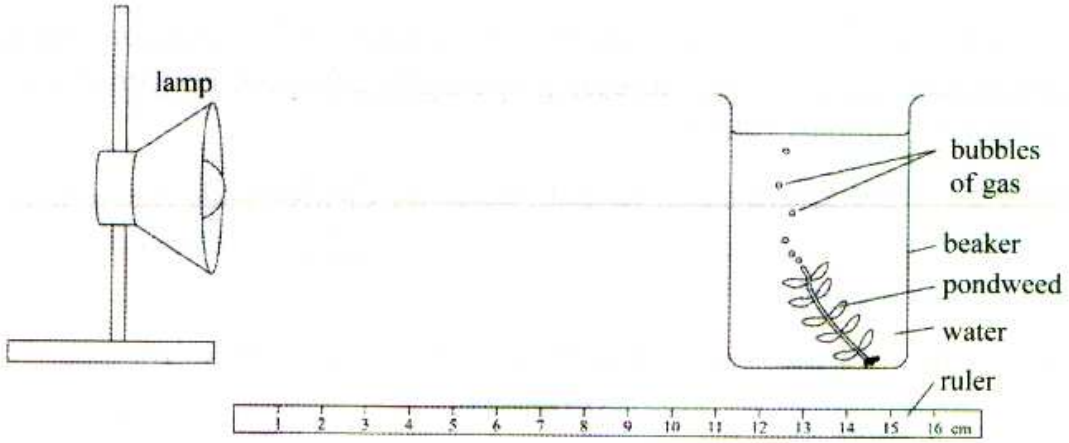
a. fructose and sucrose

b. carbon monoxide and carbon dioxide

c. hepatic portal vein and hepatic artery

d. iron and calcium. (3, 4, 3, 5 marks)
Total: 15 marks

3. A biology student carried out an investigation about photosynthesis in which the c… of carbon dioxide available to a water plant (pondweed) was varied by adding differe… of sodium hydrogen carbonate to the water in the beaker. The following diagram sho… apparatus that was set up for the investigation.



a. Name the gas produced in the beaker and explain what test can be carried out for the gas you mention. (2 marks)

b. The investigation looked at the effect of different carbon dioxide concentrations on the rate of photosynthesis. Name ONE other key factor in this investigation (shown in the diagram) that could influence the rate of photosynthesis and explain how the biology student ensured that it does not affect the rate of photosynthesis during the experiment. (2 marks)

c. Suggest ONE way in which this experiment could be modified to improve the accuracy of the results. (1 mark)

d. The student predicted that increasing the carbon dioxide concentration increases the rate of photosynthesis. Explain why this statement is only partially correct. (3 marks)

e. Explain how the burning of fossil fuels can increase the rate of photosynthesis. (2 marks)

f. At dawn and dusk no gases enter or leave the plant. Explain. (3 marks)

g. List TWO advantages of growing crops in a greenhouse. (2 marks)

Total: 15 marks

4. Explain the biological message in **each** of the following posters.

a.

b.

c.

d.

e.

(3, 3, 3, 3, 3 marks)
Total: 15 marks

5. Give a biological explanation of **each** of the following statements:

a. Red blood cells are small and flexible. (3 marks)

b. Poorly planned vegetarian diets can be low in some nutrients. (3 marks)

c. At the end of a race athletes need to repay the oxygen debt. (3 marks)

d. Biogas is produced in the absence of oxygen. (3 marks)

e. Sulphur impurities caused from burning fuels can be reduced. (3 marks)

Total: 15 marks