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<h1>Biology</h1> <p>Unit: 4BI0 Science (Double Award) 4SC0 Paper: 1BR</p>														
Thursday 23 May 2013 – Morning										Paper Reference				
Time: 2 hours										4BI0/1BR 4SC0/1BR				
You must have:												Total Marks		
Ruler														
Calculator														

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 120.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

P43315A

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Answer ALL questions.

- 1 (a) The table shows four different groups of organisms.

Complete the table to give an example for each group.

(4)

Group	Example
animals	
fungi	
bacteria	
protocists	

- (b) Different groups have different features.

Complete the table below to show if the feature is present in all, some or none of each group.

Some of the table has been completed for you.

(3)

Group	Are multicellular	Cells have nucleus	Cells contain chloroplasts	Cells have cell walls
fungi		all		all
bacteria			some	all
protocists	none		some	



(c) (i) Give one way in which the structure of a virus differs from a bacterium.

(1)

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(ii) Bacteria and viruses can act as pathogens. Give an example of a disease caused by a virus.

(1)

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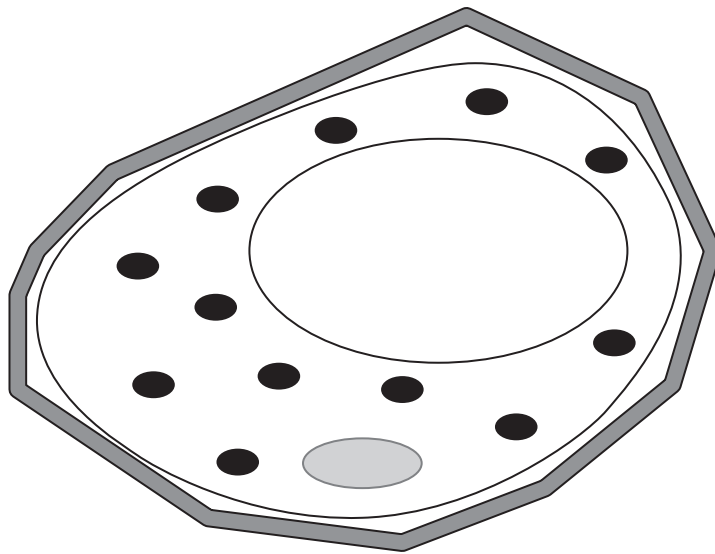
(Total for Question 1 = 9 marks)



2 (a) The diagram shows a plant cell drawn by a student.

(i) Label the diagram to show the selectively permeable membrane.

(1)



(ii) Name three parts of a typical plant cell that are not found in an animal cell.

(3)

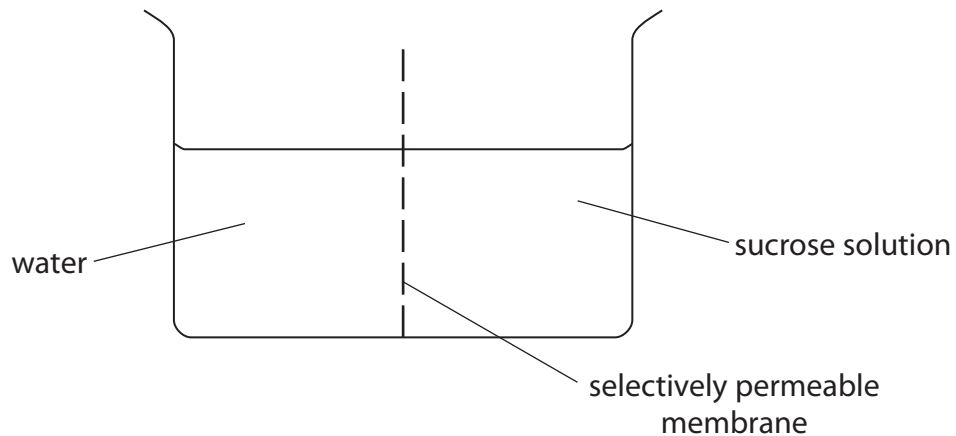
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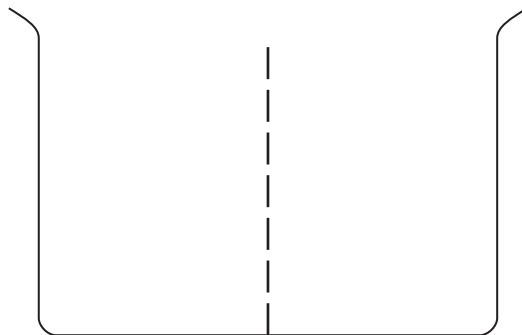


- (b) The diagram shows a glass container divided in half by a selectively permeable membrane. One half contains water and the other half contains sucrose solution.



- (i) Complete the diagram below to show the change to the level of the water and the level of the sucrose solution after one hour.

(1)



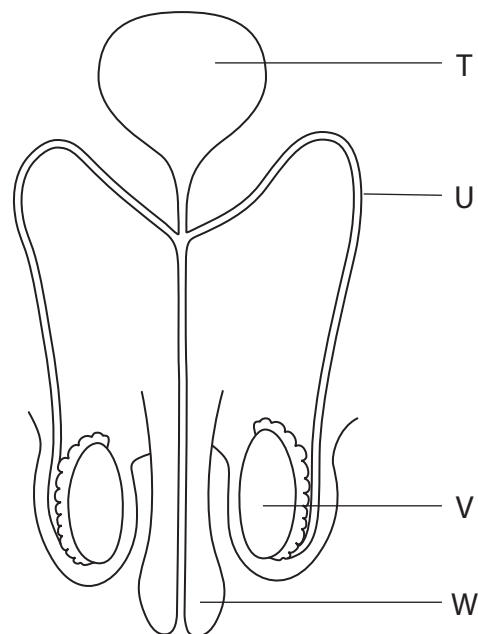
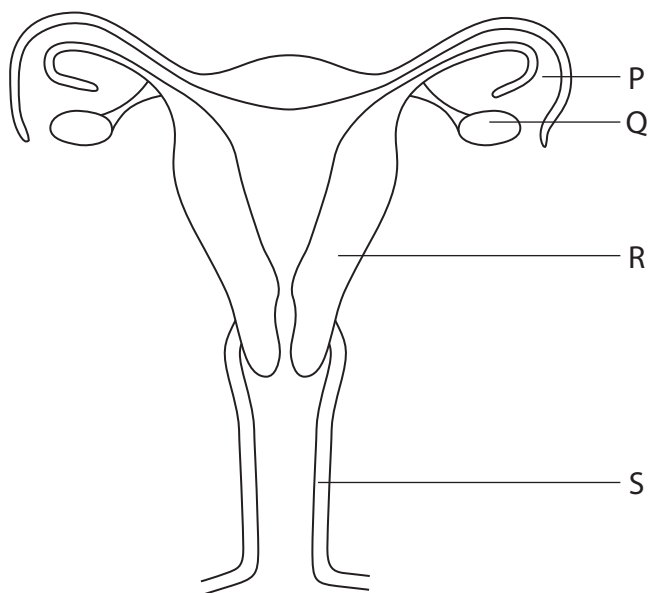
- (ii) Name the process that causes the change in the level of the water and the level of the sucrose solution.

(1)

(Total for Question 2 = 6 marks)



3 The diagrams show the female and male reproductive systems.



The table lists some events that take place in the female reproductive system, some that take place in the male reproductive system, and some that take place in both.

Complete the table by giving the letter, or letters, to indicate where each event takes place. The first one has been done for you.

(5)

Event	Letter
fertilisation	P
release of oestrogen	
meiosis	
repair of the uterus lining	
implantation of an embryo	
formation of gametes	

(Total for Question 3 = 5 marks)



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4 The photograph shows a bird called a parakeet.



(a) (i) Parakeets eat seeds.

Parakeets can be eaten by birds of prey called raptors.

Use this information to draw a food chain.

(2)

(ii) Many seeds contain starch.

Suggest what happens to starch in the gut of a parakeet.

(3)

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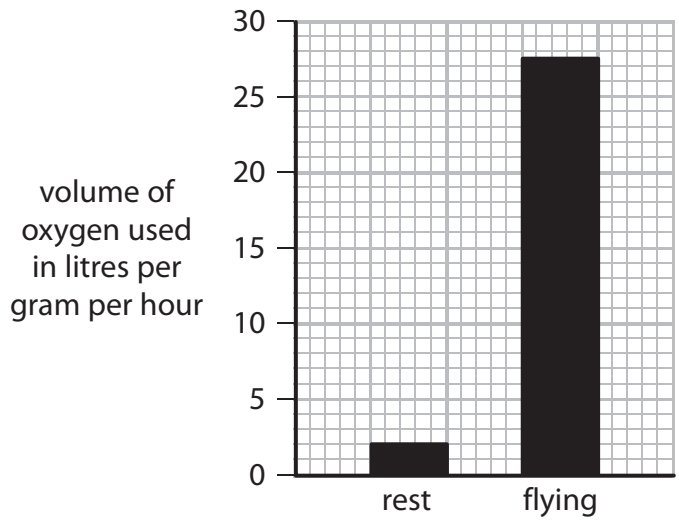
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(b) (i) The graph shows the volume of oxygen used by a resting parakeet compared to a flying parakeet.



Calculate the extra volume of oxygen used in litres per gram per hour when flying compared to the volume used at rest.

Show your working.

(2)

Answer litres per gram per hour

(ii) Like humans, parakeets need to keep their body temperature constant.

Suggest how the volume of oxygen used by a parakeet at rest would change if it was moved to a colder environment.

(3)

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(Total for Question 4 = 10 marks)

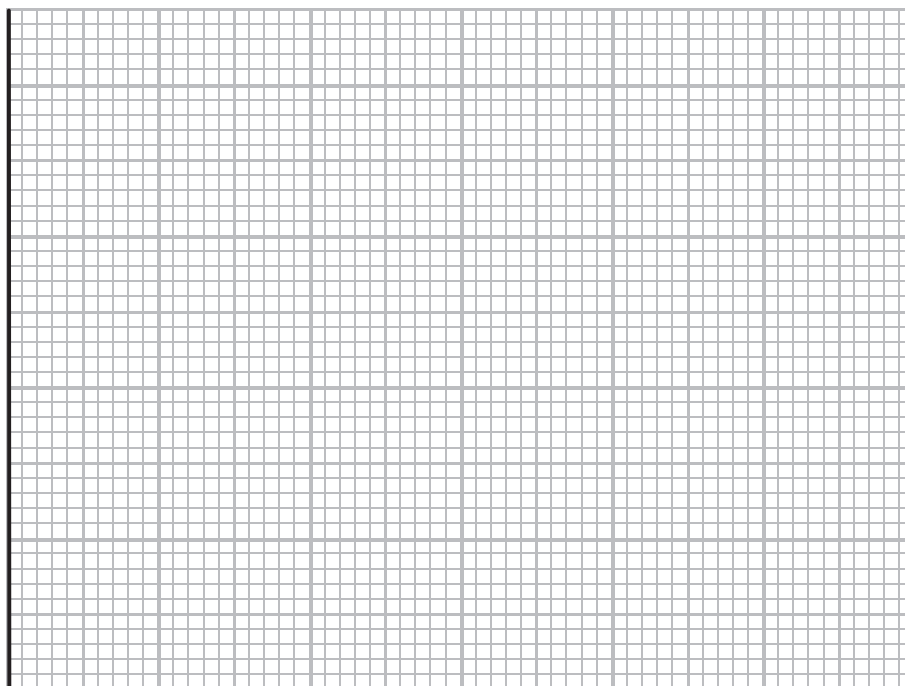


- 5 The table describes four different geographical regions. It also gives the amount of energy converted into plant biomass each year in each region.

Region	Description of region	Energy converted into plant biomass in kJ per m ² per year
A	woodland in the UK	26 000
B	tropical forest in Indonesia	40 000
C	grassland in the UK	15 000
D	farmed land in the UK	30 000

- (a) Plot a bar graph on the grid to show the amount of energy converted into plant biomass each year in each region.

(5)



- (b) The amount of energy converted into plant biomass each year depends on the effect that abiotic (non-living) factors have on the rate of photosynthesis.

Carbon dioxide is one of these abiotic factors.

Name three other abiotic factors likely to affect the rate of photosynthesis.

(3)

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2

3

- (c) Regions C and D have the same climate. Plants grown in region D have more energy converted into plant biomass than plants grown in region C. One reason for this is the use of selective breeding to produce high yielding crops.

- (i) Suggest two other reasons for more energy being converted into plant biomass in region D.

(2)

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2

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- (ii) What is meant by the term **selective breeding**?

(4)

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(d) Describe how you could use a quadrat to estimate the plant biomass in one of the regions. (4)

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(Total for Question 5 = 18 marks)



6 Describe the stages by which a bacterium can be genetically modified to produce large amounts of a named human protein.

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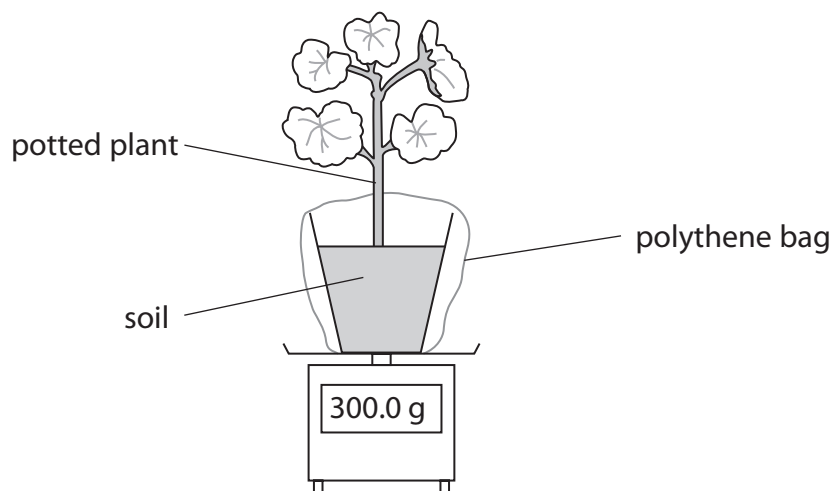
(Total for Question 6 = 5 marks)



P 4 3 3 1 5 A 0 1 3 2 8

- 7 Two potted plants, A and B, have the same surface area of leaves. They each have a mass of 300.0 g.

The mass of each potted plant was measured on the balance as shown.



The plants were placed in different environmental conditions for 12 hours and their masses were measured again.

Plant	Environmental condition	Mass in grams (after 12 hours)
A	cold air in darkness	299.8
B	warm air in light	294.4

- (a) The mass of both plants was less after 12 hours because of transpiration.

What is meant by the term **transpiration**?

(2)

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- (b) Suggest why a polythene bag was put around the pot of soil.

(1)

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(c) Explain why plant B lost more mass than plant A.

(4)

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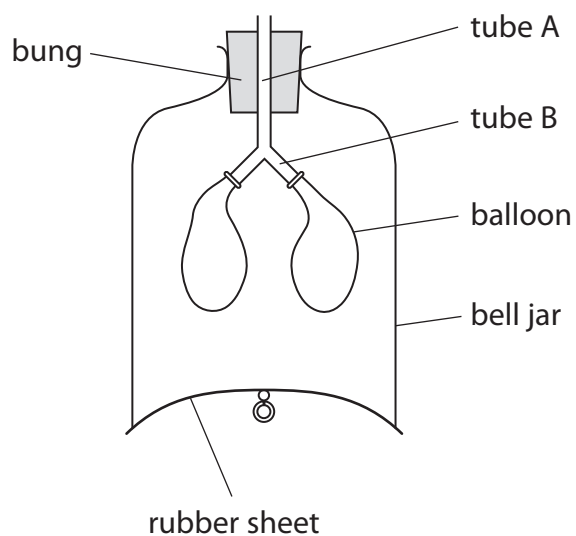
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(Total for Question 7 = 7 marks)



8 The diagram shows a model that can be used to demonstrate how the lungs inflate.



(a) Suggest which part of the human thorax is represented by

(i) the balloons

(1)

(ii) the rubber sheet

(1)

(iii) tube A

(1)

(iv) tube B

(1)



(b) Describe and explain what happens to the balloons as the rubber sheet is pulled down. (3)

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(c) Explain why the model does not fully show the mechanism of breathing in the human thorax. (2)

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(d) Describe an experiment you could carry out to investigate the effect of exercise on breathing in humans. (4)

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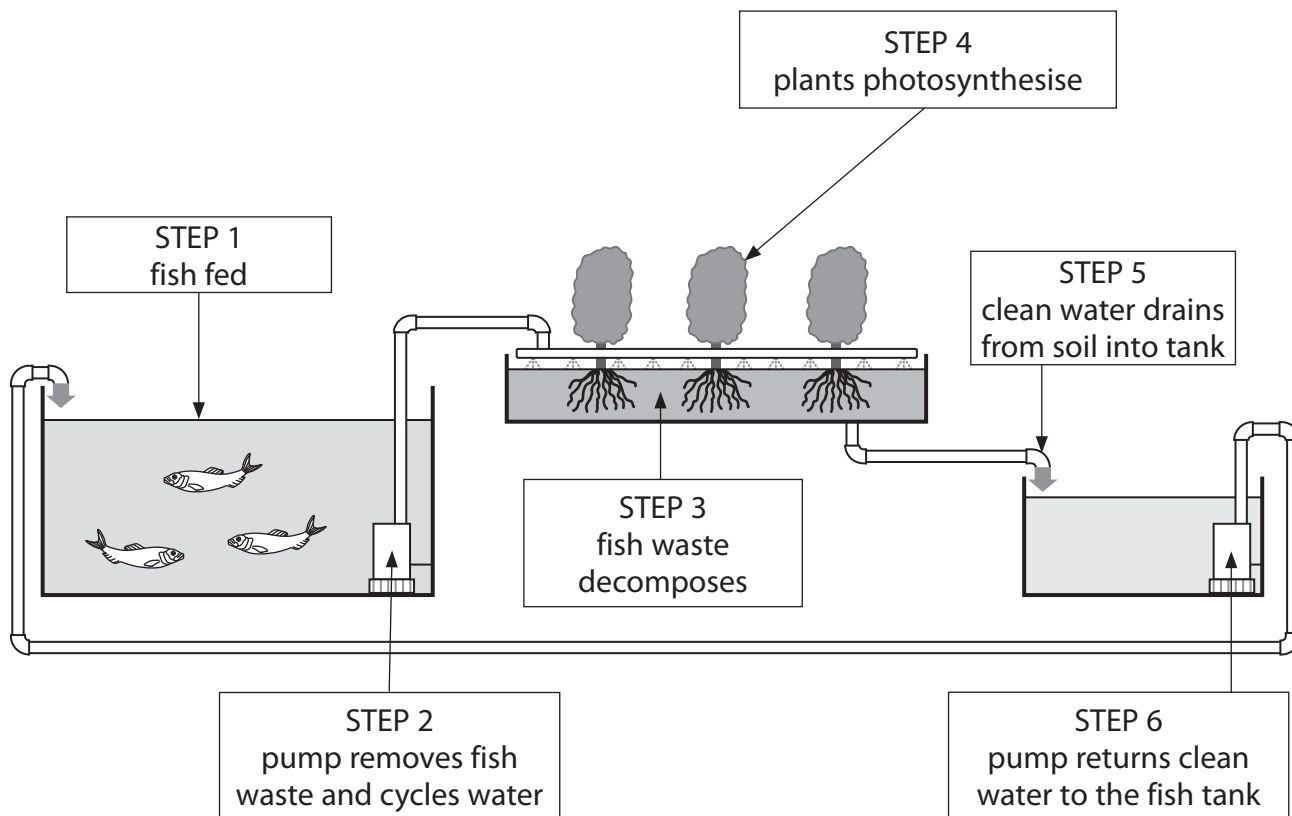
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(Total for Question 8 = 13 marks)



9 The diagram shows how water flow is controlled in a fish farm to maintain water quality.



(a) Name a waste product produced by the fish.

(1)

(b) (i) Explain how the removal of fish waste helps to maintain water quality.

(2)

(ii) Explain how adding antibiotics would also help to maintain water quality.

(2)



(c) The fish waste from step 2 is used by the plants in steps 3 and 4.

Describe how the fish waste helps the plants to grow.

(4)

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(d) Suggest what could be done on this fish farm to prevent interspecific predation.

(1)

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(Total for Question 9 = 10 marks)



10 In mammals, males have two different sex chromosomes (X and Y) and females have two similar sex chromosomes (X and X).

However, in birds males have two similar sex chromosomes (Z and Z), while females have two different sex chromosomes (Z and W).

(a) Complete the genetic diagram to show how sex is inherited in birds.

(4)

Genotype of male parent

Genotype of female parent

Gametes from male parent

Gametes from female parent

Genotypes of offspring

Sex of offspring



- (b) In birds, the egg is extremely large and contains food molecules that the growing embryo needs in order to develop.



- (i) Suggest **one** food molecule that is present in a bird's egg and describe the role of this molecule in the growth of the bird embryo.

(2)

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- (ii) Suggest an advantage of the shell of the egg being made of a hard substance.

(1)

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- (iii) Chicken eggs are a rich source of vitamin A.

Give another source of vitamin A and describe the function of vitamin A in humans.

(2)

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(c) The number of chromosomes in eggs and in sperm is less than the number of chromosomes in the body cells of animals.

Explain how the number of chromosomes in animals is maintained in their offspring. (3)

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(Total for Question 10 = 12 marks)



11 Describe the stages in the production of cloned mammals such as Dolly the sheep.

(5)

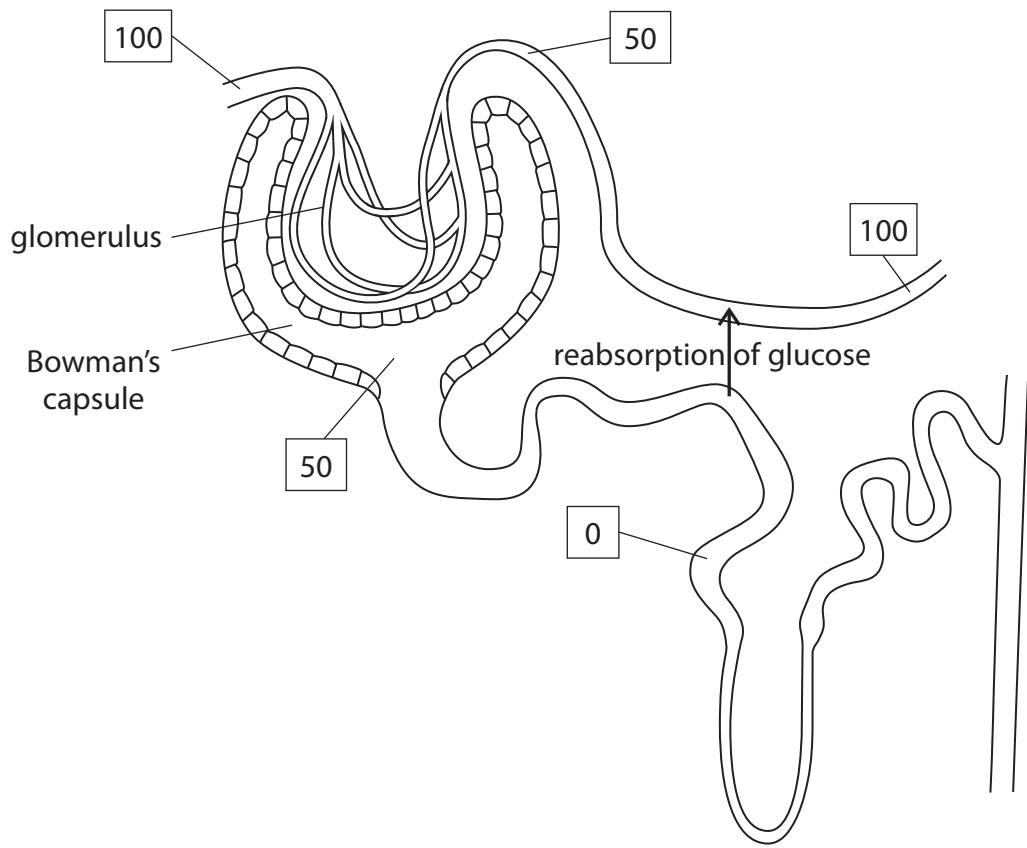
Dotted lines for writing the answer.

(Total for Question 11 = 5 marks)



P 4 3 3 1 5 A 0 2 3 2 8

12 The diagram shows some of the blood vessels and a nephron in the human kidney. The numbers represent the concentration of glucose at various places in the blood vessels and in the nephron, in arbitrary units.



(a) Explain how the structure of the blood vessels entering and leaving the glomerulus help to move glucose into the Bowman's capsule.

(2)

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(b) What type of blood vessels are found in the glomerulus?

(1)

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(c) (i) Describe how glucose is reabsorbed from the nephron back into the blood. (2)

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(ii) Suggest why glucose needs to be returned to the blood. (2)

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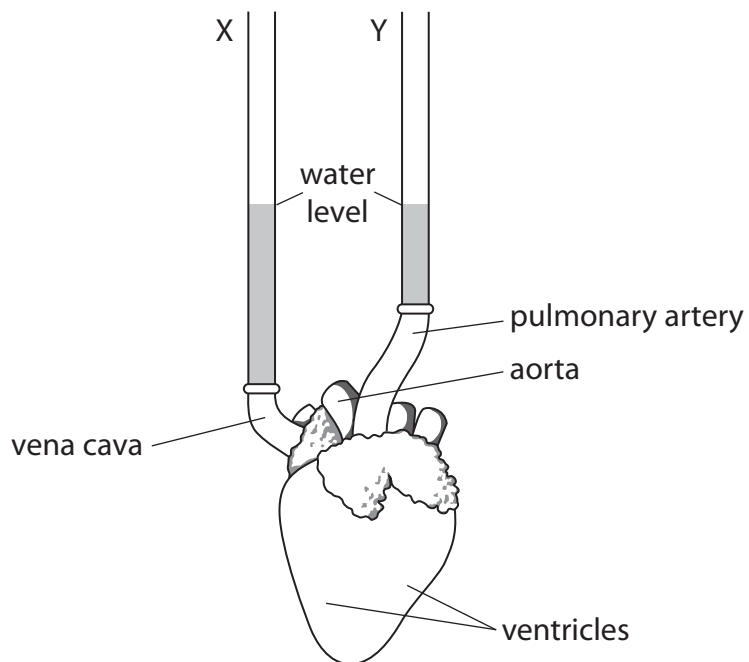
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(Total for Question 12 = 7 marks)



- 13** The diagram shows a mammal heart with glass tubes, X and Y, securely attached to the vena cava and the pulmonary artery. Water was poured into tube X, and rose up tube Y until both tubes were filled to the level shown.



- (a) When water was poured into tube X, two chambers in the heart were filled with water.

Name these two chambers.

(2)

1

2

- (b) The ventricles were squeezed once by hand.

- (i) Suggest what would happen to the level of water in tube X and in tube Y when the ventricles were squeezed.

(1)

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- (ii) Explain why no water came out of the aorta when the ventricles were squeezed.

(1)

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(Total for Question 13 = 4 marks)



14 Describe how the levels of blood glucose are kept constant in human plasma after eating a meal.

(3)

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(Total for Question 14 = 3 marks)

TURN OVER FOR QUESTION 15



