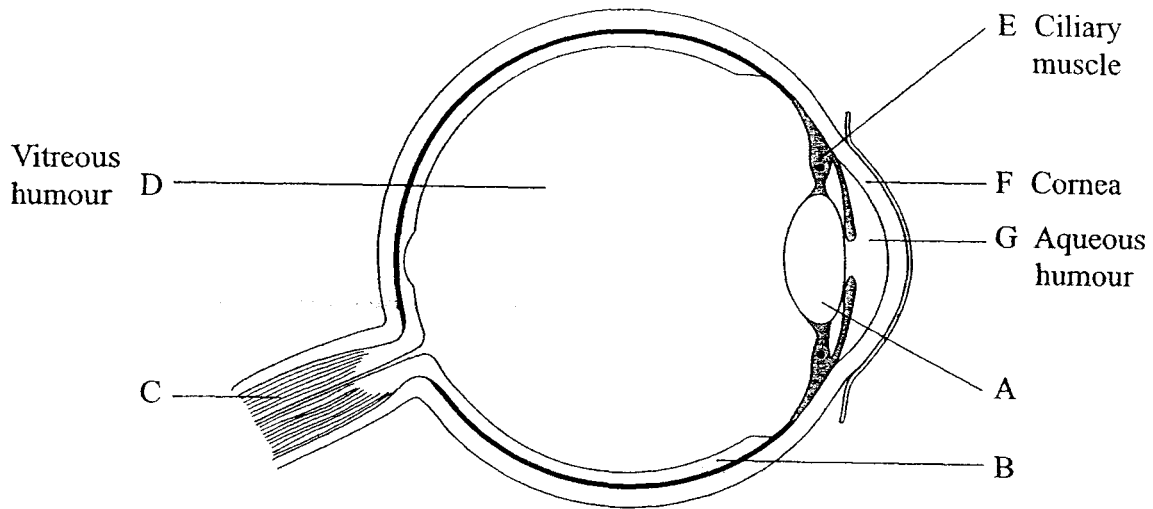




**Answer all questions in the spaces provided.**

*Leave blank*

1. The diagram below shows a section of the human eye.



(a) Name the parts labelled A, B and C.

A .....

B .....

C .....

**(3)**

(b) Give the letters of the parts that refract (bend) the light when it enters the eye and is focussed on the retina.

.....

.....

**(2)**

(c) Draw an arrow on the diagram to show the position of the 'blind spot'.

**(1)**

(d) State why this part is known as the 'blind spot'.

.....

.....

**(1)**

(e) Describe the changes that take place in the pupil as a person moves from a dark room into a brightly lit room.

Leave blank

.....  
 .....  
 .....

(2)

Q1

(Total 9 marks)

2. The hepatic artery carries blood to the liver and the hepatic vein carries blood from the liver.

(a) Complete the table below to indicate the differences between the hepatic artery and the hepatic vein. The first line has been done for you.

Feature	Hepatic artery	Hepatic vein
Oxygen content of blood	Higher	Lower
Carbon dioxide content of blood		
Urea content of blood		
Thickness of vessel walls		
Presence of valves		
Blood pressure		
Direction of blood flow (to or from the heart)		

(6)

(b) Give two functions of the capillaries that lie between arteries and veins.

1 .....

.....

2 .....

.....

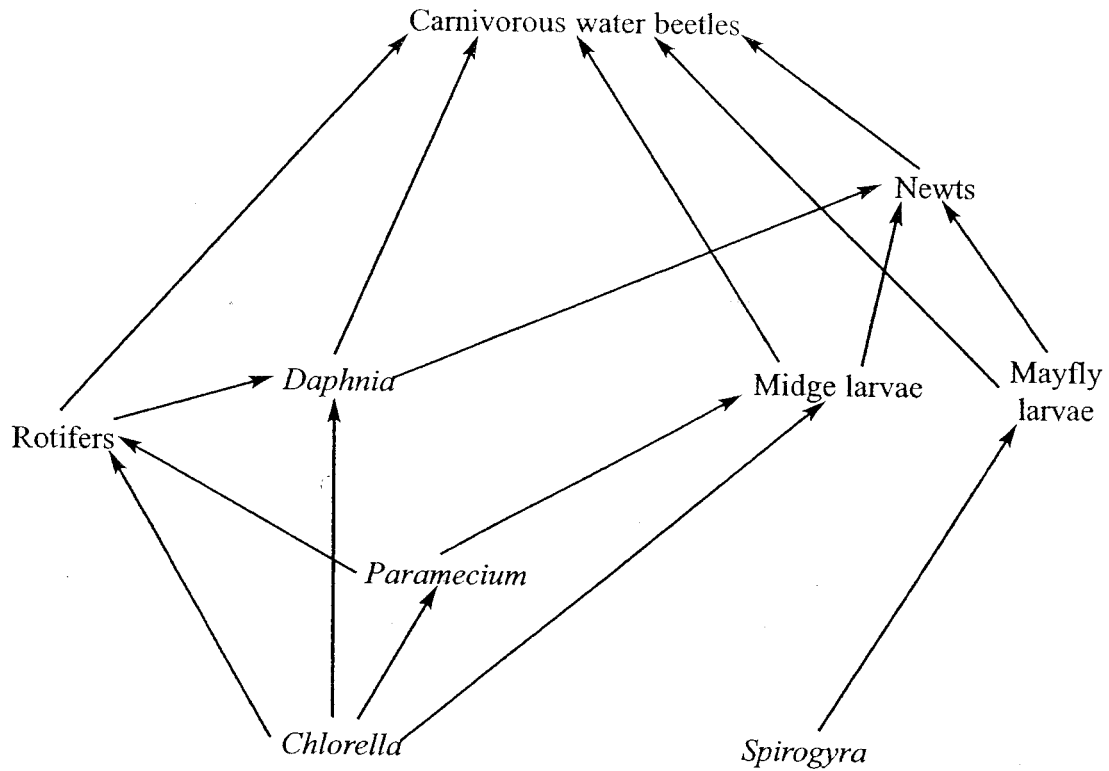
(2)

Q2

(Total 8 marks)

3. The food web below shows feeding relationships in a freshwater pond.

Leave  
blank



(a) (i) Name **two** primary consumers in this food web.

1 .....

2 .....

(2)

(ii) Name **one** organism that appears as a primary consumer and as a secondary consumer.

.....

(1)

(b) From the food web write down one food chain that includes *Paramecium* and has a total of **four** trophic levels.

(2)

(c) Some fertiliser drained into this pond from the surrounding fields. Suggest how this would affect the numbers of each of the following.

Leave blank

(i) *Chlorella* .....  
 .....  
 ..... (1)

(ii) *Daphnia* .....  
 .....  
 ..... (1)

(d) The data below were obtained for the following food chain, in a field of lettuces.

Lettuce plants → Slugs → Thrushes

Organism	Number of organisms per 100 m <sup>2</sup>
Lettuce plants	850
Slugs	2100
Thrushes	2

(i) Draw a pyramid of numbers to represent these data.  
 .....  
 ..... (3)

(ii) Draw the corresponding pyramid of biomass for these data.

(1)

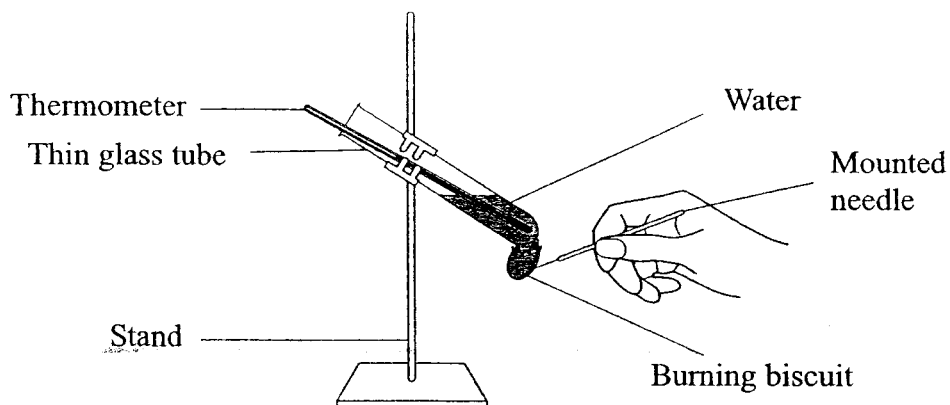
Q3

(Total 11 marks)

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4. A student used the apparatus shown below to determine the energy value of a small cheese biscuit.

Leave blank



The student weighed the cheese biscuit and held it on a mounted needle. She placed the biscuit in a Bunsen flame so that it began to burn. She then immediately placed the burning biscuit under the thin glass tube, which contained 20 cm<sup>3</sup> of water at 20 °C.

As the biscuit burned, its energy was transferred to the water in the tube. The temperature of the water rose to 43 °C.

She calculated the energy in the biscuit as follows:

$$\text{Energy in joules} = \text{Mass of water} \times \text{rise in temperature} \times 4.2$$

*Note* 4.2 = the energy in joules required to raise the temperature of 1 g of water by 1 °C.  
1 cm<sup>3</sup> of water has a mass of 1 g.

- (a) (i) Calculate the energy (in joules) released when the biscuit was burned.

(3)

- (ii) The mass of the biscuit was 0.2 g. Calculate the energy released per g of biscuit.

(1)

- (b) (i) The energy value given on the packet of biscuits was 22 340 joules per g. Suggest why the value determined by the student was very much lower.

*Leave blank*

.....  
.....  
.....

(2)

- (ii) Suggest **one** way that the student could increase the accuracy of her experiment, and explain how it would lead to a more accurate result.

.....  
.....  
.....

(2)

- (c) The nutritional information provided on the side of the packet of biscuits stated that most of the energy was in the form of carbohydrates.

Describe **two** tests that you could carry out to show the presence of **two different** carbohydrates in the biscuits.

.....  
.....  
.....  
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.....  
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.....  
.....  
.....  
.....  
.....

(5)

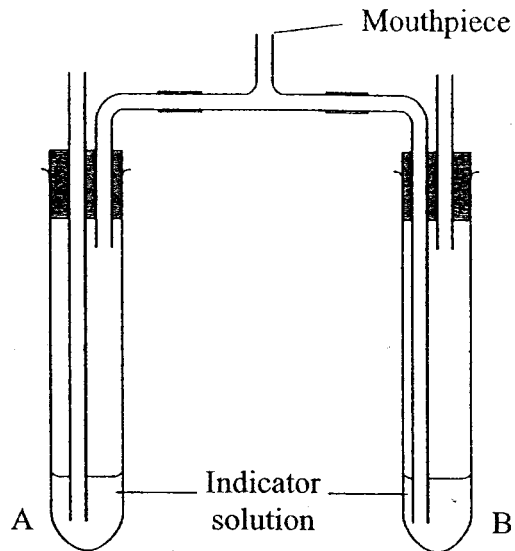
Q4

(Total 13 marks)

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5. A student used the apparatus below to compare the amount of carbon dioxide in inhaled air and exhaled air. The student breathed in and out through the mouthpiece.

*Leave blank*



- (a) Which tube would inhaled air pass through? Give a reason for your answer.

.....  
.....  
.....  
.....

(2)

- (b) (i) Name a suitable indicator solution that could be used in this experiment.

.....

(1)

- (ii) Describe the changes that would occur to this indicator solution when air with increased carbon dioxide concentration is bubbled through it.

.....

(1)



(c) (i) Explain why exhaled air has more carbon dioxide than inhaled air.

*Leave  
blank*

.....  
.....  
.....  
.....

(2)

(ii) Give **two** ways, other than carbon dioxide concentration, that exhaled air differs from inhaled air.

1 .....

.....

2 .....

.....

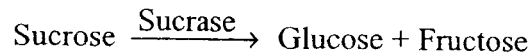
(2)

Q5

(Total 8 marks)

--

6. Sucrose can be digested to give glucose and fructose. This reaction is speeded up by the enzyme sucrase.



- (a) 'Disaccharide' is the term used to describe sucrose. What term is used to describe glucose?

.....  
(1)

- (b) A student carried out an investigation into the effect of increasing the concentration of the enzyme sucrase on the rate of this reaction.

He kept the concentration of sucrose constant. He used six different concentrations of the enzyme (sucrase) and for each of these he measured the time taken for the sucrose to be completely digested. He carried out all the reactions at 40 °C. The student's results are shown in the table below.

Enzyme (sucrase) concentration (%)	Time taken to digest sucrose in seconds
0.10	950
0.25	600
0.50	470
1.00	290
1.50	225
2.00	160

- (i) Plot a graph of these results on the grid opposite. Join the points with straight lines.

(5)

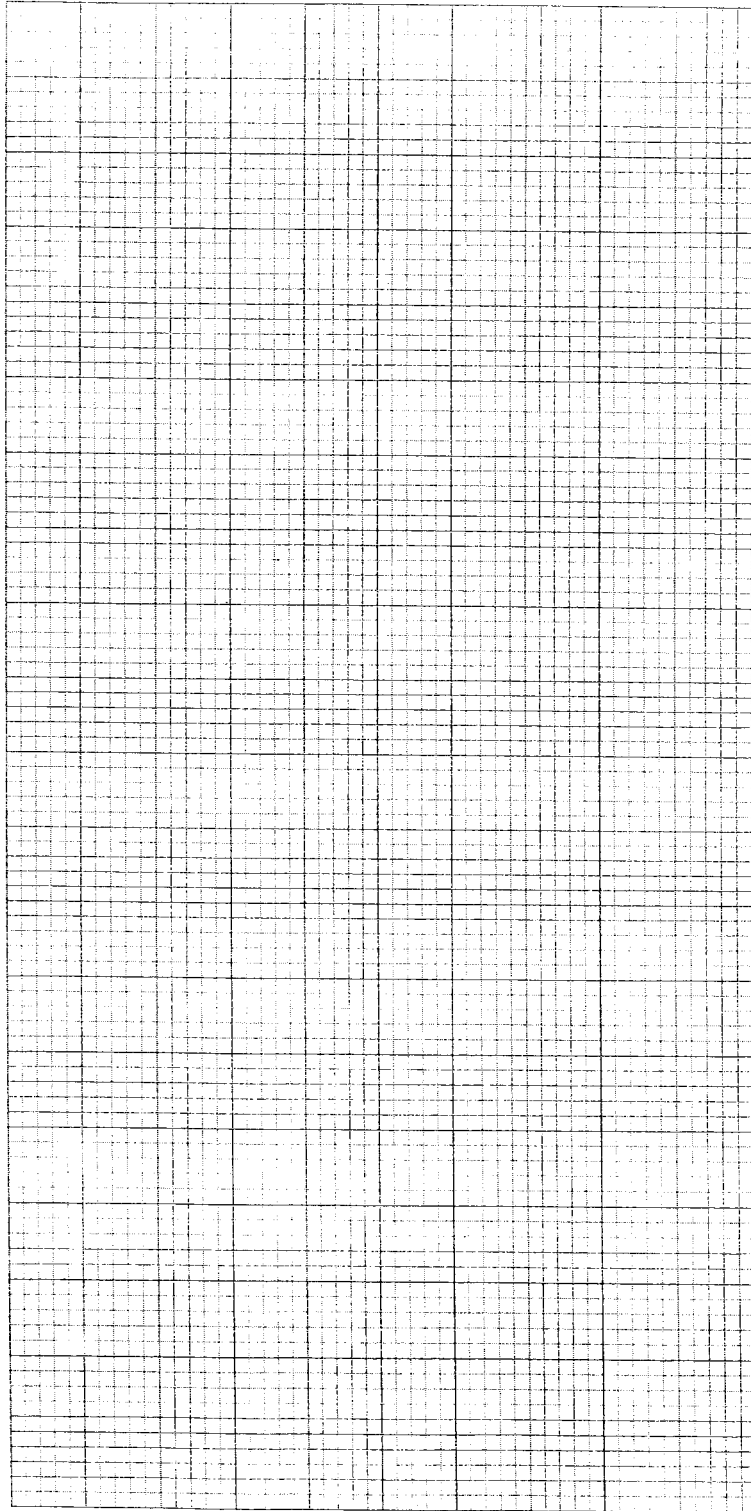
- (ii) Describe how increasing the concentration of the enzyme (sucrase) affected the time taken for the sucrose to be digested.

.....  
.....  
.....

(2)

**Graph grid for Question 6 (b) (i)**

*Leave  
blank*



**QUESTION 6 CONTINUES ON PAGE 12**

(c) (i) Suggest why he carried out all of the reactions at 40 °C.

*Leave  
blank*

.....

(1)

(ii) Describe **one** way that he could keep the temperature constant (at 40 °C).

.....

(1)

(d) The student then repeated this experiment, first at 20 °C and then at 80 °C.

Suggest what would happen to the time taken for the sucrose to be digested at 20 °C and 80 °C. In each case give a reason for your answer.

1. 20 °C .....

.....

.....

2. 80 °C .....

.....

.....

(4)

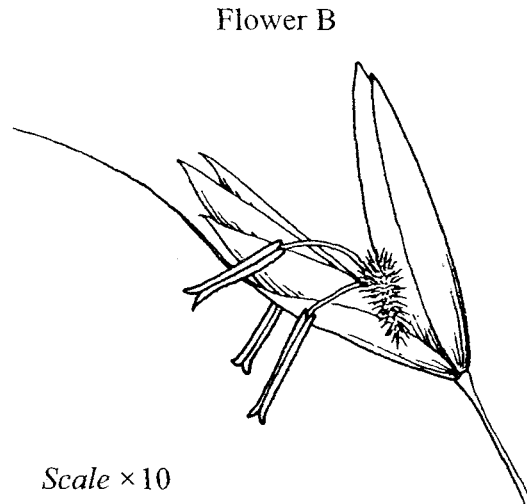
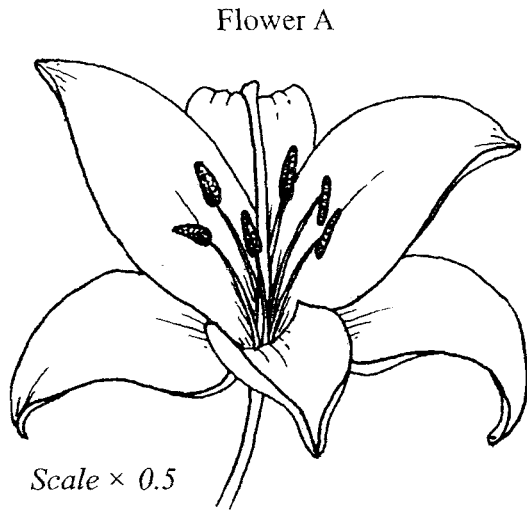
Q6

**(Total 14 marks)**

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7. The diagrams below show the structure of two flowers, A and B. One flower is wind-pollinated and the other is insect-pollinated.

Leave blank



(a) State **three** ways that flower A differs from flower B. Use features shown in the diagram.

- 1 .....
- .....
- 2 .....
- .....
- 3 .....
- .....

(3)

(b) Which flower is wind-pollinated?

.....

(1)

(c) Give **two** ways that pollen produced by insect-pollinated flowers differs from pollen produced by wind-pollinated flowers.

- 1 .....
- .....
- 2 .....
- .....

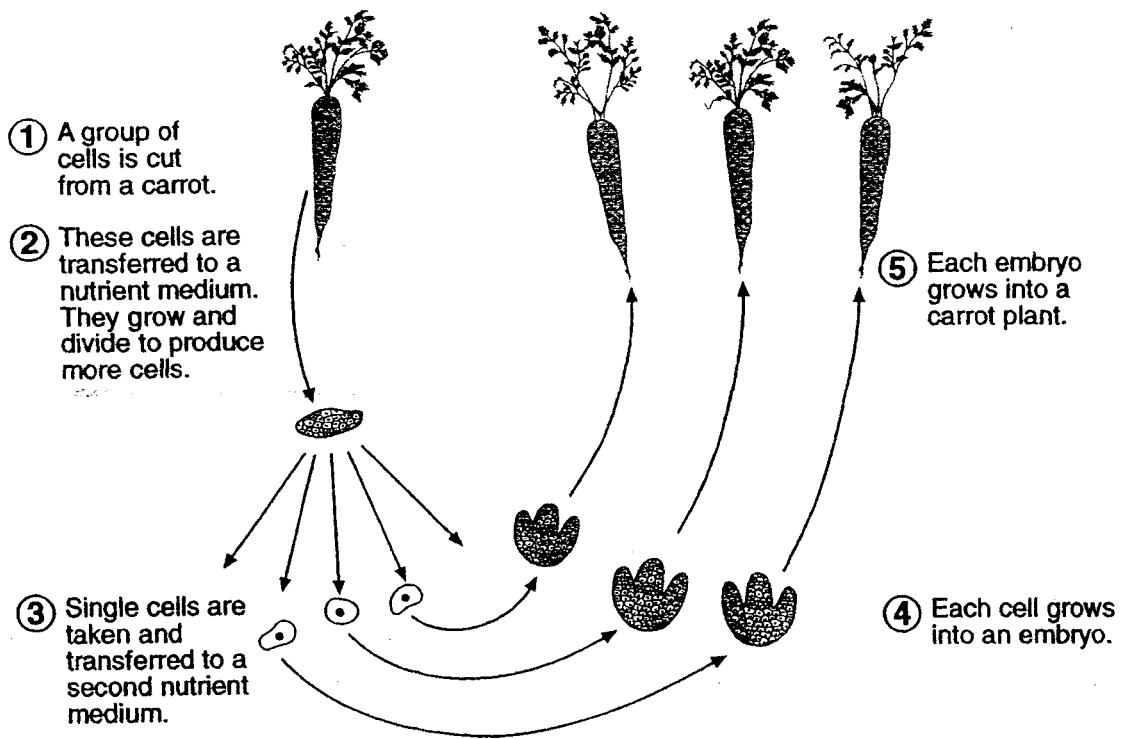
(2)

Q7

(Total 6 marks)

8. The diagram below shows a method that can be used to clone a carrot plant.

Leave blank



(a) Suggest **two** substances, other than water, that might be present in the nutrient medium. For each substance you name give a reason why it is needed.

Substance	Reason why needed
1	
2	

(4)

(b) (i) **Cloning** is an example of what type of reproduction?

.....  
(1)

(ii) Carrots can also be produced from seed. How would carrots produced by cloning differ from those grown from seed?

.....  
.....  
.....  
.....  
(2)

(c) Suggest **one** way in which cloning could be exploited or used commercially.

.....  
.....  
(1)

**(Total 8 marks)**

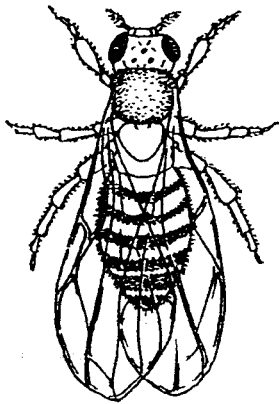
*Leave blank*

**Q8**

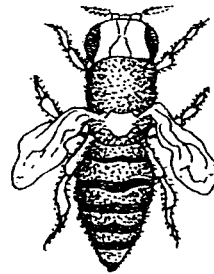
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9. *Drosophila* is a fruitfly often used in genetic research. The diagram below shows two different strains of *Drosophila*.

Leave  
blank



Normal (wild type)



Mutant with vestigial wings

- (a) Give **three** structures shown in the normal fly that are characteristic of an insect.

1 .....

2 .....

3 .....

(3)

- (b) Vestigial wing is caused by a mutation. For wings, the normal allele is represented by the symbol **N** and the allele for vestigial wings is represented by **n**.

In a breeding experiment, pure bred normal-winged male flies were mated with pure bred vestigial-winged female flies. All the offspring of this cross had normal wings.

- (i) State the genotype of the male parents.

.....  
(1)

- (ii) State the genotype of the female parents.

.....  
(1)

- (iii) State the genotype of the offspring.

.....  
(1)



(c) In a second experiment, flies with the genotype **Nn** (for wings) were allowed to mate together.

*Leave blank*

(i) Use a genetic diagram to show this cross.

(3)

(ii) Give the expected ratio of the genotypes of the offspring of this cross.

(1)

(iii) Give the expected ratio of the phenotypes of the offspring of this cross.

(1)

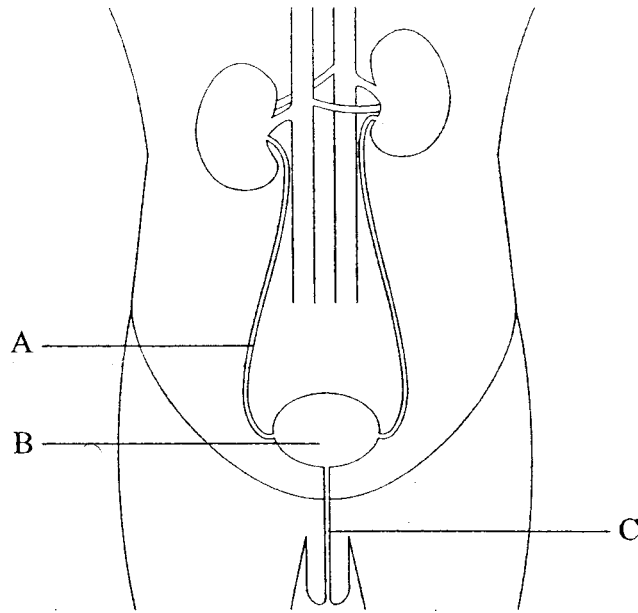
Q9

(Total 11 marks)

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10. The diagram below shows the human urinary system including the kidneys and their blood vessels.

*Leave blank*



(a) Name the structures labelled A, B and C.

A .....

B .....

C .....

(3)

(b) (i) State **three** substances found at a greater concentration in the liquid stored in structure B than in the blood entering the kidney.

1 .....

2 .....

3 .....

(3)

(ii) Name **two** substances found in the blood that are not normally present in the liquid stored in structure B.

1 .....

2 .....

(2)

(c) (i) Name the process carried out by the kidney that helps to control the regulation of water in the body.

*Leave blank*

.....  
(1)

(ii) Name **one** hormone that is involved in this process.

.....  
(1)

(iii) A person drinks a large quantity of water. How would this affect the liquid stored in structure B?

.....  
.....  
.....  
(2)

Q10

(Total 12 marks)

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**TOTAL FOR PAPER: 100 MARKS**

**END**