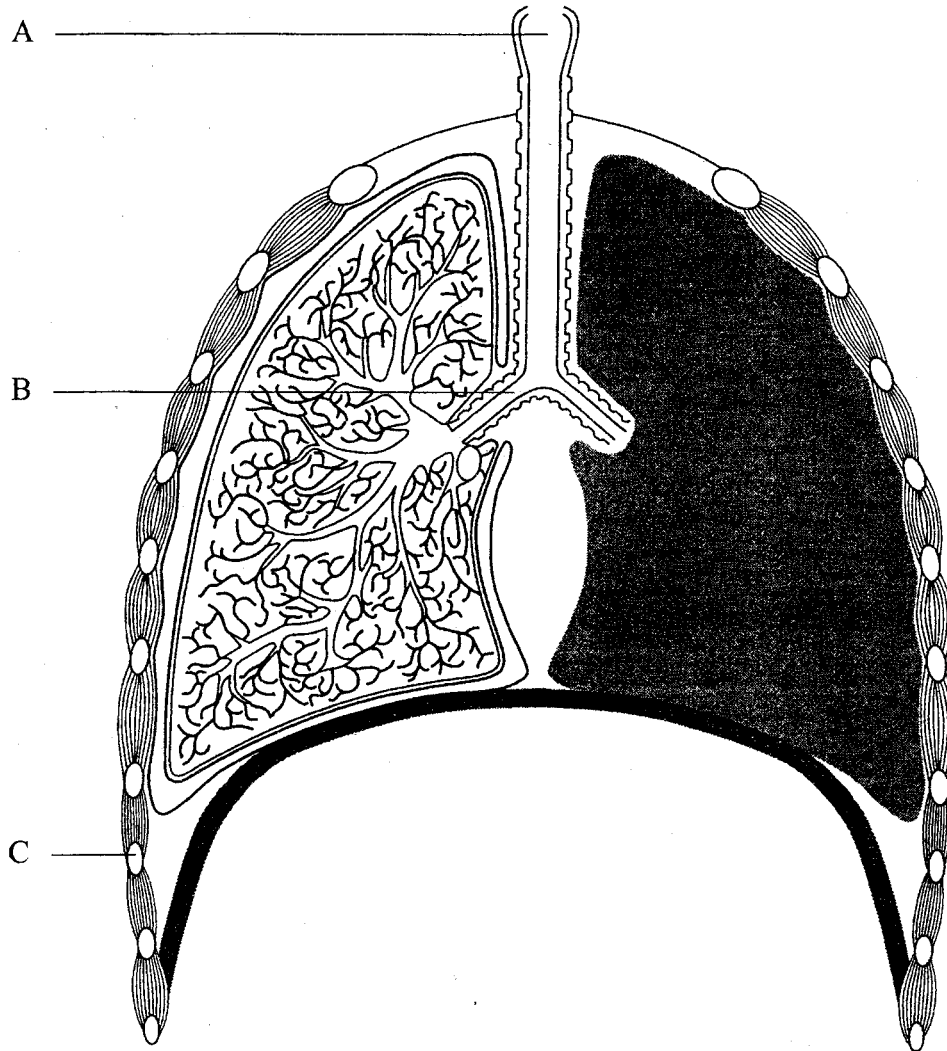


1. The diagram below shows a section through the human thorax.



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

A

B

C

(3)

(b) Complete the table below, which shows changes that take place during inhalation and exhalation.

Leave blank

Feature	During inhalation	During exhalation
Position of diaphragm		Dome shaped
External intercostal muscles	Contract	
Position of ribcage	Raised	
Volume of thorax		Less
Pressure in thorax compared to atmospheric pressure		

(6)

(c) In a condition such as arteriosclerosis the blood vessels tend to become blocked, especially in the legs.
Suggest why this might cause damage to the tissues which are supplied with blood by these arteries.

.....

.....

.....

.....

.....

.....

.....

(3)

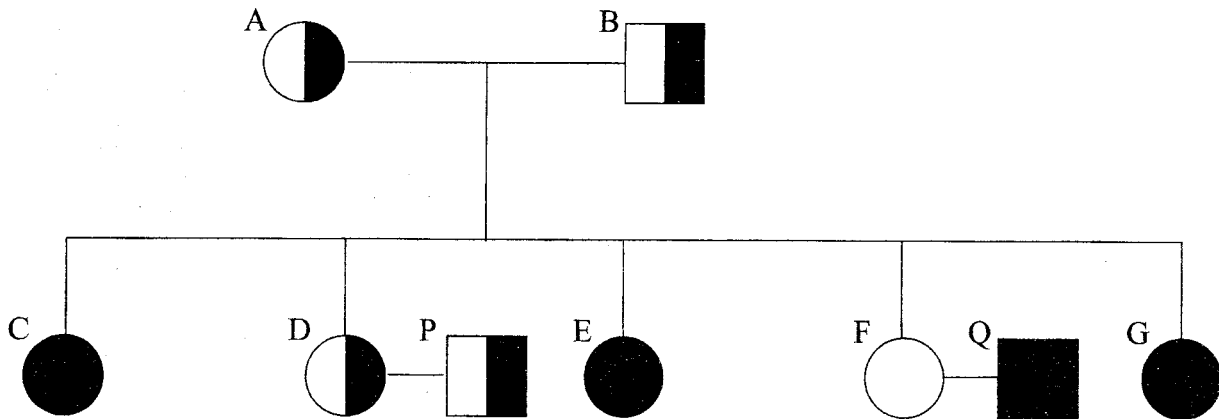
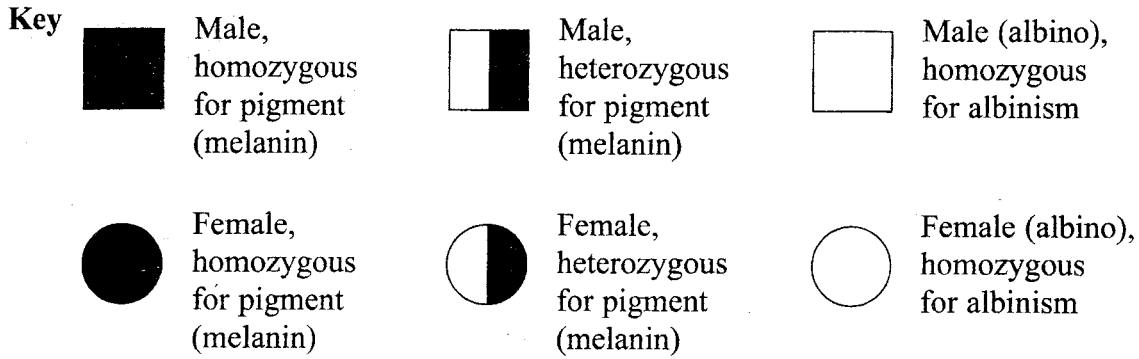
Q1

(Total 12 marks)

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2. Melanin is a pigment normally produced by skin cells. Production of melanin is controlled by a single gene with two alleles. Albinism is an inherited disorder in which skin cells are unable to make melanin. The allele for albinism is recessive.

The diagram below shows how albinism was inherited in one family with parents A and B, and their children C, D, E, F and G.



- (a) How many of the children of A and B were homozygous dominant?

..... (1)

- (b) What is the phenotype of F?

..... (2)

(c) In the space below draw and shade the symbol you would expect if F and Q had a child who was a boy.

Leave blank

(2)

(d) In the table below put a tick in the correct box to show the probability of having offspring as described. The first one has been done for you.

Description	Probability				
	Zero	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	One
A and B having a child with albinism			✓		
D and P's next child being a girl					
D and P having a child with albinism					
D and P having a girl with albinism					

(3)

Q2

(Total 8 marks)

--

Leave blank

3. Two similar groups of barley seedlings (A and B) were grown from seed in a culture solution containing all the mineral ions needed for plant growth. The sulphate ions in the solution contained radioactive sulphur atoms so that the rate of absorption of the sulphate ions could be measured.

In group A, oxygen was bubbled through the solution containing the seedlings. In group B, nitrogen was bubbled through the solution containing the seedlings. The amount of sulphate ions absorbed by each group of seedlings over a period of 4 hours is shown in the table below.

Time in minutes	Total amount of sulphate ions absorbed in arbitrary units	
	Group A (with oxygen)	Group B (with nitrogen)
0	0	0
60	290	190
120	390	225
180	490	250
240	530	290

- (a) (i) On the grid opposite plot the results for Group A and for Group B. Join the points with straight lines.

(5)

- (ii) Describe how the absorption of sulphate ions in Group A (with oxygen) differs from the absorption of sulphate ions in Group B (with nitrogen).

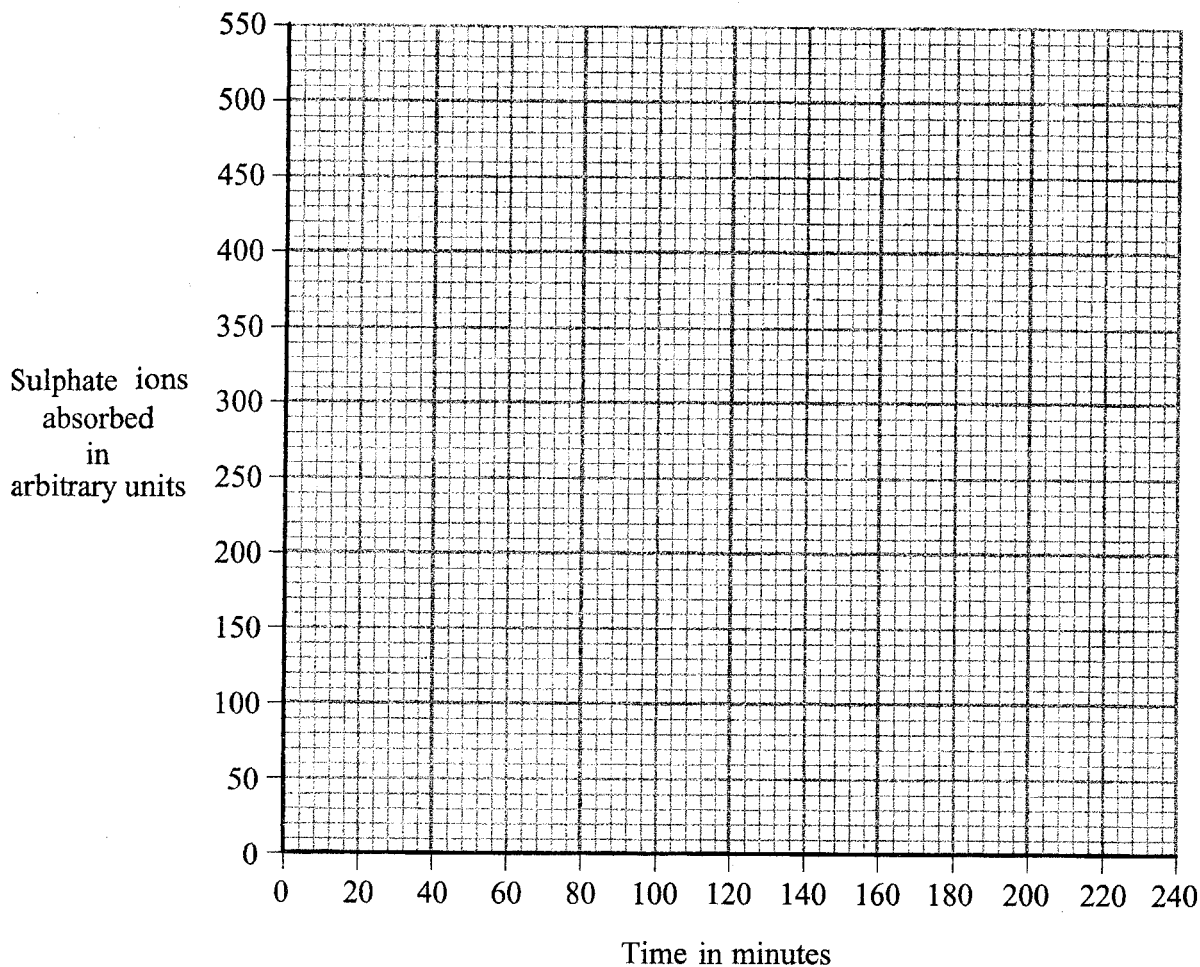
.....
.....
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.....
.....

(3)

- (iii) Suggest reasons for the differences between the two groups.

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

(3)



(b) Suggest why potted plants may die if they are given too much water and the soil becomes waterlogged.

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

(2)

(c) Give **one** function of magnesium ions in plant cells.

.....

(1)

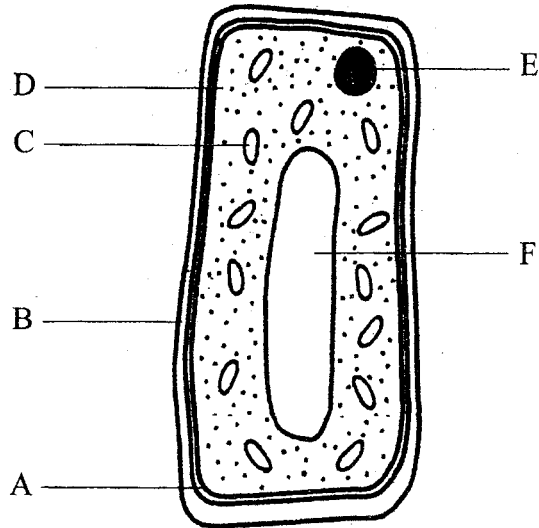
Q3

(Total 14 marks)

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4. The diagram below shows a typical plant cell with parts labelled A to F.

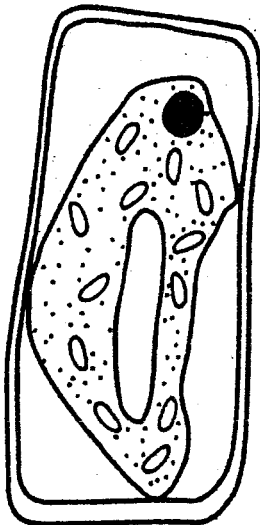
Leave blank



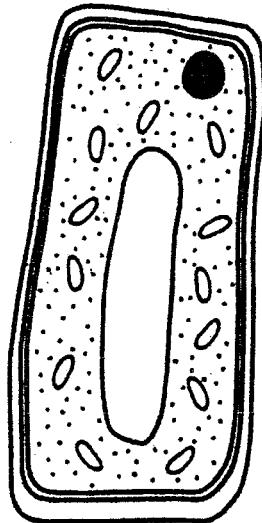
(a) Which **three** label letters indicate cell parts **not** found in typical animal cells?

.....
(1)

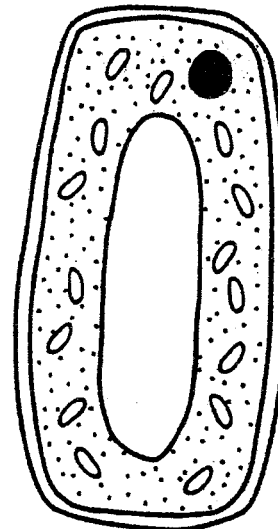
(b) Which of the diagrams X, Y or Z would show the same plant cell after it had been put in a very strong salt solution for one hour? Give a reason for your choice.



X



Y



Z

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

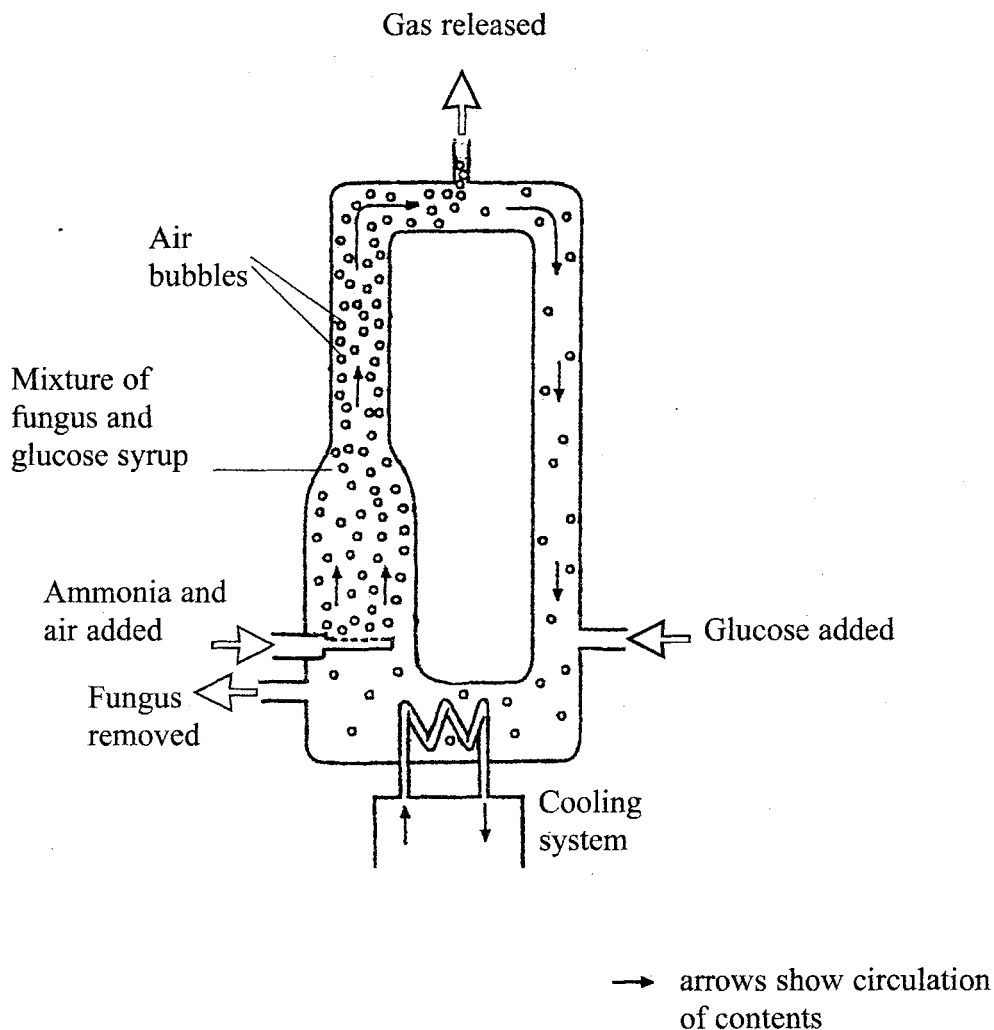
(3)

(Total 4 marks)

Q4

5. The mycelium of a fungus called *Fusarium* can be grown in a fermenter to make 'mycoprotein'. This is similar to the process used for the production of single cell protein (SCP).

The diagram below shows the fermenter used to grow the fungus.



- (a) (i) What evidence, shown on the diagram, suggests that the fungus obtains energy for growth from aerobic respiration.

.....

 (1)

- (ii) Name **two** substances produced by aerobic respiration.

1
 2
 (2)

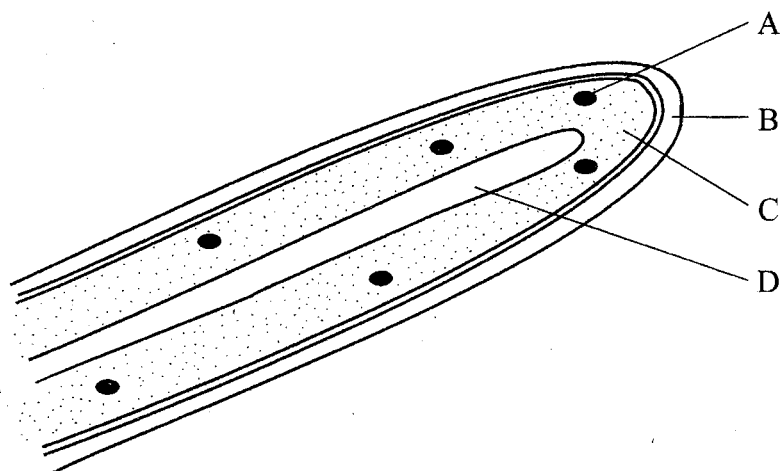
(b) What element does ammonia provide to help the fungus grow?

.....
(1)

(c) Explain what would happen if the cooling system stopped working.

.....
.....
.....
.....
.....
(3)

(d) A sample of the liquid containing the fungus mycelium was observed under a microscope. The diagram below shows part of a hypha from the mycelium.



Name the parts labelled A, B, C and D.

A

B

C

D

(4)

(e) The table below gives information about two pies of the same size. One is made from mycoprotein and the other is made from meat.

Leave blank

Component	Mycoprotein pie	Meat pie
Energy	425 kJ	1010 kJ
Animal fat	None	19 g
Vegetable fat	4 g	None
Cholesterol	None	20 mg
Protein	14 g	18 g
Dietary fibre	7 g	None

(i) Which component found in mycoprotein pies helps egestion?

.....
(1)

(ii) Using information in the table, suggest **two** reasons for choosing to eat a mycoprotein pie rather than a meat pie.

1

.....

2

.....
(2)

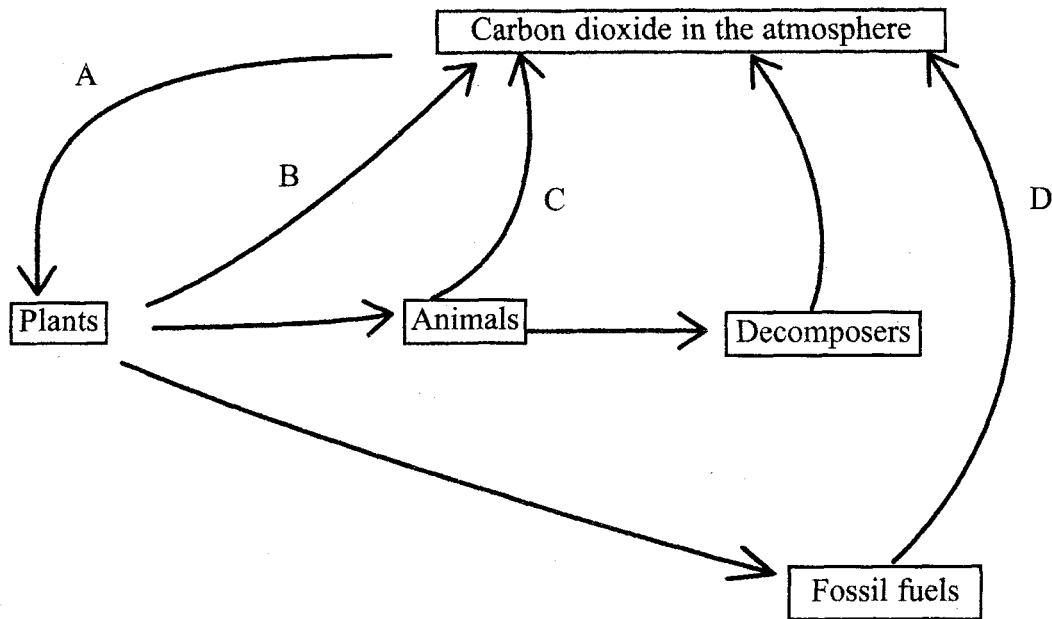
Q5

(Total 14 marks)

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6. The recycling of nutrients has an important role in the maintenance of ecosystems.

The diagram below outlines a nutrient cycle. The letters A, B, C and D represent processes within the cycle.



(a) (i) Name this cycle.

..... (1)

(ii) Name the processes labelled A, B, C and D.

A

B

C

D

(4)

(b) Name **two** groups of organisms that can act as decomposers.

1

2

(2)

(c) Suggest how urbanisation might affect processes A and B in this cycle.

Leave blank

.....

.....

.....

.....

.....

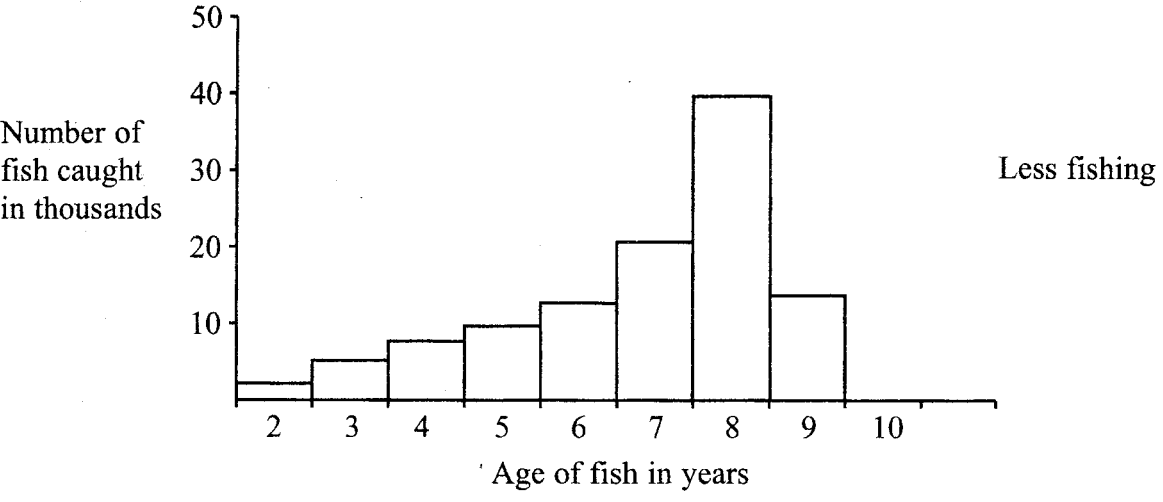
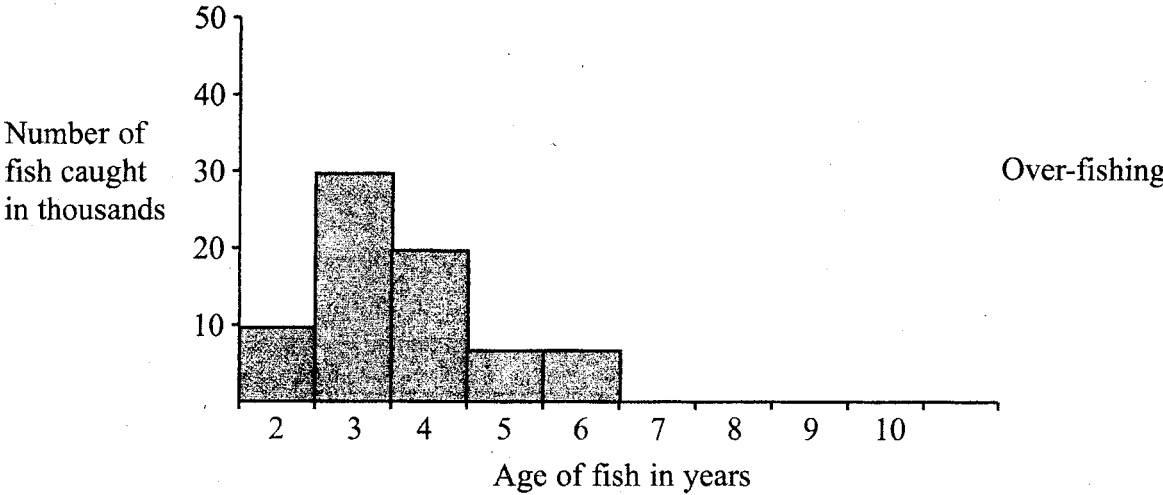
(3)

Q6

(Total 10 marks)

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7. The graphs below show the numbers of fish of various ages caught in an area where over-fishing had occurred and an area where there was less fishing. In both areas the fish were caught using nets.



- (a) (i) What is the age range for fish caught in the area of over-fishing?
..... (1)
- (ii) In the area of less fishing, what is the age of the fish that are most at risk of being caught?
..... (1)
- (iii) Suggest why fish younger than 2 years old are not recorded on the graphs.
.....
.....
..... (2)

(iv) Use information from the graphs to explain why over-fishing reduces the population of fish in an area.

Leave blank

.....

.....

.....

(2)

(b) Fish farming can provide a useful source of animal protein. The table below gives steps taken at a fish farm to ensure maximum growth of the fish.

Complete the table by giving an explanation for each step.

Step	Explanation
The water is kept oxygenated	
Faeces is removed from the water	
Tanks containing the fish are covered with nets	

(6)

Q7

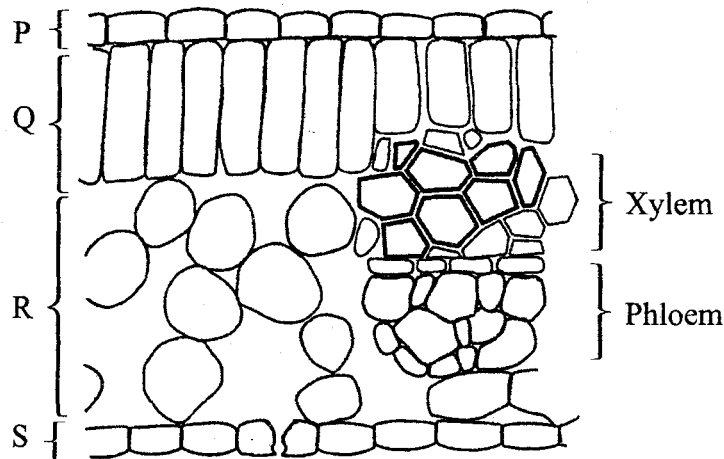
(Total 12 marks)

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8. Diagram A below shows a cross section of a leaf as seen with a microscope.

Leave blank

Diagram A



(a) Name the structures labelled P, Q, R and S.

P

Q

R

S

(4)

(b) In which region (P, Q, R or S) is most photosynthesis carried out? Explain your answer.

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

(3)

(c) State the function of the xylem and the phloem.

Xylem

.....

Phloem

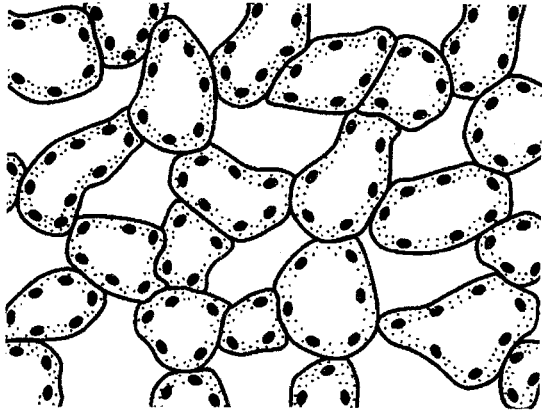
.....

(2)

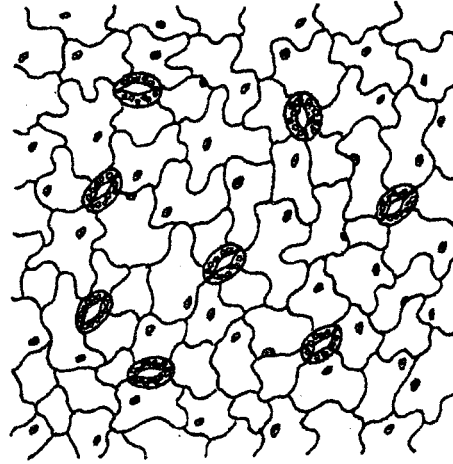
- (d) Each of the sections shown in Diagram B has been cut parallel to the leaf surface. These sections are at a higher magnification than in Diagram A and show more detail.

Leave blank

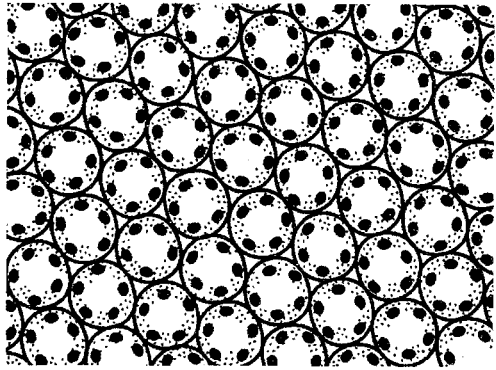
Diagram B



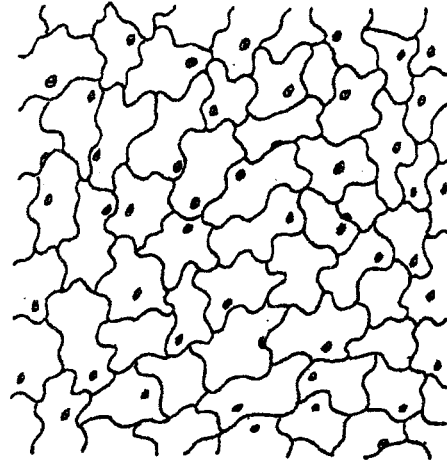
Section 1



Section 2



Section 3



Section 4

Match the sections, numbered 1 to 4 (in Diagram B) with its correct region as labelled on Diagram A.

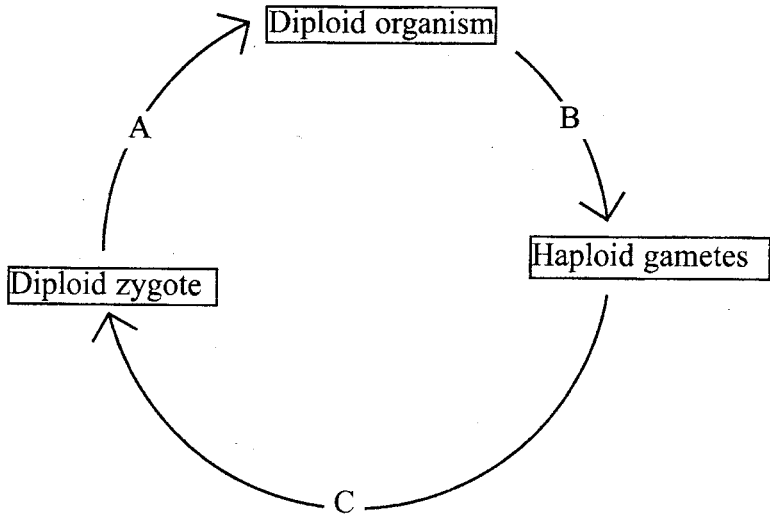
Letter of region in Diagram A	Section number in Diagram B
P	
Q	
R	
S	

(4)

Q8

(Total 13 marks)

9. The diagram below shows stages in the life cycle of an organism. A, B and C represent events that occur during the life cycle.



(a) (i) Name the types of cell division that take place in the life cycle at A and at B.

A

B

(2)

(ii) Name the process represented by C.

.....

(1)

(b) In humans the diploid number of chromosomes is 46. How many chromosomes would be found in each of the following human cells?

Sperm

Egg

Zygote

White blood cell

Red blood cell

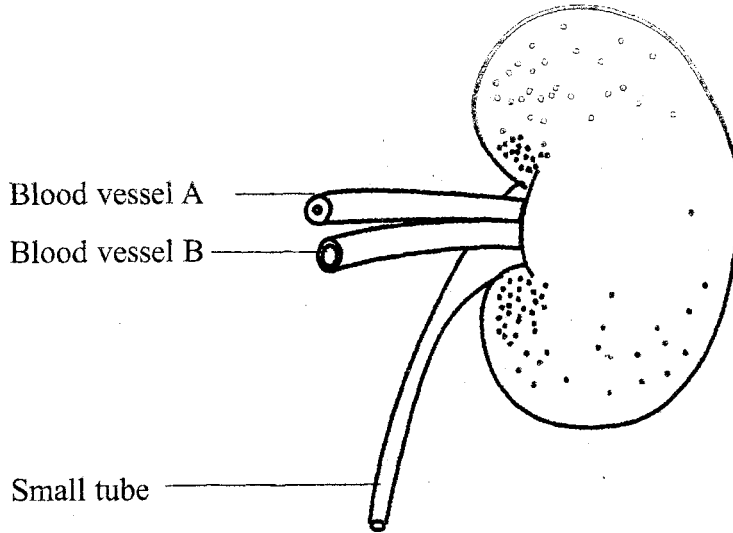
(5)

Q9

(Total 8 marks)

10. (a) The diagram below shows a kidney with a small tube and two blood vessels.

Leave blank



Refer to the diagram and, in the boxes below, put a tick (✓) if the statement is correct. There are three correct statements.

The small tube contains glucose, urea and water.

The small tube is called a nephron.

The small tube leads to the bladder.

Blood vessel B is the renal vein.

Blood vessel A comes from the vena cava.

Blood vessel A contains blood at high pressure.

(3)

(b) Name the precise part of the nephron in which each of the following occurs.

(i) Ultrafiltration

..... (1)

(ii) Selective reabsorption of glucose

..... (1)

Q10

(Total 5 marks)

TOTAL FOR PAPER: 100 MARKS

END