

Answer ALL questions in the spaces provided.

1. (a) Describe a test to find out if the contents of the cells in a piece of grass contain glucose.

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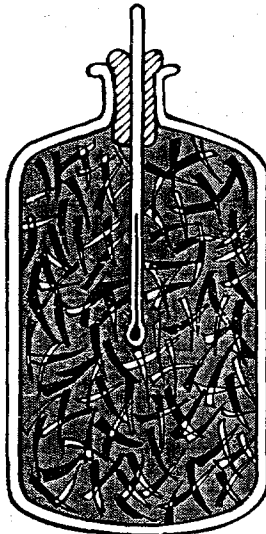
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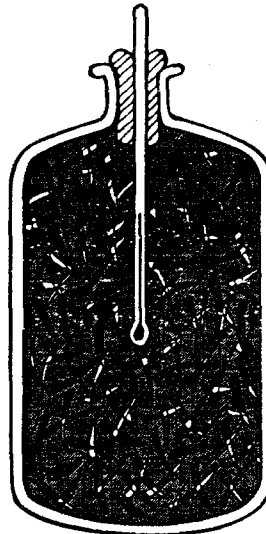
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(3)

- (b) The diagram below shows two vacuum flasks. One was filled with wet grass and the other was filled with dry grass.



Dry grass



Wet grass

The temperature inside each of the flasks was recorded at the start of the experiment and again after two days. Which flask would show the greatest increase in temperature? Explain your answer.

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(3)

(Total 6 marks)

Q1



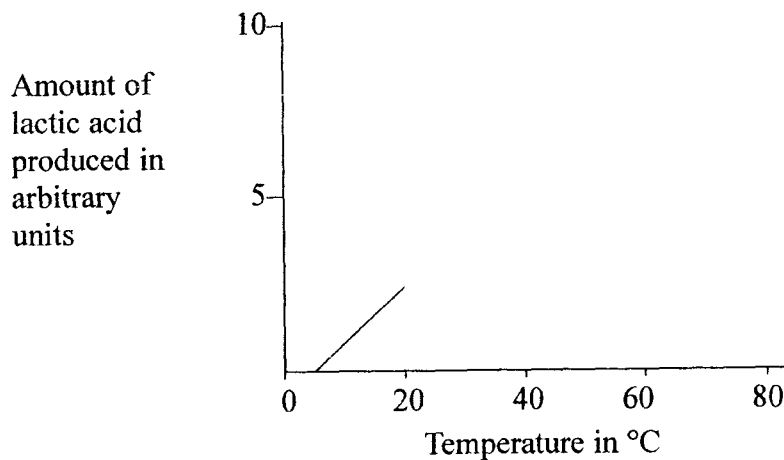
2. (a) Enzymes are involved in many biological processes. Complete the table below by naming the enzyme involved in each of the processes listed.

Process	Enzyme
The digestion of fat	
The digestion of maltose	
Cutting DNA at specific sites	
Joining pieces of DNA together	

(4)

(b) The bacterium *Lactobacillus* is used to make yoghurt in a fermenter and this is usually carried out at a temperature of 42 °C. The bacterium releases lactase enzyme, which produces lactic acid. The presence of lactic acid helps convert milk to yoghurt.

An investigation was carried out to find out how temperature affected production of lactic acid. The results for temperatures up to 20 °C are shown on the graph below.



(i) On the graph, continue the line to show the amount of lactic acid you would expect to be produced at the higher temperatures.

(2)

(ii) Explain why no lactic acid is produced at the coldest temperature.

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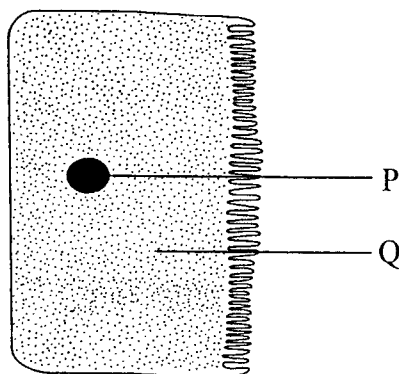
(2)

Q2

(Total 8 marks)



3. The diagram below shows a cell from the lining of the small intestine. The cell is in direct contact with the contents of the small intestine.



(a) Name the parts labelled P and Q.

P

Q

(2)

(b) The concentration of salts is higher in the cell than in the contents of the small intestine.

(i) Explain how **salts** move into the cell from the contents of the small intestine.

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

(2)

(ii) Explain how **water** moves into the cell from the contents of the small intestine.

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

(2)

(c) Certain microorganisms produce toxins that prevent salt being absorbed by the small intestine. This means that the faeces contain more water than normal. This condition is known as diarrhoea.

Suggest why faeces contain more water in someone suffering with diarrhoea.

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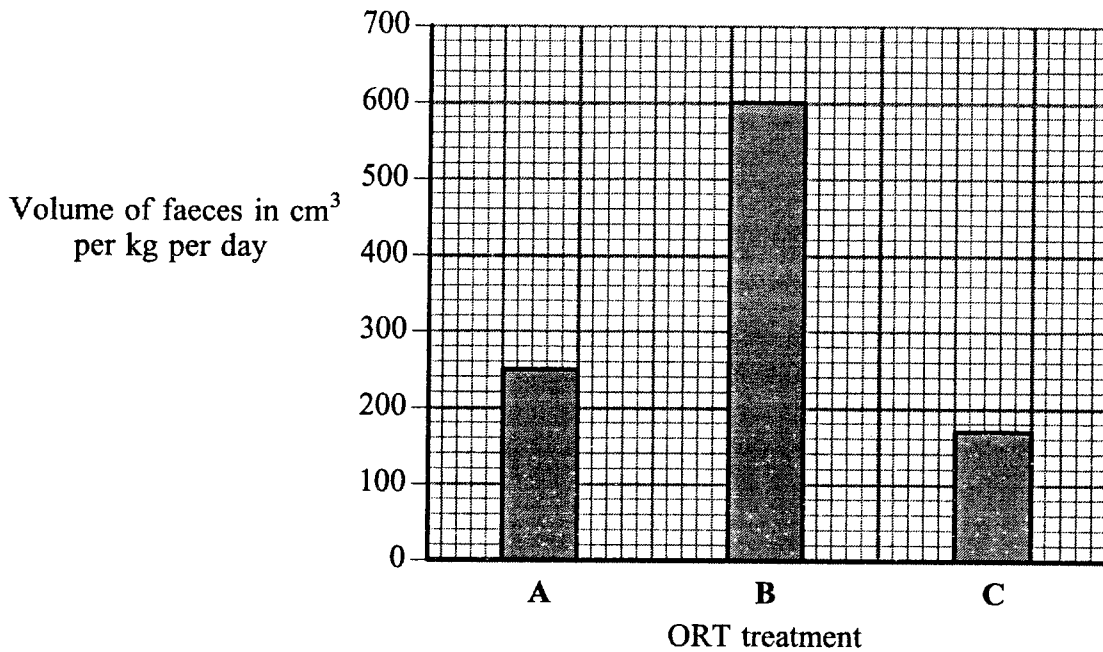
(1)



(d) Treatment for diarrhoea, known as oral rehydration therapy (ORT), involves drinking fluid containing salt and glucose. The treatment works because small amounts of glucose stimulate the absorption of salt. This helps water to be absorbed. However, too much glucose inhibits water absorption.

An investigation was carried out to compare the effect of three different ORT treatments, A, B and C. Each of the treatments contained the same amount of salt. Treatments A and B contained different amounts of glucose. Treatment C contained starch instead of glucose.

The graph below shows the volume of faeces produced when testing these three treatments.



Adapted from Biological Sciences Vol 14, September 2001

(i) What volume of faeces was produced by treatment A?

..... cm³ per kg per day (1)

(ii) Which treatment was most successful?

..... (1)

(iii) Suggest why this treatment for diarrhoea is called 'oral rehydration therapy'.

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

(Total 11 marks)

Q3

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4. Some women are infertile and infertility may result from a number of causes. It may be possible to overcome some forms of infertility by carrying out fertilisation outside the body. This is known as IVF (*in vitro* fertilisation).

The table below shows the steps taken in IVF treatment. The steps are not in the correct order.

(a) Complete the table by using numbers to show the correct order of steps. The third and fifth steps have been done for you.

Step	Order of step
The eggs and the sperm are mixed	
The eggs are collected from the woman and put into a special solution in a petri dish	
The eggs are checked to make sure they have been fertilised	5
The woman is given a hormone to cause many eggs to develop at the same time in her ovaries	
A sample of sperm is collected	3
The embryos are put into the mother's uterus (womb)	

(4)

(b) (i) Name the hormone that would cause many eggs to develop in the ovaries.

.....
(1)

(ii) Name **one** substance in the special solution that is needed for respiration of the eggs.

.....
(1)



(iii) How does the chromosome number of a fertilised egg differ from that of an unfertilised egg?

.....
(1)

(iv) Name the part of the body where implantation occurs.

.....
(1)

(c) Name the organ in the body where sperm is produced.

.....
(1)

(Total 9 marks)

Q4

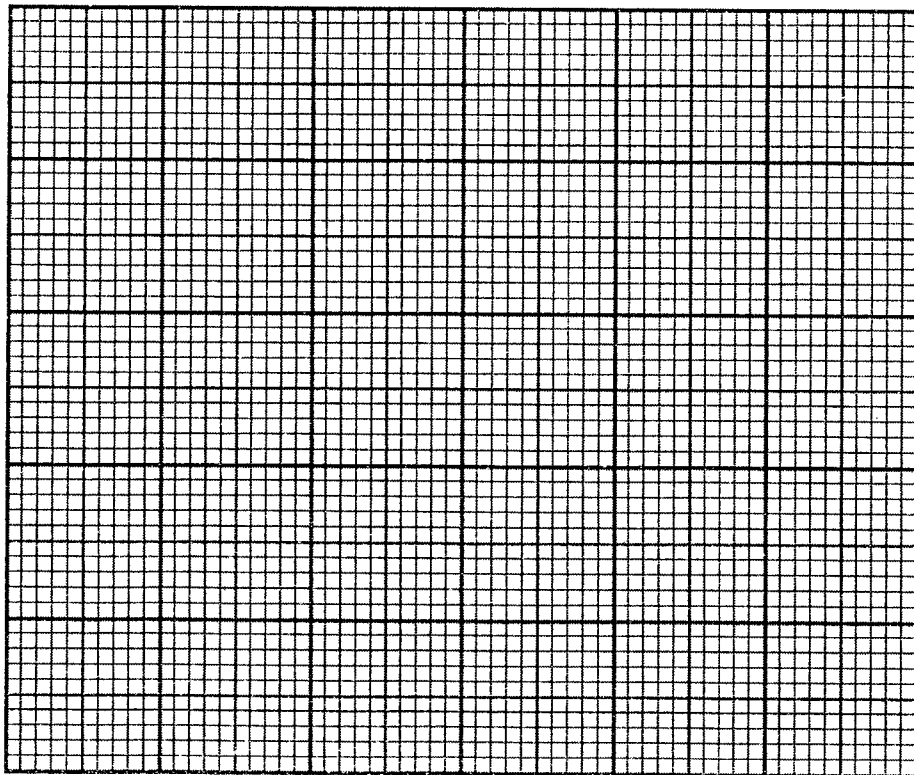


5. Maize is a largely tropical crop plant and rye grass is a temperate crop plant that grows in much cooler climates.

The data below show the rate of photosynthesis in leaves of maize and rye at different light intensities.

Light intensity in arbitrary units	Rate of photosynthesis in cm ³ of CO ₂ used per cm ² of leaf per hour	
	Rye grass	Maize
10	50	40
20	110	130
30	125	170
40	131	200
50	130	223
60	132	235

- (a) (i) On the grid below, plot a graph to show how increasing light intensity can affect the rate of photosynthesis for the two plant species. Join the points with straight lines.



(5)



(ii) Which plant reaches the highest rate of photosynthesis?

.....
(1)

(iii) At what light intensity do both plants have the same rate of photosynthesis?

.....
(1)

(b) (i) Describe the shape of the curve for rye grass.

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

(ii) Explain how light intensity affects the rate of photosynthesis for rye grass between the following light intensities.

10 and 30 units

40 and 60 units

(2)

(c) Suggest why maize is less suitable than rye grass as a crop for growing in regions with lower light intensities.

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

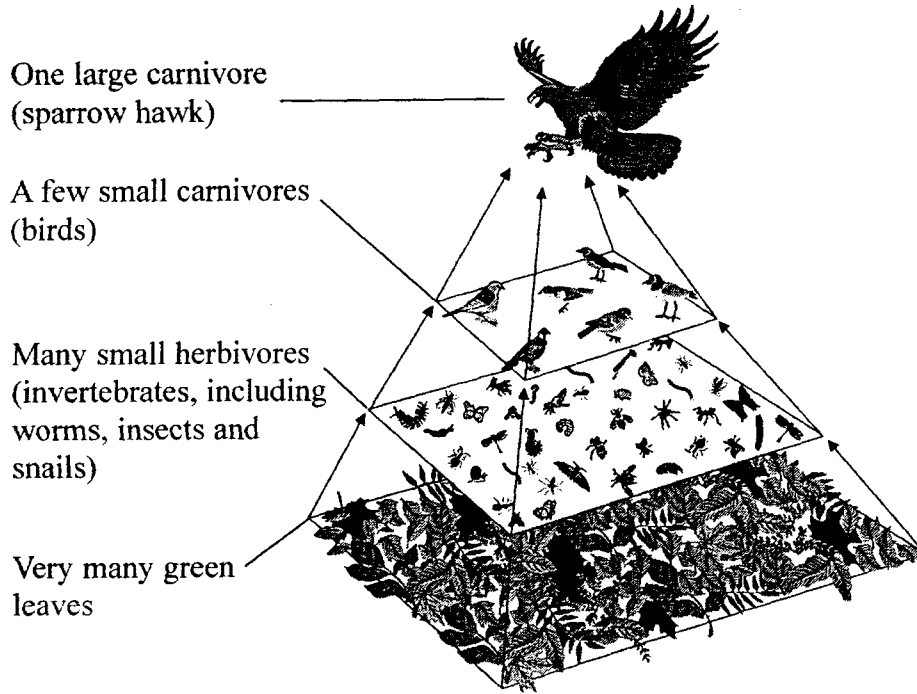
(Total 12 marks)

Q5

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6. The diagram below represents different trophic levels in a woodland.



(a) (i) Name the type of pyramid shown by the diagram.

..... (1)

(ii) Draw a food chain from this pyramid.

(2)

(b) A small carnivore (bird) feeds on different types of herbivore. Explain why it is an advantage for a small carnivore to feed on many different types of herbivore.

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



- (c) The trees that produced the leaves were sprayed with a chemical pesticide. This pesticide is poisonous and is harmful to other organisms because it cannot be broken down. It was noticed that the number of sparrow hawks decreased.

With reference to the trophic levels in the woodland, suggest why this decrease in numbers occurred.

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(3)

- (d) Some farmers prefer to use biological control rather than chemical pesticides to reduce the number of pests.

(i) Explain what is meant by **biological control**.

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(2)

(ii) Give **one** example of the use of biological control.

.....

(1)

(iii) State **three** disadvantages of using biological control compared to using chemical control of pests.

1

.....

2

.....

3

.....

(3)

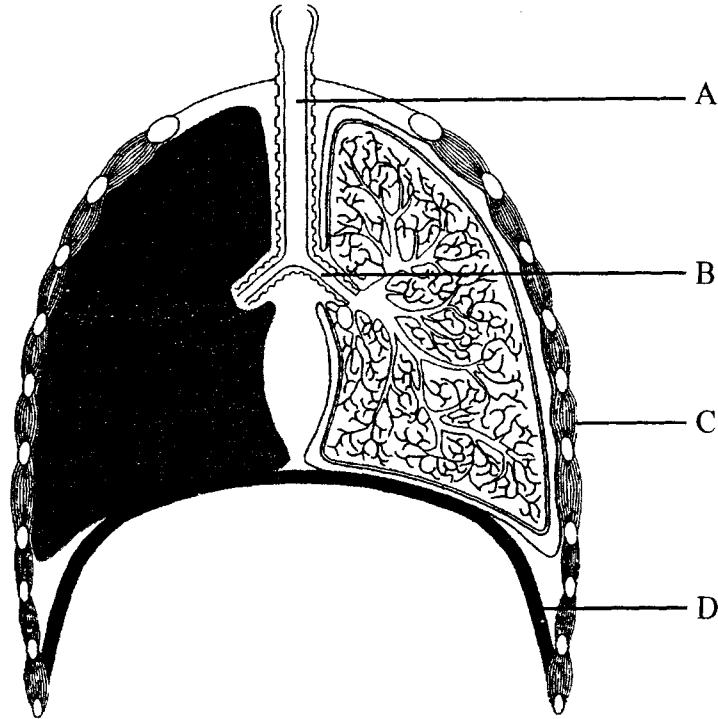
(Total 14 marks)

Q6

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



(a) Name the parts labelled A and B.

A

B

(2)

(b) Describe how parts C and D help you to breathe in.

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(5)

(Total 7 marks)

Q7



8. The picture below shows the rodent mammal *Rattus norvegicus* and its young.



(a) Give **three** features you can see in the picture that show the rat is a mammal.

- 1
- 2
- 3 (3)

(b) Rats are able to feed on different foods and can colonise many different habitats.

(i) Give **two** ways in which rats can cause damage on a farm.

- 1
- 2 (2)

(ii) Suggest **one** way that the damage caused by rats could be reduced.

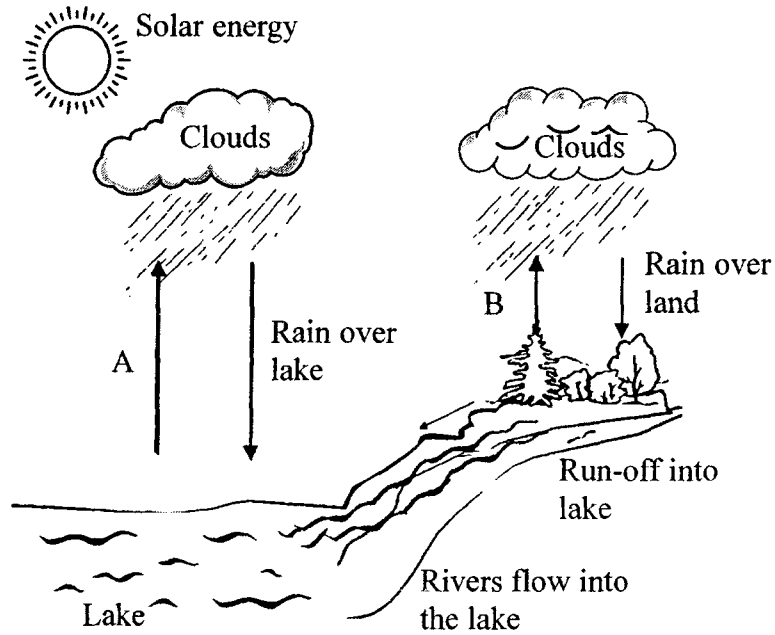
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- (1)

(Total 6 marks)

Q8



9. The diagram below shows the water cycle.



(a) Name the processes, A and B, shown in the diagram.

A

B

(2)

(b) Run-off from fields may have excess nitrate that can lead to pollution of the lake.

(i) Give a possible source of this excess nitrate.

.....

(1)

(ii) Describe and explain the effects of this excess nitrate on organisms in the lake.

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(4)

(Total 7 marks)

Q9



10. (a) The seeds of pea plants can be smooth or wrinkled. A single gene with two alleles controls this character. The dominant allele **R** gives smooth seeds and the recessive allele **r** gives wrinkled seeds.

Plants with the genotype **Rr** were crossed with plants with the genotype **rr**.

(i) State the phenotype of each of the parents.

Rr

rr

(2)

(ii) Complete the genetic diagram below to show the gametes and the genotypes and phenotypes of the offspring produced in this cross.

Parents **Rr** **rr**

Gametes

Genotype of offspring

Phenotype of offspring

(4)

(b) Pea plants can be tall or dwarf. A single gene, with two alleles, controls this character. A pure-breeding tall plant was crossed with a pure-breeding dwarf plant. All the seeds produced grew into tall plants.

(i) Give **two** conclusions you can make about the genetic make-up of these tall plants.

1.

.....

2.

.....

(2)

(ii) The tall offspring of this cross were allowed to self pollinate. The seeds germinated and grew into mature plants.

State the ratio of genotypes and the ratio of phenotypes of these mature plants.

Genotype ratio

Phenotype ratio

(2)

(Total 10 marks)

Q10



11. Plants have transport systems that allow substances to move around the plant.

(a) (i) Name the tissue that transports water in plants.

..... (1)

(ii) Name **one** substance, other than water, that is transported in this tissue.

..... (1)

(b) Plants also transport the products of photosynthesis around the plant.

(i) Name the tissue that transports the products of photosynthesis.

..... (1)

(ii) Name **one** other substance that is transported in this tissue.

..... (1)

(c) The systems used for transport of water and transport of the products of photosynthesis differ in a number of ways. Use the key to complete the table below to show the effect of changes in the environment on transport in the two systems. Two answers have been done for you.

Key + increases
 - decreases
 0 no effect

Environmental change	Volume of water transported	Mass of products of photosynthesis transported
Increase in temperature		+
Increase in carbon dioxide concentration		
Increase in humidity		0
Increase in light intensity		

(6)

(Total 10 marks)

Q11

TOTAL FOR PAPER: 100 MARKS

END

