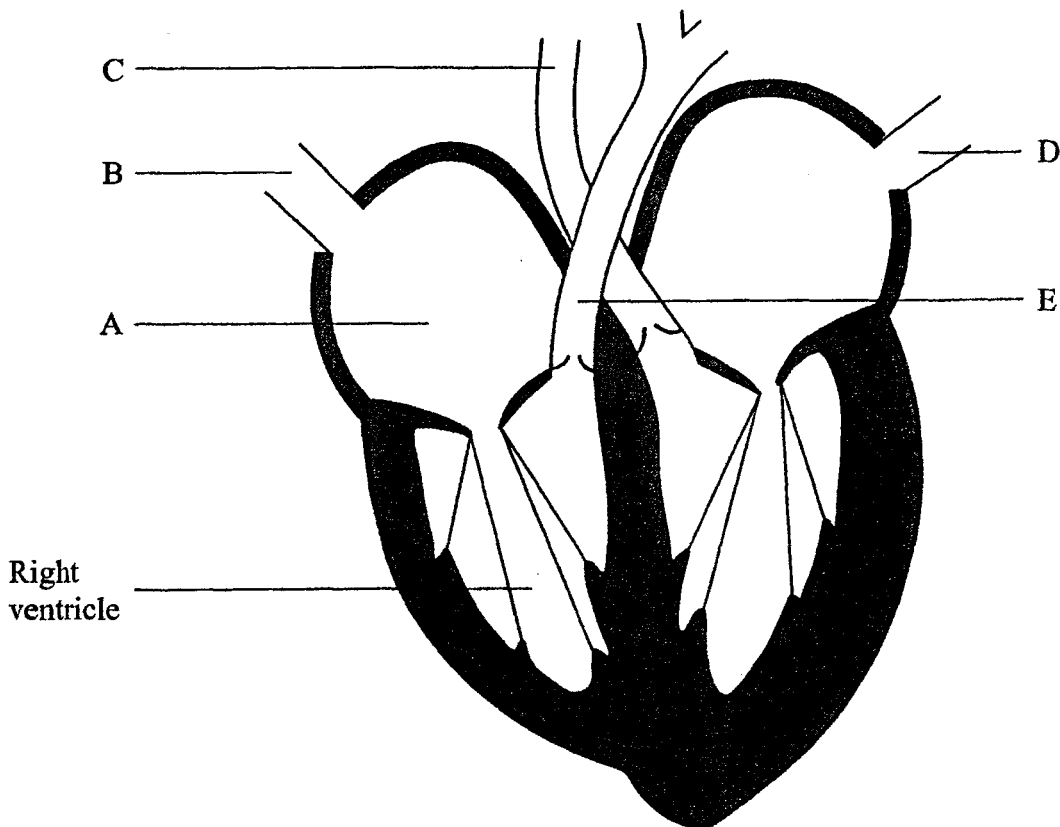




Answer all questions in the spaces provided.

Leave blank

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



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

- A .....
  - B .....
  - C .....
  - D .....
- (4)

(b) Part E transports blood to an important organ.

(i) Name the organ.

.....

(1)

(ii) Describe the changes that occur in the blood as it passes through this organ.

.....

.....

.....

(2)

(Total 7 marks)

Q1

2. A meal contained four items of food: **lamb, rice, peas and a glass of wine.**

(a) The table below shows the amount of carbohydrate, fat and protein in each item of food. Values are given in g per 100 g of each item of food.

Food	Amount in g per 100 g portion		
	Carbohydrate	Fat	Protein
Peas	7.7	0.0	5.0
	0.0	22.1	23.0
	0.3	0.0	0.0
	86.8	1.0	6.2

(i) Complete the table by putting the other three items of food in the correct position in the first column.

(3)

(ii) Peas contain nutrients other than those listed in the table. What is the total mass of these other nutrients in 100 g of peas?

.....  
(1)

(b) A balanced diet includes carbohydrate, fat and protein. Name **two** other nutrients found in a balanced diet.

1 .....

2 .....

(2)

(c) Describe how you would find out if a sample of food contained fat.

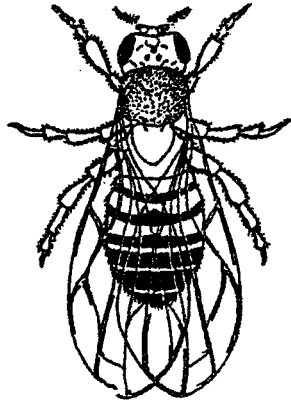
.....  
.....  
.....

(2)

Q2

(Total 8 marks)

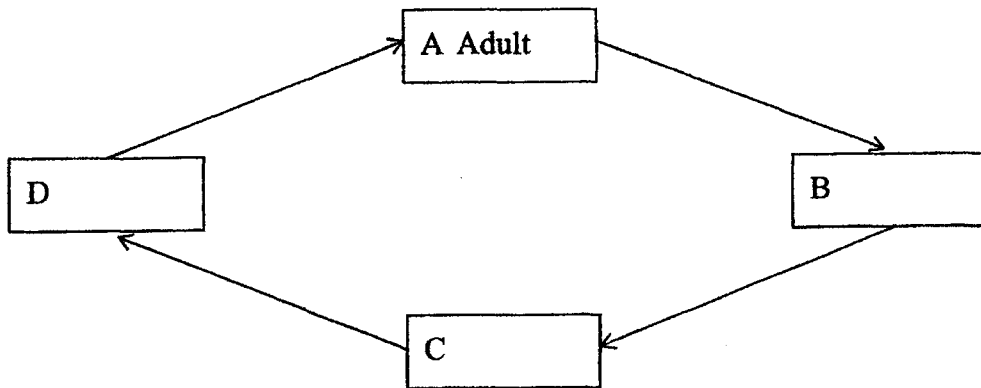
3. The diagram below shows a female fruit fly, an example of a dipteran fly.



(a) Give **three** features shown in the diagram that tell you the fruit fly is an insect.

- 1 .....
  - 2 .....
  - 3 .....
- (3)

(b) (i) Complete the diagram of the life cycle of the fruit fly by writing the name of the correct stage in the boxes labelled B, C and D.



(3)

(ii) Give the letter of the stage in which metamorphosis takes place.

.....  
(1)

(iii) At an air temperature of 25 °C the life cycle of the fruit fly lasts about 12 days.

*Leave blank*

Explain how an air temperature of 20 °C would affect the time taken to complete the life cycle.

.....

.....

.....

.....

(2)

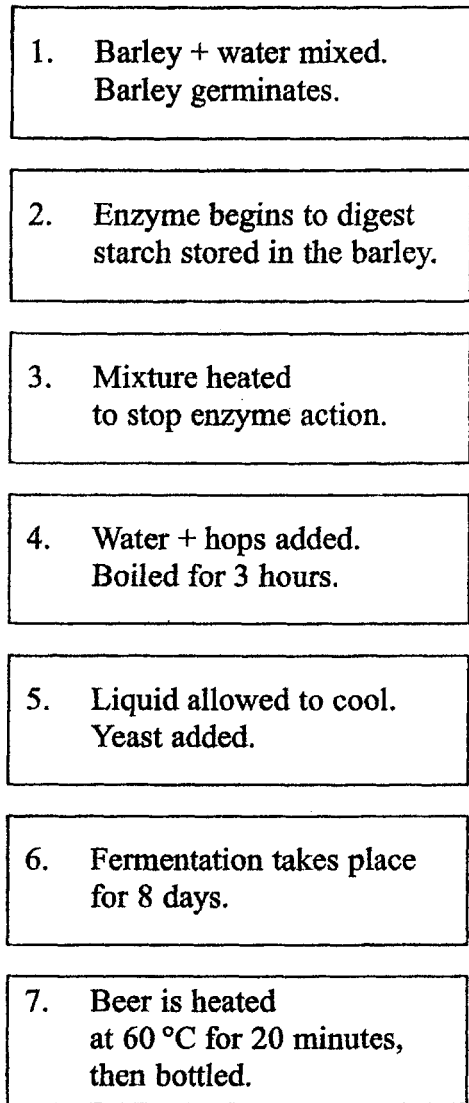
Q3

(Total 9 marks)

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4. The diagram below shows the stages (1 to 7) involved in brewing beer.

*Leave  
blank*



(a) (i) Name the enzyme involved in stage 2.

..... (1)

(ii) State the product of this enzyme action.

..... (1)

(iii) Explain why heating would stop this enzyme action (stage 3).

..... (1)

(b) Write a word equation for the process taking place in stage 6.

*Leave  
blank*

(2)

(c) Suggest why beer is heated before putting it into bottles (stage 7).

.....

.....

(1)

**Q4**

**(Total 6 marks)**

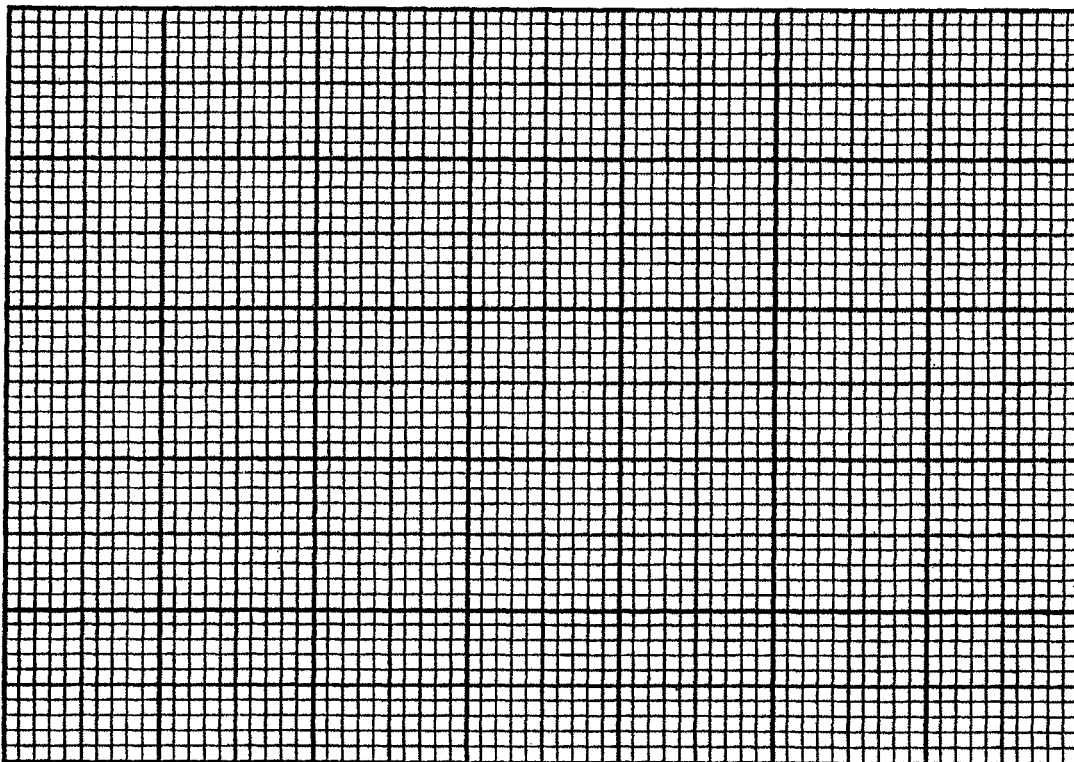
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5. The rate of photosynthesis can be altered by using coloured filters to change the wavelength of light shining on a plant. An experiment was carried out to investigate this effect.

The table below shows how the rate of photosynthesis varied with light of different wavelengths.

Colour of light	Wavelength of light in nm	Rate of photosynthesis in arbitrary units
Dark blue	440	78
Blue	480	56
Green	520	22
Yellowish green	560	20
Yellow	600	30
Orange	640	38
Red	680	66
Dark red	720	30

- (a) Plot a graph on the grid below to show how the rate of photosynthesis changes with wavelength of light. Join the points with straight lines.



(5)



(b) Describe the effect of different wavelengths of light on the rate of photosynthesis.

*Leave blank*

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

(3)

(c) Which **two** colours of light produce the highest rates of photosynthesis?

1 .....

2 .....

(2)

(d) Conditions other than wavelength can also alter the rate of photosynthesis.

Complete the table below to show how changes in **three** different external conditions can change the rate of photosynthesis. Two boxes have been completed for you.

Condition	Change in rate of photosynthesis
Decrease in temperature	
	Increase in rate

(4)

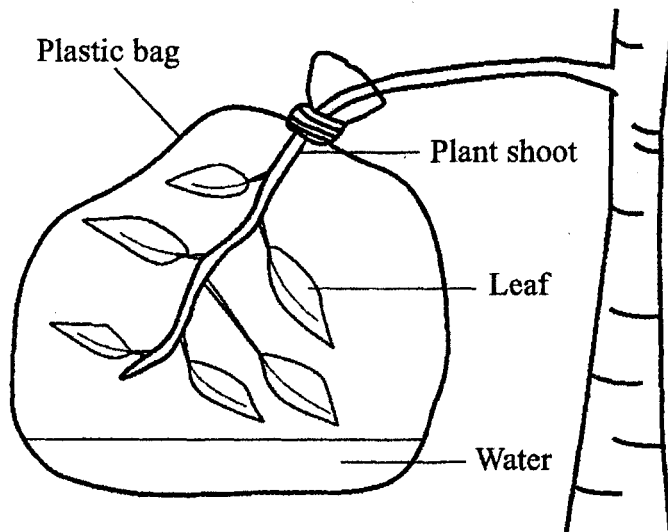
Q5

(Total 14 marks)

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6. The diagram below shows a 'survival method' used by explorers to obtain water in remote places. A plastic bag is tied around a plant shoot during the day and after a while water from the plant shoot collects in the plastic bag.

Leave blank



(a) Describe the process by which water is lost from the plant.

.....

.....

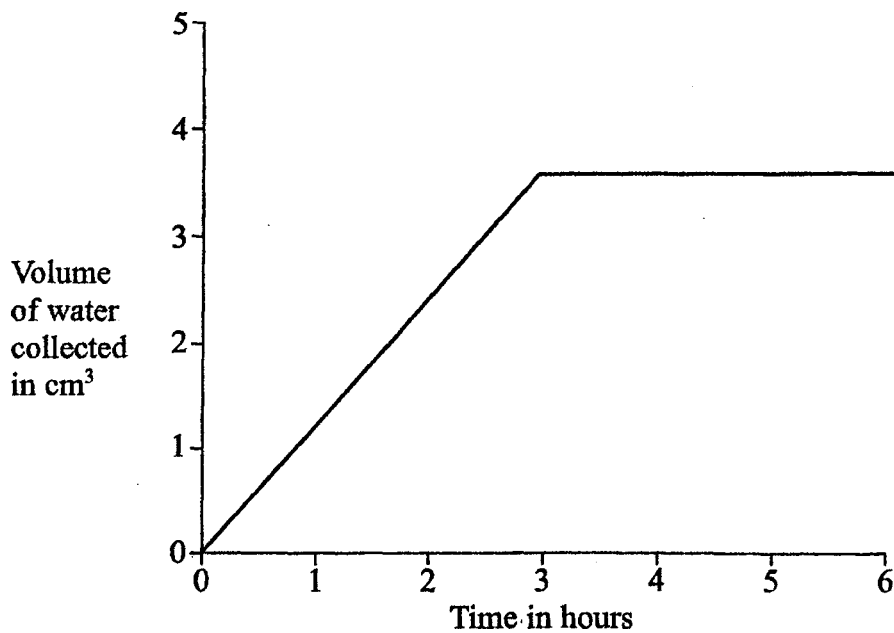
.....

.....

.....

(3)

(b) The graph below shows the volume of water collected over a period of 6 hours during the day by the method shown in the diagram above.



(i) Describe how the volume of water collected changed over this time period.

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

(2)

(ii) Suggest an explanation for the changes in the volume of water collected over this time period.

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

(3)

(c) An experiment was set up to find out which of two different plant species was better to collect water from. Give two factors that need to be kept the same for the experiment to be fair.

1 .....

2 .....

(2)

(Total 10 marks)

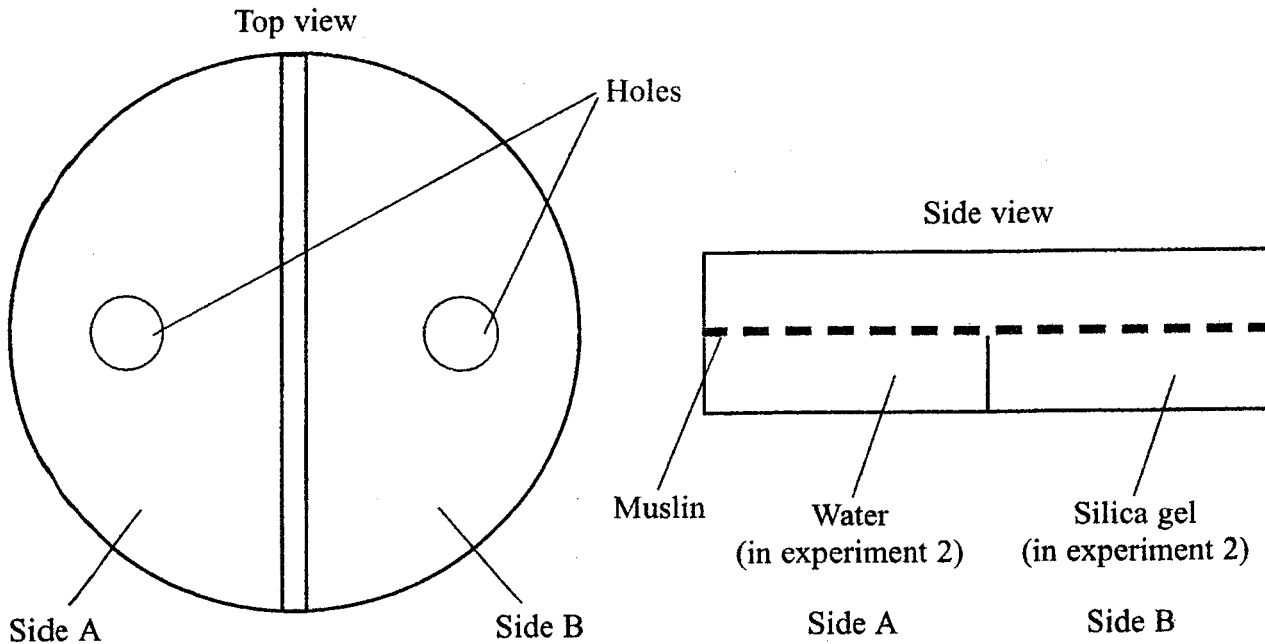
*Leave  
blank*

Q6

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7. Flour beetles (*Tribolium confusum*) are found in flour mills and bakeries.

The diagram below shows a choice chamber that was used to investigate the response of flour beetles to humidity (moisture).



The upper part and lower part of the choice chamber are separated by a layer of muslin. The lower part has two sections. These sections can be filled with certain substances to produce different conditions in the upper part of the choice chamber. The beetles are put into the choice chamber through the holes in the top.

In this investigation two experiments were carried out. First, in experiment 1, both sides of the lower part of the choice chamber were left empty and 20 flour beetles were put in the upper part of the chamber. The whole chamber was then covered with a dark cloth and left for 10 minutes. After 10 minutes the cloth was removed and the positions of the beetles were noted. The results are shown in the table below.

Experiment 1

Number of beetles in side A	Number of beetles in side B
11	9

In experiment 2, water was put in one side of the lower part of the chamber (side A). Silica gel, which absorbs moisture, was placed in the other side (side B). Again, 20 beetles were introduced into the top part. The chamber was covered with a dark cloth and left for 10 minutes. The results are shown in the table below.

Experiment 2

Number of beetles in side A (moist)	Number of beetles in side B (dry)
3	17

(a) Explain the reason for carrying out experiment 1.

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

(2)

(b) Suggest why experiments 1 and 2 were carried out in the dark.

.....  
.....

(1)

(c) Suggest a method you could use to compare the humidity on sides A and B of the upper chamber.

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

(2)

(d) What conclusions can you draw from experiment 2 about the response of flour beetles to moisture?

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

(2)

Q7

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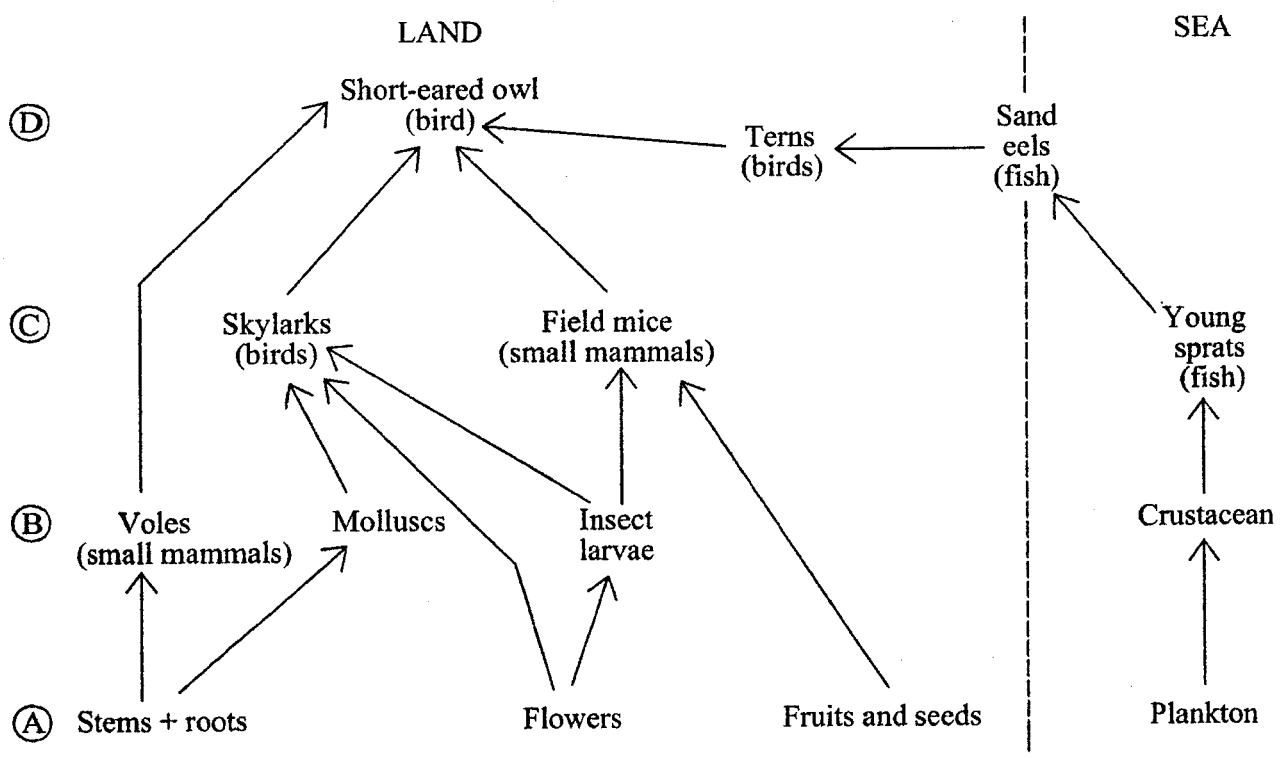
(Total 7 marks)

8. The short-eared owl, shown in the photograph below, lives in coastal sand dunes in some parts of Europe.

Leave blank



The diagram below shows where the owl fits into a food web in its habitat.



(a) The letters A, B, C and D (in circles) represent different trophic (feeding) levels in this web.

(i) Complete the table below by naming the trophic level and giving an example of an organism in this food web from each level.

Letter	Trophic level	Example of organism
Ⓐ		
Ⓑ	Primary consumer	
Ⓒ	Secondary consumer	
Ⓓ		Sand eels

(5)

(ii) From this web, give a food chain that contains **four** trophic levels and includes skylarks.

*Leave blank*

(2)

(b) Suggest why it is an advantage to the short-eared owl to feed on a variety of different organisms.

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

(2)

(c) The short-eared owl is a successful predator. Look carefully at the photograph and select **two** features that help the owl to be a successful predator. For each feature, suggest how it helps the owl to catch its prey.

Feature 1 .....

.....  
.....

Feature 2 .....

.....  
.....

(4)

Q8

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**(Total 13 marks)**

9. The passage below describes how genetic engineering is used to make human insulin. Write on the dotted lines the most suitable word or words to complete the passage.

*Leave blank*

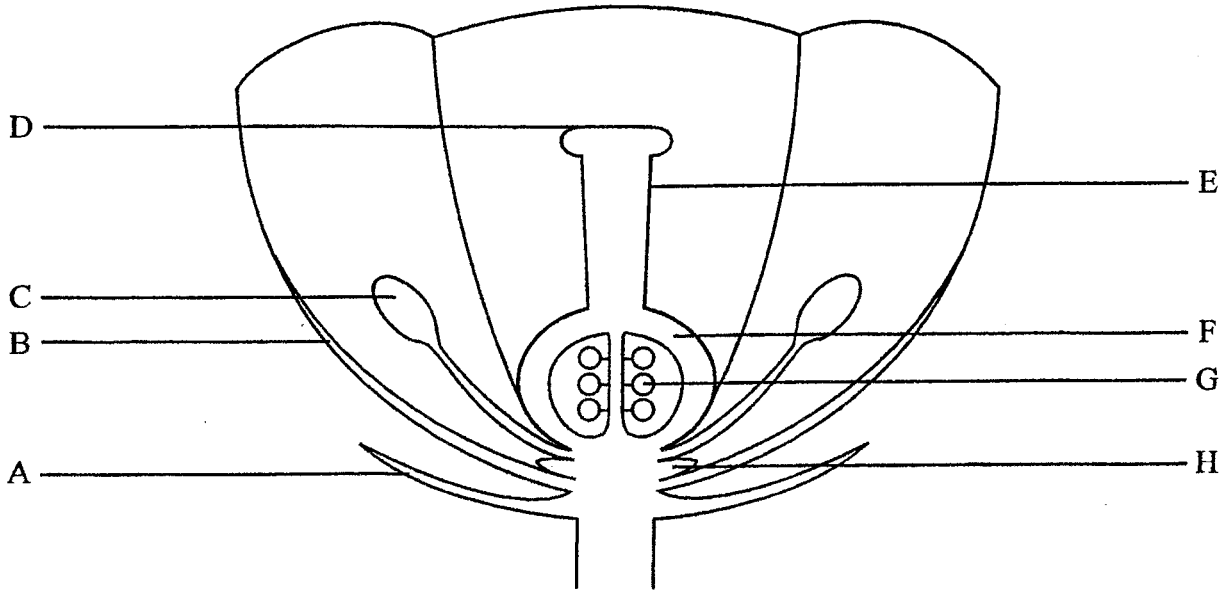
The ..... for human insulin is cut out using a  
..... enzyme. The same enzyme is used to cut open a circle of  
DNA called a ..... from a bacterial cell. The human DNA and the  
circle of DNA are joined together by an enzyme called ..... To  
produce human insulin, the bacteria containing the recombinant .....  
are then cultured in a container called a ..... Human insulin  
produced in this way can be used to treat people with the disease  
.....

Q9

(Total 7 marks)



10. The diagram below shows a typical insect pollinated flower.



(a) After pollination, the events in the table below take place in this flower. Using the diagram, complete the table by writing the correct letter to show where each event would occur. One has been done for you.

Event	Letter
Germination of pollen grain	
Growth of pollen tube	E
Fertilisation of egg cell	
Development of fruit wall	

(3)

(b) Give one function of part B.

.....

(1)

(c) Name the substance produced by part H.

.....

(1)

(d) Explain what is meant by the term 'insect pollinated'.

.....

.....

(2)



Q10

(Total 7 marks)

11. An inherited disease in humans, known as FH (familial hypercholesterolaemia), affects the level in the blood of a fatty substance called cholesterol.

The gene that controls blood cholesterol has two alleles. There is a dominant allele (H) for high cholesterol level and a recessive allele (h) for low cholesterol level. Heterozygous humans have medium cholesterol level.

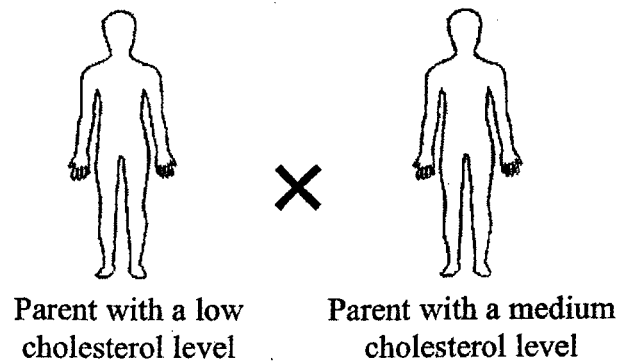
(a) (i) Use this information to complete the table below.

Phenotype of human	Genotype of human
 <p data-bbox="321 824 613 898">High cholesterol level (homozygous)</p>	<p data-bbox="862 734 1268 745">.....</p>
 <p data-bbox="297 1205 638 1279">Medium cholesterol level (heterozygous)</p>	<p data-bbox="862 1122 1268 1133">.....</p>

(2)

(ii) Below is part of a genetic diagram to show the way this gene is inherited in a family.

*Leave blank*



Complete the diagram to show how the alleles are inherited.

Genotypes of parents

Gametes

Genotypes of offspring

(3)

(b) Tick the box that shows the correct phenotype ratio for the offspring of two parents with medium cholesterol levels.

Phenotype ratio	Tick
1:1	
3:1	
1:2:1	
1:1:1:1	

(1)

(c) People suffering from FH have a high level of the fatty substance cholesterol in their blood stream. This often leads to a build up of fat on the inside walls of arteries. Suggest how this might be harmful to the heart.

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

(3)

*Leave blank*

(d) Cholesterol is needed for making bile and myelin.

(i) Describe the role of bile in the body.

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

(2)

(ii) Where is myelin found in the body?

.....

(1)

Q11

(Total 12 marks)

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**TOTAL FOR PAPER: 100 MARKS**

**END**

London Qualifications gratefully acknowledge the following source in the production of this paper.  
Photograph of owl © Michael Leach/OSF