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KU PS

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Total Marks

0300/401

NATIONAL MONDAY, 21 MAY
 QUALIFICATIONS 9.00 AM – 10.30 AM
 2001

BIOLOGY
STANDARD GRADE
General Level

Fill in these boxes and read what is printed below.

Full name of centre

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Town

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Forename(s)

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Surname

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Date of birth

Day Month Year

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Scottish candidate number

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Number of seat

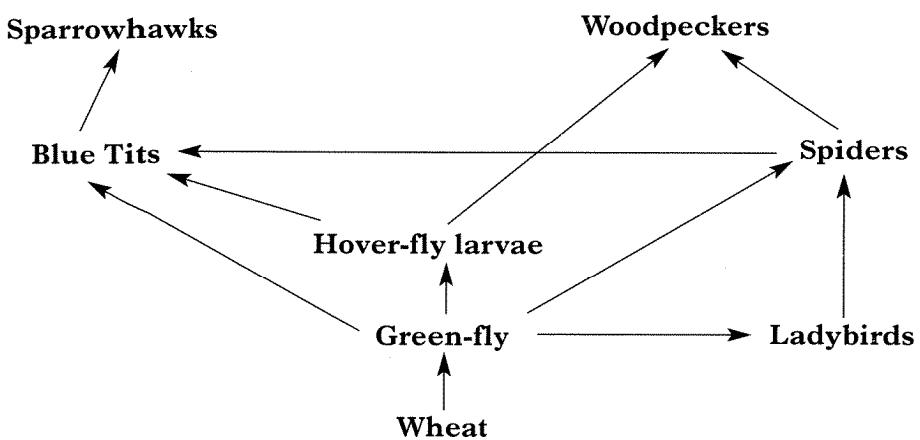
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- 1 All questions should be attempted.
- 2 The questions may be answered in any order but all answers are to be written in the spaces provided in this answer book, and must be written clearly and legibly in ink.
- 3 Rough work, if any should be necessary, as well as the fair copy, is to be written in this book. Additional spaces for answers and for rough work will be found at the end of the book. Rough work should be scored through when the fair copy has been written.
- 4 Before leaving the examination room you must give this book to the invigilator. If you do not, you may lose all the marks for this paper.

1. The diagram below represents part of a food web involving wheat.

Marks

KU PS

(a) Sparrowhawks are consumers.

Explain what is meant by the term consumers.

1

(b) How is the transfer of energy represented in a food web diagram?

1

(c) Most of the energy taken in by the blue tits does not pass to the sparrowhawks which eat them.

Give **two** ways in which this energy may be lost.

1

2

1

Marks	KU	PS
3		
1		

2. The table below contains examples of pollution of four different ecosystems.

<i>Ecosystem affected</i>	<i>Source of pollution</i>	<i>Example of pollutant</i>
Air	Domestic	CFC gases from aerosol sprays
Fresh water		Pesticides in a river
	Industrial	Crude oil from tanker vessels
Land	Domestic	

(a) Complete the empty boxes in the table.
(b) The list below contains statements about pollution.

X Smoke from coal fired power stations causes acid rain.
Y Raw sewage in rivers leads to the death of fish.
Z Car exhaust fumes contain poisonous gases.

Choose **one** of the statements and give an example of a way in which the pollution **could** be controlled.

Statement letter _____

Method of control _____

[Turn over

3. The table below shows the annual percentage yield loss of five crops, due to disease and insects.

Marks

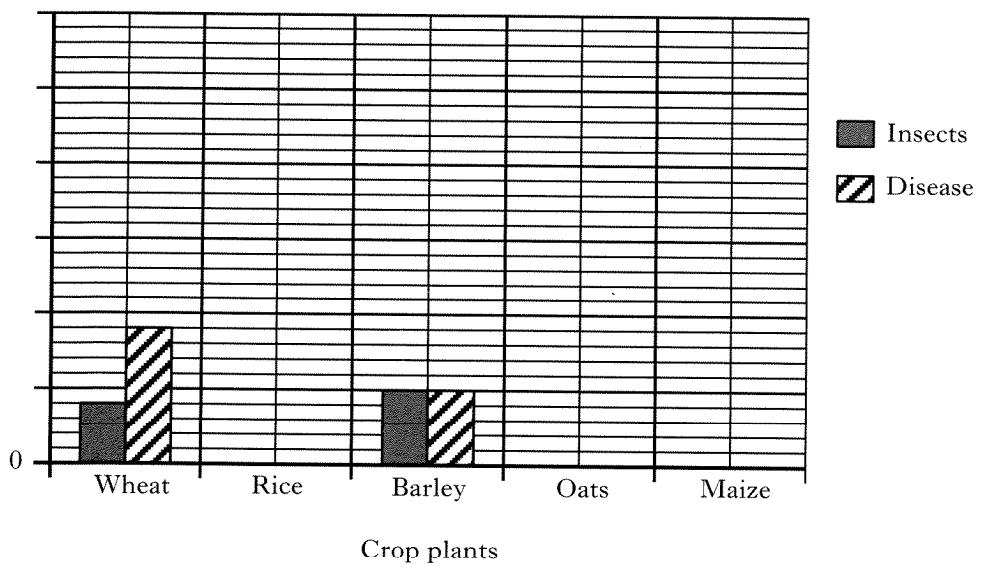
KU PS

Crop plant	Percentage yield loss	
	Insects	Disease
Wheat	4	9
Rice	28	8
Barley	5	5
Oats	5	10
Maize	10	10

(a) Use the table to complete the chart below by

- (i) labelling the Y-axis
- (ii) adding the scale to the Y-axis
- (iii) completing the bars for the other crops.

(Additional graph paper, if required, will be found on page 29.)



(b) Which crop plant had the lowest total yield loss?

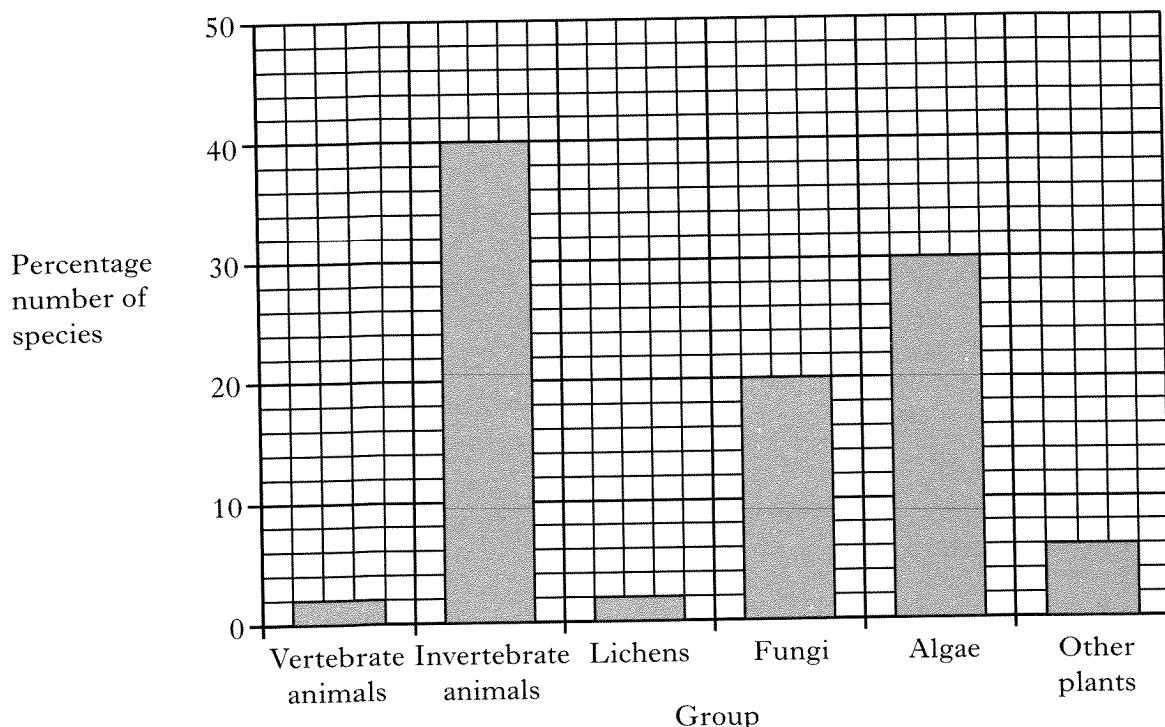
1

(c) Which crop plants have a greater yield loss to disease than to insects?

1

Marks	KU		PS	
1				
1				
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1				

4. (a) The bar chart below shows the proportion of different groups of animals and plants found in Scotland.



(i) What percentage of the total number of species are fungi?

_____ %

1

(ii) What percentage of the total number of species are animals?

Space for calculation

_____ %

1

(iii) The total number of species is 70 000. How many of these are algae?

Space for calculation

Number of algae species _____

1

(b) Many species of plants and animals are useful to humans.

Give **two** different uses of plants by humans.

1 _____

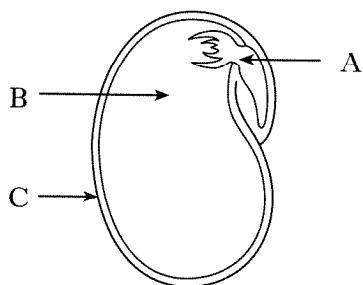
2 _____

1

[Turn over]

5. (a) The diagram below shows a section through a seed.

Marks	KU	PS
2		
1		



Complete the table by writing the letter, name or function of each labelled structure.

Letter	Name	Function
		forms young plant
C	seed coat	
	food store	resources for growth

(b) Gardeners can buy plant seeds from catalogues, which give information as shown in the table below.

Plant name	Flowering ability	Temperature range for germination (°C)
Busy Lizzie	●	19 – 25
Dahlia	○	15 – 20
Marigold	○	20 – 25
Geranium	●	20 – 24
Pansy	○	16 – 21
Dianthus	●	20 – 25

○ = requires plenty of light for flowering ● = flowers well in shade

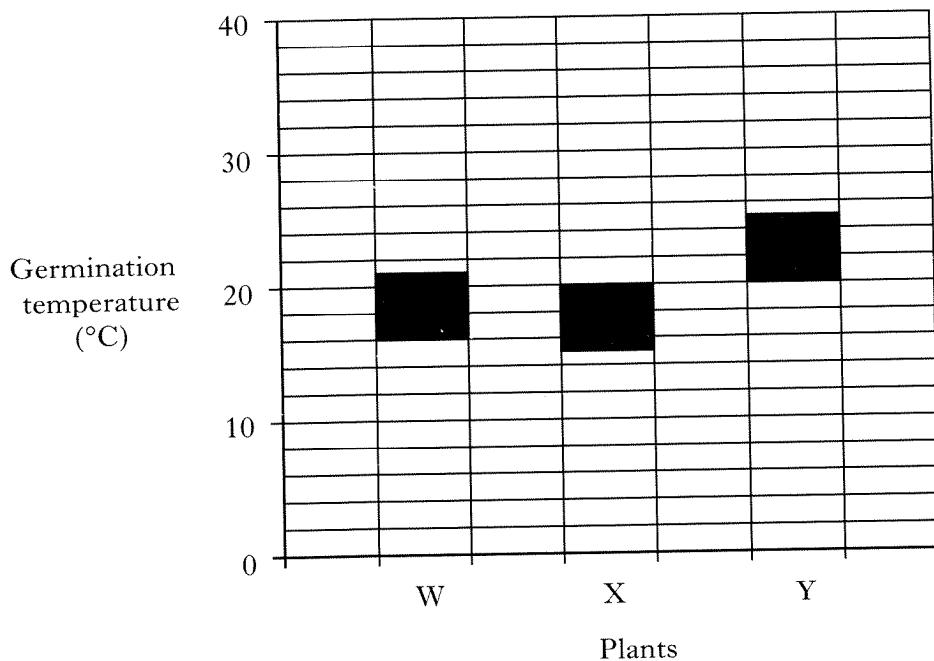
(i) What temperature would be suitable for germination of all these seeds?

_____ °C

Marks	KU	PS

5. (b) (continued)

(ii) The chart shows the germination temperatures for the three types of plants that require plenty of light for flowering.



Identify plants W, X and Y.

W _____

X _____

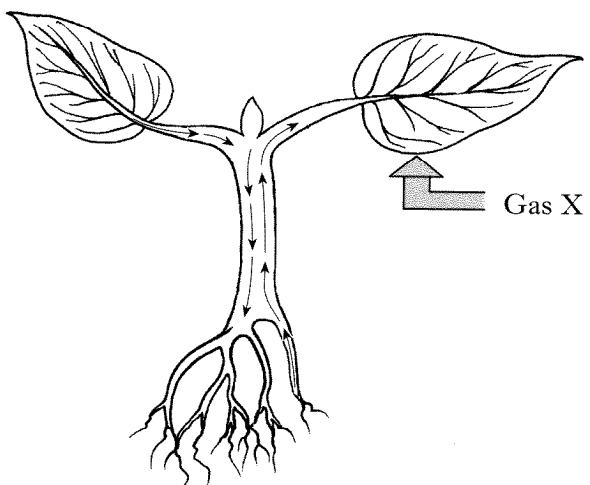
Y _____

1

[Turn over

Marks	KU	PS
1		
1		
1		
1		
1		
2		

6. (a) The diagram represents a plant carrying out photosynthesis.



(i) Name Gas X which is required for photosynthesis.

1

(ii) Name the pores on the leaves, through which Gas X can enter.

1

(b) Name the gas produced during photosynthesis.

1

(c) Name the chemical, made from glucose, which is stored in the leaves.

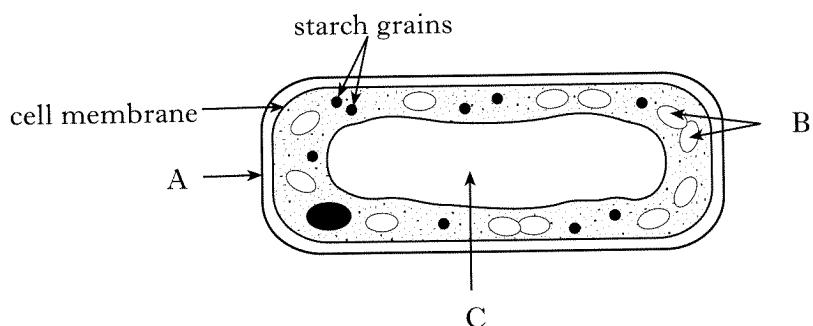
1

(d) The transport of substances in the plant is shown by arrows (↓↑) in the diagram.

Complete the table below with the correct information.

Transport tissue	Substance carried	Part of plant from which substance is carried
		root
	sugar	leaves

7. The diagram below shows a cell from the leaf of a green plant.



(a) Complete the table with the names of the parts shown in the diagram.

Letter	Cell part
A	
B	
C	

(b) Name the type of cell division which increases the number of cells for the growth of an organism.

1

(c) State **one** reason why cells need energy, other than for cell division.

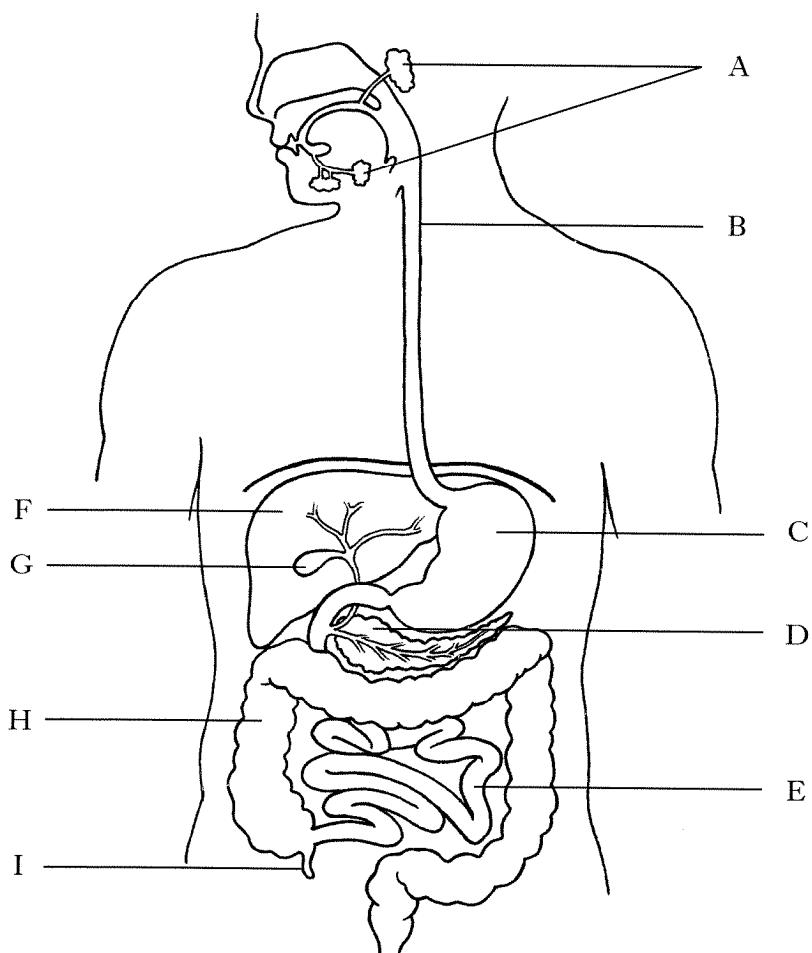
1

(d) Complete the word equation for aerobic respiration.

Glucose + _____ \rightarrow _____ + _____ + energy

1

8. (a) The diagram below shows part of the human digestive system.



(i) Complete the following table to identify the parts it contains.

<i>Letter</i>	<i>Name of part</i>
A	
	oesophagus
D	
	liver
I	

3

(ii) The large intestine (H) eliminates undigested food from the body as faeces.

State **one other** function it performs.

1

8. (a) (continued)

(iii) Explain how each of the following features of the small intestine helps it to function efficiently.

1. The small intestine is long.

Explanation _____

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2 The small intestine contains many blood vessels in its walls.

Explanation _____

(b) The grid below contains words about the kidneys.

renal artery	renal vein	urea
filtration	ureter	glucose
bladder	reabsorption	urine

Use words from the grid to complete the following sentences correctly.

(i) The _____ brings blood to the kidney and the _____ takes blood away from the kidney.

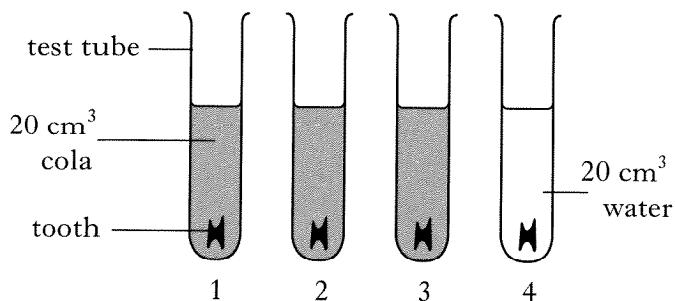
(ii) The kidneys are the main organs for regulating the water content of mammals.

Their method of action involves _____ of

blood followed by _____ of useful substances.

(iii) _____ is a waste product which is removed in the

9. Cola is a type of fizzy drink. An investigation into its effect on teeth was carried out as shown in the diagram below.



(a) Complete the following table by

- (i) adding the correct headings
- (ii) calculating the missing percentage
- (iii) completing the results for tooth 2.

<i>Tooth number</i>			<i>Loss in weight (mg)</i>	<i>Percentage loss in weight</i>
1	3000	2100	900	
2	4200			10
3	3800	3040	760	20
4 (control)	4000	4000	0	0

Space for calculations

(b) Tooth 4 was used as a control.
What is the purpose of a control?

The teeth were sterilised before carrying out this investigation. Explain why this was necessary.

<i>Marks</i>	KU	PS
2		
1		
rn over		

9. (continued)

(d) Give two factors, not mentioned already, which would need to be kept constant for the investigation to be valid.

1 _____

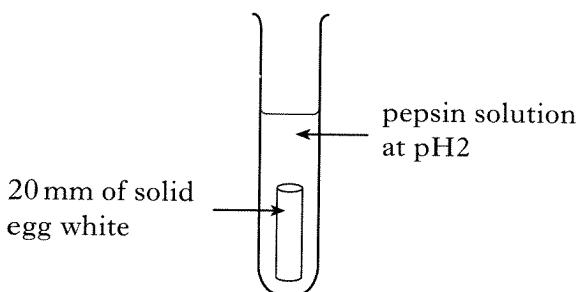
2 _____

(e) What valid conclusion could be drawn from the results of the investigation?

[Turn over

Marks	KU	PS
1		
1		
1		
1		
1		

10. To investigate the effect of temperature on the activity of the enzyme pepsin, five test tubes were set up as shown below.



Each tube was placed in a water bath at a different temperature. After 12 hours, the following results were obtained.

Test tube	Temperature (°C)	Length of egg white after 12 hours (mm)
A	5	19
B	20	17
C	35	13
D	45	15
E	60	20

(a) At which temperature did the greatest digestion of egg white take place?

_____ °C

1

(b) Describe the effect of increasing the temperature on the activity of the pepsin over each of the temperature ranges below.

Between 5 °C and 35 °C _____

1

Between 35 °C and 60 °C _____

1

(c) If the experiment had been repeated at pH7, which of the following would be the most likely result for the length of egg white in test tube B?

Tick the correct box.

19 mm

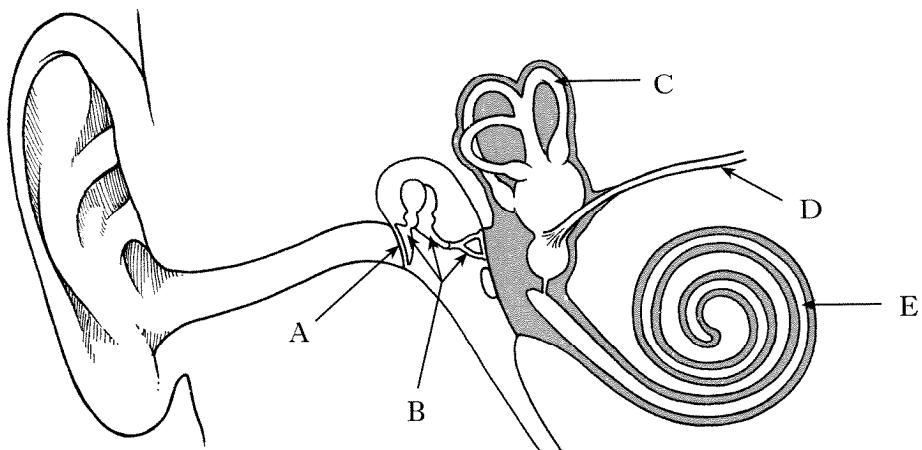
17 mm

15 mm

13 mm

1

11. The diagram below represents part of the human ear.



(a) Complete the table below.

Letter	Name	Function
		picks up vibrations in the air
	bones of the middle ear	amplify vibrations and pass them to the inner ear
E		changes vibrations into nerve impulses
D	auditory nerve	
C	semi-circular canals	

3

(b) What can you judge more accurately when using two ears, rather than one?

1

(c) The list below gives the names of some parts of the human body.
Underline the three parts, which make up the nervous system.

head heart nerves muscle

skin spinal cord lungs brain

1

[Turn over

Marks	KU	PS
1		
1		
1		
1		
1		
1		
1		
1		
1		
1		
1		
1		
1		
1		
1		

12. (a) In an investigation to measure fitness, the distance sprinted by an athlete in five seconds was measured. The sprints were repeated every 15 seconds. The distance covered in each sprint is shown in the table.

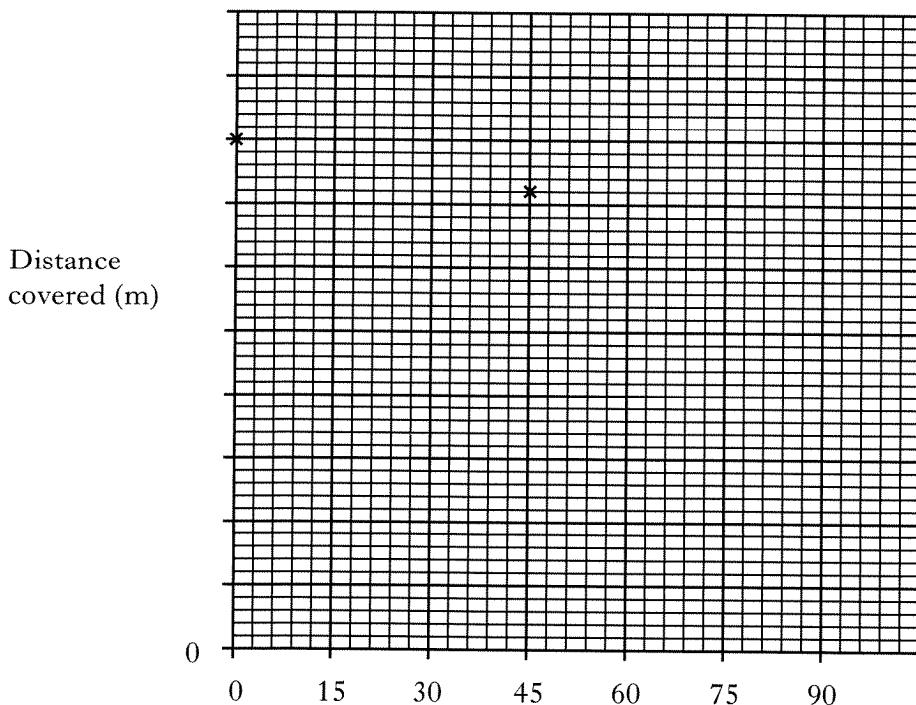
<i>Time at start of sprint (s)</i>	0	15	30	45	60	75	90
<i>Distance covered (m)</i>	40	40	39	36	32	27	21

(i) Use the table to complete the **line graph** below by

1. labelling the X-axis
2. adding a scale to the Y-axis
3. completing the graph.

Two points have already been plotted.

(Additional graph paper, if required, will be found on page 29.)



(ii) Between which two times was there the biggest decrease in distance covered in the sprints?

Between _____ s and _____ s

(iii) What valid conclusion could be drawn about the distance covered in a sprint as the number of sprints increased?

(iv) What could have been done to check that these results are reliable?

<i>Marks</i>	KU	PS
2		
Turn over		

12. (continued)

(b) Complete the following sentence by adding the names of the missing chemicals.

Muscle fatigue is caused by the lack of _____ and the build up of _____ in muscles.

2

[Turn over

13. Many birds feed and roost at airports. Collisions between birds and planes may result in crashes. Scientists try to use their understanding of bird behaviour to reduce the number of collisions.

The pie charts show the number of collisions with different birds at five airports.

Chart A 1994–1996

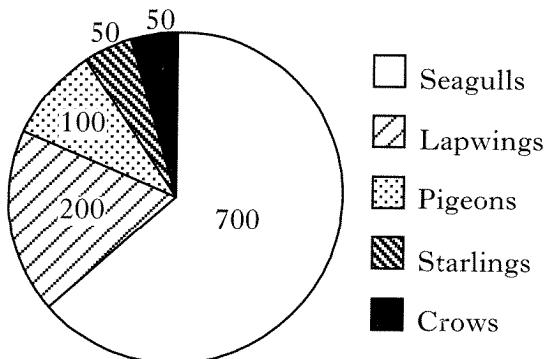
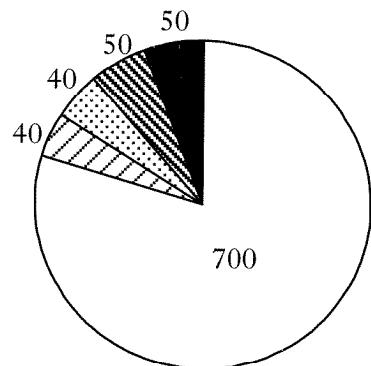


Chart B 1997–1999



(a) (i) Which type of bird was involved in most collisions during the period 1994–1996?

1

(ii) What was the total number of collisions in this period?

Space for calculation

1

(b) From 1997, birds of prey were kept at these airfields

(i) Which **two** species were involved in fewer collisions after the introduction of the birds of prey?

— and

1

(ii) What appeared to be the effect of the birds of prey on the number of collisions with seagulls?

10. *What is the primary purpose of the following statement?*

1

(iii) Calculate the ratio of collisions involving lapwings before and after the introduction of the birds of prey.

Space for calculation

 :

Marks	KU	PS
1		
3		

14. (a) Underline one word in each group to make the sentences correct.

Yeast is a $\left\{ \begin{array}{l} bacterium \\ fungus \end{array} \right\}$ and is $\left\{ \begin{array}{l} single-celled \\ multicellular \end{array} \right\}$.

Yeast can use $\left\{ \begin{array}{l} sugar \\ oxygen \end{array} \right\}$ as a source of food.

(b) Complete the table by writing the correct word from the list in the empty boxes.

Each word may be used **once**, **more than once** or **not at all**.

Description	Word
Organisms used to make yoghurt	
Pieces of these can be transferred from a different organism into bacteria by genetic engineering to make new substances	
Chemicals made by micro-organisms and which kill bacteria	

List
antibiotics
bacteria
fungus
enzymes
hormones
chromosomes

[Turn over

Marks	KU	PS
1		
1		
1		

15. Read the following passage carefully.

Salt sellers threaten the whale. Adapted from “The Sunday Herald”.

Every year grey whales leave the seas around Alaska and travel to the San Ignacio Lagoon in Mexico where they mate. They return a year later to give birth and mate again. The red mangroves that edge the lagoon provide shelter for the newborn calves. The high salt content of the water gives the calves support while they learn to swim.

The whales' breeding grounds are now in danger from a Japanese/Mexican company which has applied to build a salt production plant in San Ignacio. The new plant would produce seven million tonnes of salt a year, the quantity Japan imports from Australia. Japan uses the salt in everything from the manufacture of glass to cosmetics.

Environmental groups claim that the company's manufacturing methods will alter the salt concentration of the lagoon. The methods involve removing the salt from 6600 gallons of water per second and pumping salt-free water back into the lagoon. Controversy surrounds the company's existing salt production plant nearby where the dead bodies of marine animals such as whales, turtles and fish have been found washed up on the shore. The company said the most likely explanation for this was that the animals had been killed by a chemical dye released into the water by drug traffickers.

Answer the following questions based on the passage.

(a) Which area do the grey whales leave to go to their breeding grounds?

1

(b) State **two** reasons why the lagoon provides ideal conditions for the whale calves.

1 _____

2 _____

1

(c) How much salt does Japan import from Australia every year?

_____ tonnes

1

Marks	KU		PS
1			
1			
1			
1			
1			

15. (continued)

(d) Name **two** products, mentioned in the passage, which require salt during their manufacture.

1 _____

2 _____

(e) Which part of the manufacturing process affects the salt concentration of the lagoon?

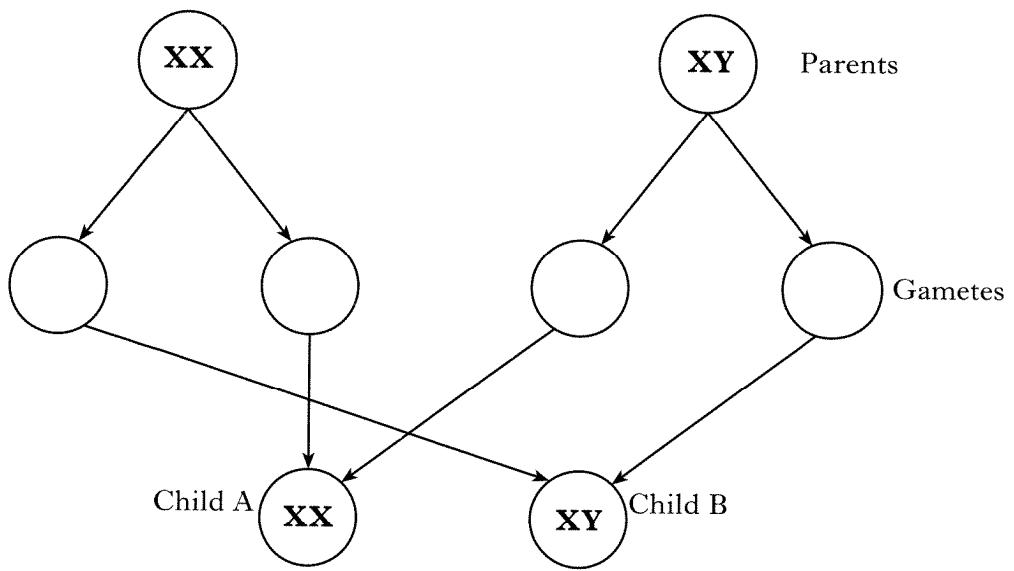
(f) Does the salt production company accept responsibility for the death of marine animals in their area? Give a reason for your answer.

Accept responsibility _____

Reason for answer _____

[Turn over

16. The diagram below shows the sex chromosomes present in the cells of two generations.



(a) (i) Complete the diagram to show the sex chromosomes of the gametes and the children.

(ii) What is the sex of the children?

Child A _____ Child B _____

Child A _____ Child B _____

(b) For each of the following, write the word described by the phrase.

(i) The genes that an organism contains.

Word ...

(ii) The cell which carries one of the two forms of a gene

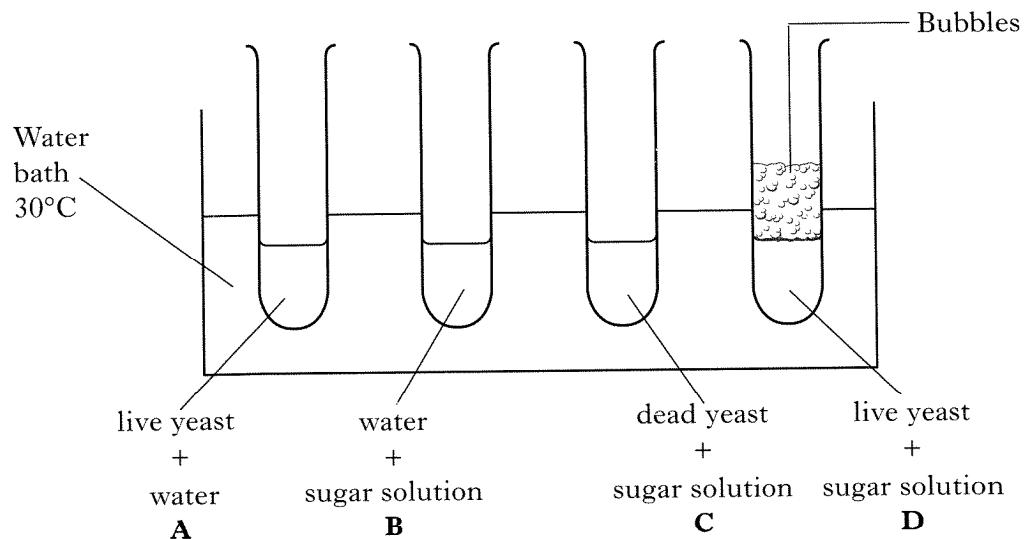
Word

(iii) Differences between organisms of the same species

Word

Marks	KU	PS
1		
1		
1		

17. The diagram below shows the results of an experiment using yeast and sugar solution.



(a) Explain why bubbles were formed only in test tube D.

1

(b) Predict what would happen to the volume of bubbles in test tube D if the experiment had been carried out in a water bath at 80 °C.

1

(c) Which test tubes are controls?

Tick the correct box.

Tubes A and B only

Tubes B and C only

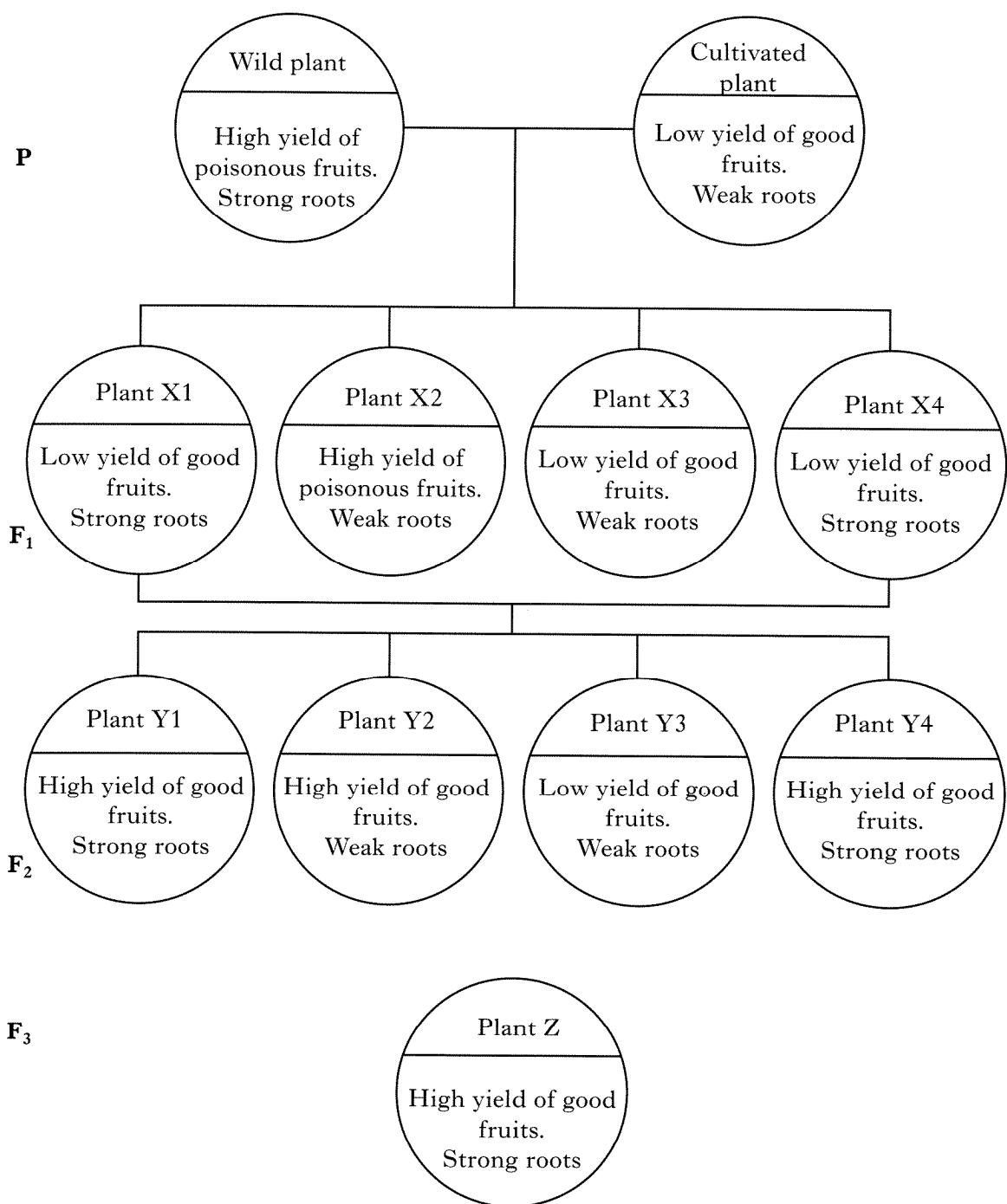
Tubes A and C only

Tubes A, B and C

1

[Turn over

18. The diagram below shows how a tomato grower produced tomato plants with a high yield of good fruits and a strong root system.



(a) Describe the two parent plants.

Wild plant _____

Cultivated plant _____

1

Marks	KU	PS
2		
1		
1		

18. (continued)

(b) (i) Which two F_1 plants are shown being crossed to produce F_2 plants?

Plants _____ and _____

(ii) Explain why these plants were chosen.

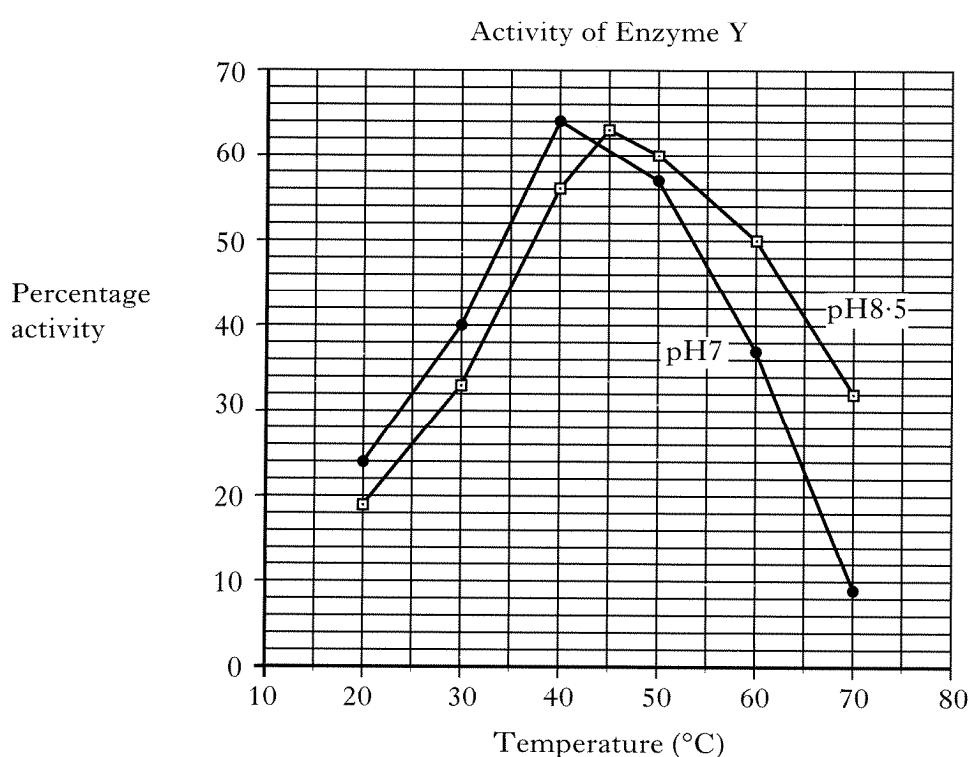
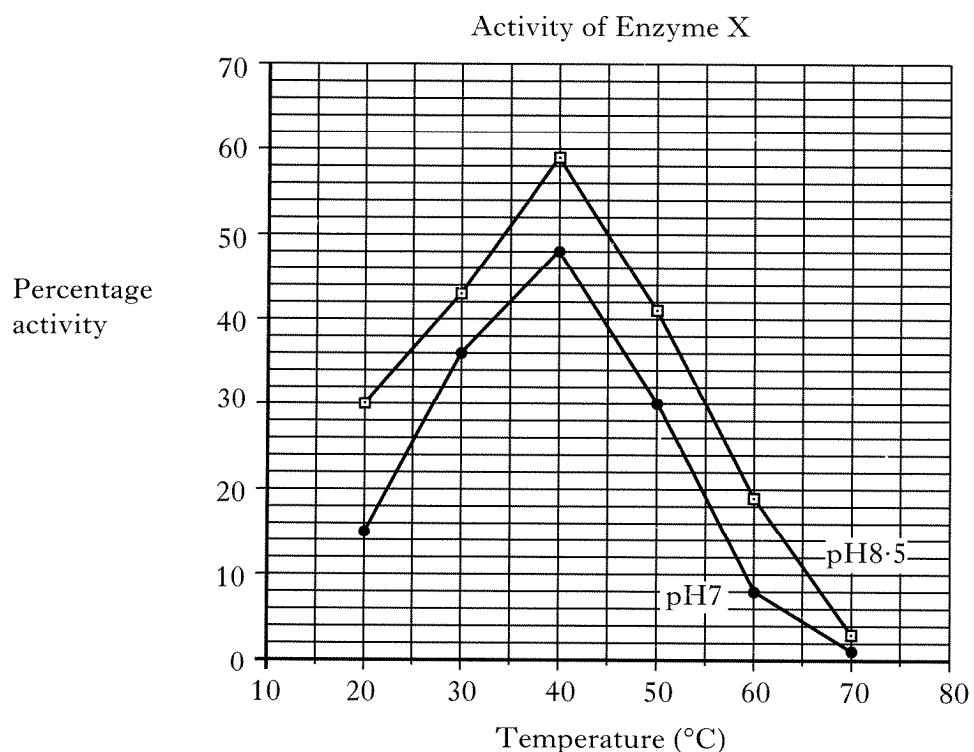
(c) Which two F_2 plants should be used to obtain the generation of F_3 plants similar to Plant Z?

Plants _____ and _____

(d) What is the name given to this type of breeding programme?

[Turn over

19. The graphs below show the results of tests on two enzymes for use in biological washing powders.



Marks	KU	PS
1		
1		
1		
2		

19. (continued)

(a) (i) Complete the table to show the activity of the two enzymes at pH 8.5 at different wash temperatures.

Type of wash	Enzyme X (% activity)	Enzyme Y (% activity)
Warm (40 °C)		56
Medium (50 °C)	41	60
Hot (60 °C)	19	

(ii) Most washing powders contain detergents that make the conditions alkaline, around pH 8 or 9. Which enzyme would be best to use for a hot wash?

Enzyme _____

(iii) Describe the effect of decreasing pH on the activity of Enzyme X.

(b) Underline one word in each group to make the sentences correct.

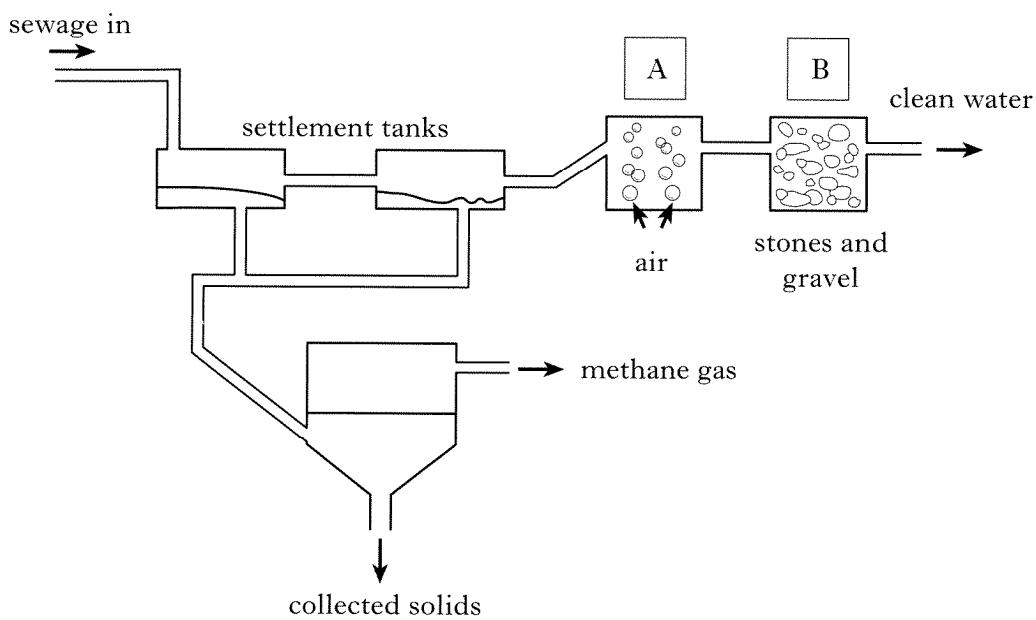
Enzymes are found in $\left\{ \begin{array}{l} \text{some} \\ \text{most} \\ \text{all} \end{array} \right\}$ cells and are made of $\left\{ \begin{array}{l} \text{protein} \\ \text{carbohydrate} \\ \text{fat} \end{array} \right\}$.

Enzymes are $\left\{ \begin{array}{l} \text{substrates} \\ \text{reagents} \\ \text{catalysts} \end{array} \right\}$ and work best in $\left\{ \begin{array}{l} \text{hot} \\ \text{warm} \\ \text{cold} \end{array} \right\}$ conditions.

[Turn over

Marks		KU	PS
1			
1			
1			

20. The diagram below represents a sewage treatment plant.



(a) What type of organisms are involved in the breakdown of sewage into harmless products during stages A and B?

1

(b) The methane gas and the collected solids may be of economic importance.

Choose **one** of these products and explain its value.

Product _____

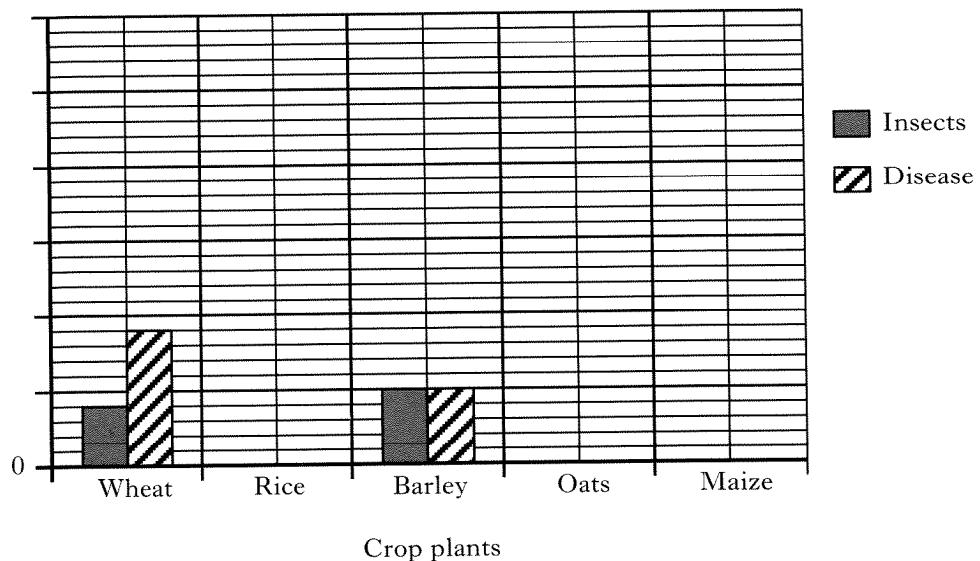
Value _____

1

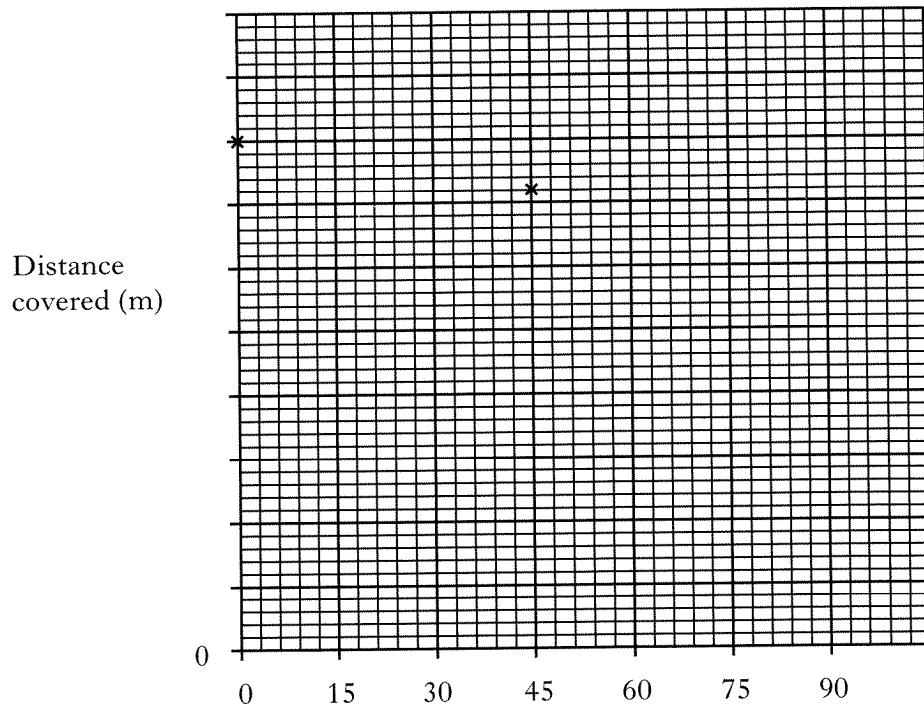
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SPACE FOR ANSWERS
AND FOR ROUGH WORKING

ADDITIONAL GRID FOR QUESTION 3(a)



ADDITIONAL GRID FOR QUESTION 12(a)(i)



SPACE FOR ANSWERS
AND FOR ROUGH WORKING

SPACE FOR ANSWERS
AND FOR ROUGH WORKING

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