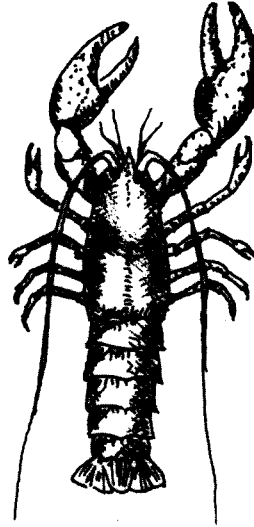


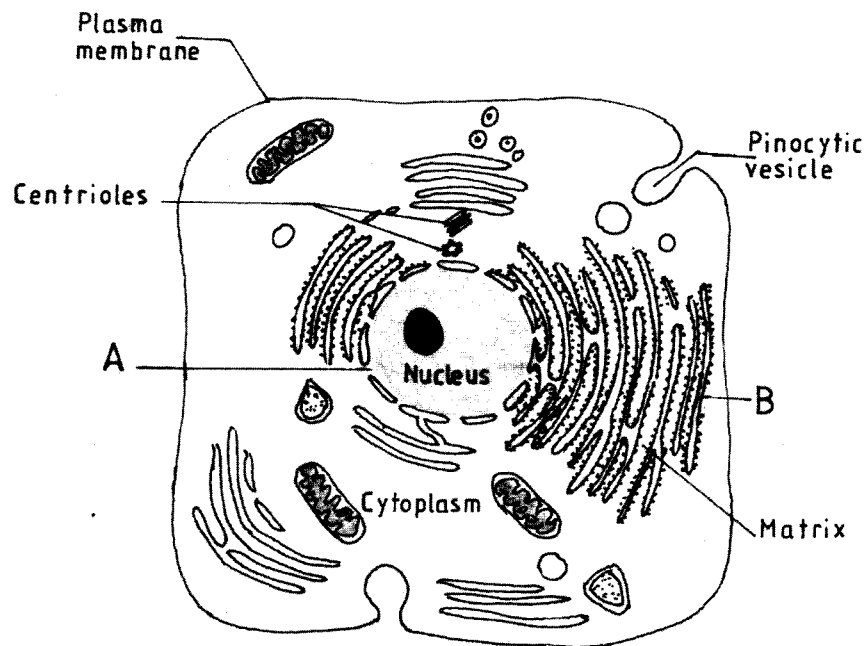
4.2 BIOLOGY (231)

4.2.1 Biology Paper 1 (231/1)

- 1 How does nutrition as a characteristic of living organisms differ in plants and animals? (2 marks)
- 2 The diagram below represents a certain organism collected by a student at the sea shore.



- (a) Name the class to which the organism belongs. (1 mark)
  - (b) Give **three** reasons for your answer in (a) above. (3 marks)
- 3 The figure below is a fine structure of a generalised animal cell as seen under an electron microscope.



- (a) Name the parts labelled **A** and **B**. (2 marks)

**A** .....

**B** .....

- (b) How is the structure labelled **B** adapted to its function? (2 marks)

- 4 In an investigation, a student extracted three pieces of paw paw cylinders using a cork borer. The cylinders were cut back to 50 mm length and placed in a beaker containing a solution.

The results after 40 minutes were as shown in the table below.

Feature	Result
Average length of cylinders (mm)	56 mm
Stiffness of cylinders	stiff

- (a) Account for the results in the table above. (3 marks)

- (b) What would be a suitable control set-up for the investigation? (2 marks)

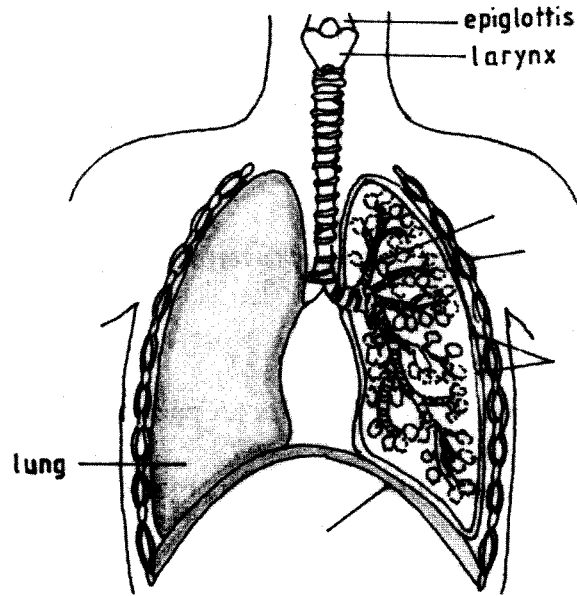
- 5 The table below shows results of a study of three plants **C**, **D** and **E** growing in different habitats.

Feature	Plant C	Plant D	Plant E
Number of stomata on upper surface of leaf per square area	4	20	6
Number of stomata on lower surface of leaf per square area	6	0	8
Thickness of leaf cuticle (mm)	0.4	0.1	0.2
Surface area of roots (cm <sup>2</sup> )	2000	1000	1200

- (a) Which one of the plants **C**, **D** and **E** grows in an area of relatively low water availability? (1 mark)

- (b) Explain your answer in (i) above. (3 marks)

6 The diagram below represents part of the gaseous exchange system in human.



(a) Name the parts labelled F and G. (2 marks)

F .....

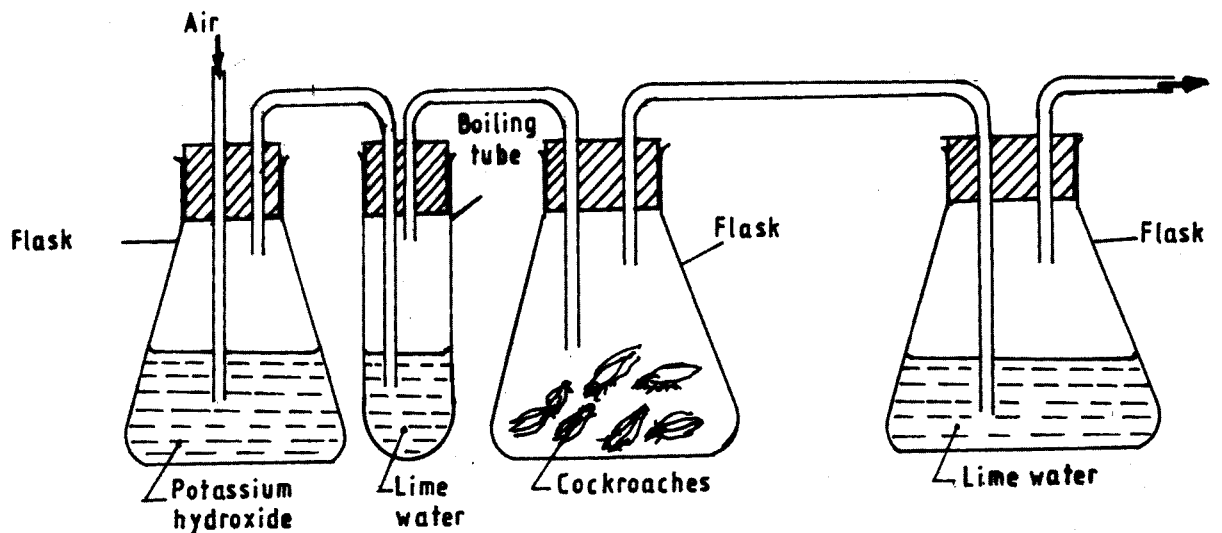
G .....

(b) State **one** function of each of the parts labelled H and J. (2 marks)

H .....

J .....

7 The diagram below represents a set-up that students used in an investigation.



(a) Name the physiological process that was being investigated. (1 mark)

(b) State the role of potassium hydroxide in flask K. (1 mark)

(c) Account for the observation in boiling tube L and flask N. (2 marks)

L .....  
N .....

8 What is the probability of a couple with blood group AB getting a child with blood group AB?  
Show your working. (4 marks)

9 State the importance of negative phototaxis to termites. (1 mark)

10 What is meant by the term irritability? (1 mark)

11 (a) State **two** ways in which heart muscles are special. (2 marks)

(b) Name the muscles found in the following organs: (2 marks)

stomach; .....  
bone. ....

12 (a) Name the part of a light microscope used to bring an image of a specimen into sharp focus. (1 mark)

(b) Why is it recommended to keep the stage of the microscope dry? (1 mark)

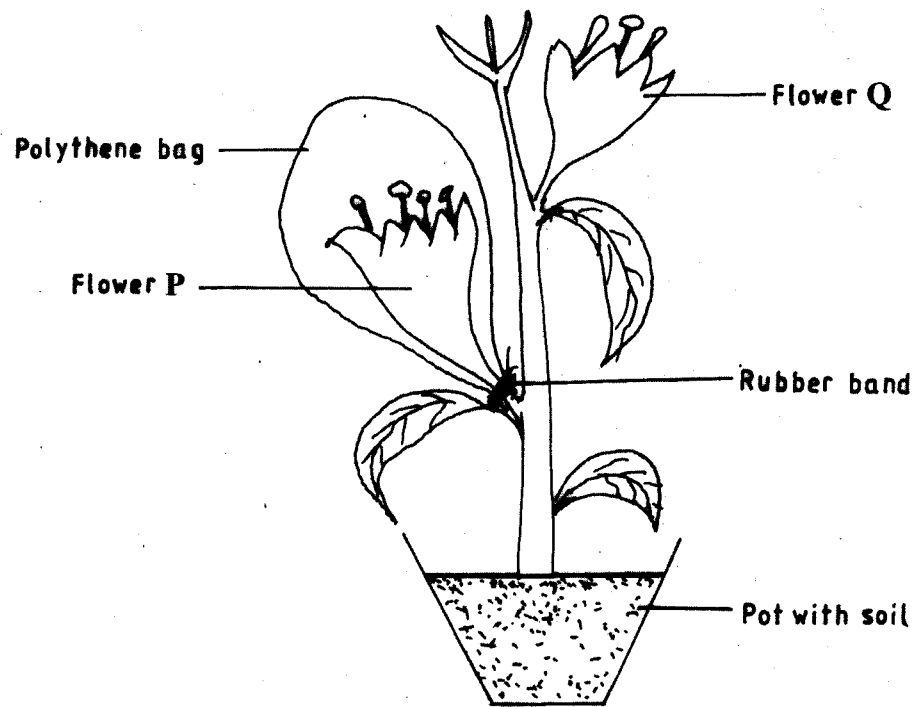
13 State **three** factors that affect the rate of diffusion. (3 marks)

14 (a) Name the type of respiration that is most efficient. (1 mark)

(b) Give a reason for your answer in (a) above (1 mark)

15 What name is given to a group of hormones that controls the development of secondary sexual characteristics in a human male? (1 mark)

- 16 The diagram below represents an experimental set-up used by students to investigate a certain process.



- Flower Q produced seeds while P did not. Account for the results. (3 marks)
- 17 Name **two** substances that leave the foetal blood through the placenta. (2 marks)
- 18 Why are plants able to accumulate most of their waste products for long? (1 mark)
- 19 List **four** symptoms of diabetes mellitus. (4 marks)
- 20 State **three** aspects that can be used to estimate growth in seedlings (3 marks)
- 21 Name the process through which free atmospheric nitrogen is converted into nitrates. (1 mark)
- 22 State the importance of divergent evolution to organisms. (2 marks)
- 23 Name the strengthening materials found in the following support tissues: (2 marks)
- (a) collenchyma; .....
- (b) xylem. ....
- 24 State **four** characteristics of apical meristem cells. (4 marks)

25 State the role of the following hormones in the life cycle of insects: (2 marks)

ecdysone hormone; .....

juvenile hormone. ....

26 (a) State the theories of evolution proposed by the following scientists. (2 marks)

Charles Darwin .....

Jean-Baptiste de Lamarck .....

(b) State the evidence of evolution based on (2 marks)

(i) cell organelles .....

(ii) fossils. ....

27 What is the function of contractile vacuoles in amoeba? (1 mark)

28 State **two** differences between open and closed circulatory systems. (2 marks)

29 Name **two** nutrients that are absorbed without being digested by enzymes in humans. (2 marks)

30 Name the organelle that is involved in each of the following: (2 marks)

(a) manufacture of lipids .....

(b) formation of lysosomes.....

4.2.2 Biology Paper 2 (231/2)

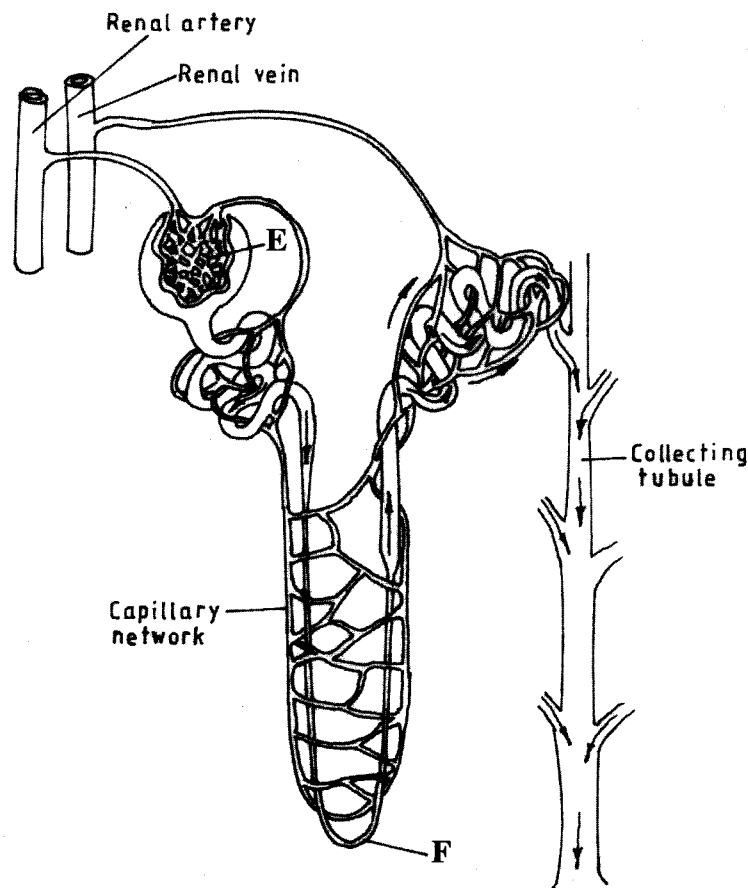
SECTION A (40 marks)

Answer ALL the questions in this section in the spaces provided.

1 In a certain plant species which is normally green, a recessive gene for colour (n) causes the plants to be white in colour. Such plants die at an early age. In the heterozygous state, the plants are pale green in colour but grow to maturity.

- (a) Give a reason for the early death of the plants with the homozygous recessive gene. (2 marks)
- (b) If a normal green plant was crossed with the pale green plant, what would be the genotype of the first filial generation ( $F_1$  generation)? Show your working. (4 marks)
- (c) If heterozygous plants were self-pollinated and the resulting seeds planted, work out the proportion of their offspring that would grow to maturity. (2 marks)

2 The diagram below illustrates the structure of the kidney nephron.



- (a) Name the part labelled E. (1 mark)
- (b) How is the part labelled F adapted to its function? (4 marks)

- (c) State **three** physiological mechanisms of controlling the human body temperature during a cold day. (3 marks)

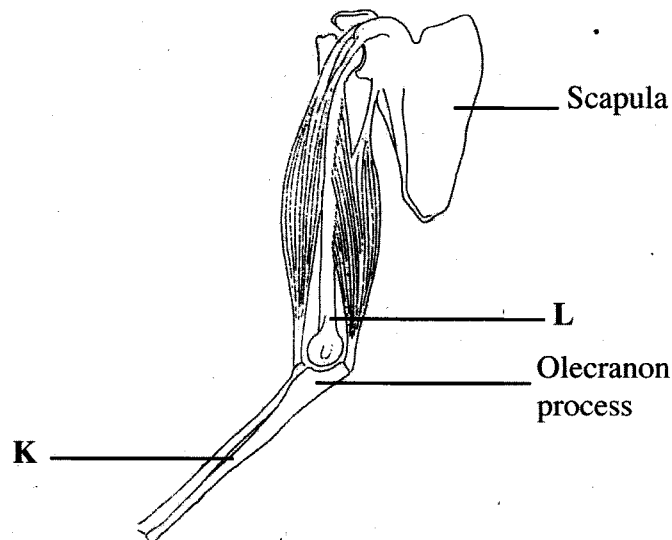
- 3 (a) In an investigation, equal amounts of water was placed in three test-tubes labelled **G**, **H** and **J**. Pondweeds of equal length were dropped in each test tube. The test-tubes were then placed in identical conditions of light and carbon (IV) oxide at different temperatures for five minutes. After the five minutes, the bubbles produced in each test-tube were counted for one minute. The results were as shown in the table below.

Test tube	Temperature (°C)	Number of bubbles
<b>G</b>	20	28
<b>H</b>	35	42
<b>J</b>	55	10

- (i) Name **one** requirement for this process that is not mentioned in the investigation. (1 mark)
- (ii) Name the gas produced in this investigation. (1 mark)
- (iii) Account for the results in test-tubes **H** and **J**. (2 marks)

- (b) State **two** ways in which the human intestinal villus is adapted to its function. (4 marks)

- 4 (a) The diagram below illustrates arrangement of bones and muscles of the human arm.



- (i) Name the bones labelled **K** and **L**. (2 marks)

**K** .....

**L** .....



- (ii) Explain how the upward movement of the lower arm is brought about by the bones and muscles shown in the diagram above. (3 marks)
- (b) State **three** ways in which support is brought about in a leaf. (3 marks)
- 5 (a) Describe the process of inhalation. (4 marks)
- (b) Explain the mechanism of stomatal opening. (4 marks)

**SECTION B (40 marks)**

Answer question 6 (compulsory) and either question 7 or 8 in the spaces provided after question 8.

- 6 The data provided below represent populations of a predator and its prey over a fifty years' period.

TIME IN YEARS	POPULATION IN RELATIVE NUMBERS	
	POPULATION OF P	POPULATION OF Q
5	24500	17000
10	30000	20500
15	33500	26000
20	33500	30000
25	31000	33000
30	27000	32000
35	25000	30000
40	29000	27500
45	32500	28000
50	34000	28500

- (a) (i) Using the same axes, draw graphs of the relative populations of P and Q against time. (7 marks)
- (ii) With a reason, identify the curve that represents the prey. (2 marks)
- (iii) Account for the two populations between 25 and 32 years. (2 marks)
- (iv) Which years were the two populations equal? (2 marks)

- (v) A part from predation, state **three** biotic factors that may have led to the decline of the prey population. (3 marks)
- (b) Describe the hazards of air pollution by Sulphur (IV) Oxide. (4 marks)
- 7 Using a relevant example in each case, describe simple and conditional reflex actions. (20 marks)
- 8 (a) Using a relevant example, describe how an allergic reaction occurs in a human being. (10 marks)
- (b) Describe how environmental factors increase the rate of transpiration in terrestrial plants. (10 marks)

4.2.3 Biology Paper 3 (231/3)

1 Below is a photograph showing a seedling during germination.



(a) With a reason, name the type of germination shown in the photograph.

(i) Type of germination ..... (1 mark)

(ii) Reason .....  
..... (2 marks)

(b) State **three** functions of the part labelled **A** in the germination of a seedling up to the appearance of the first foliage leaves. (3 marks)

(c) Account for the change in shape the seedling will undergo to straighten. (6 marks)

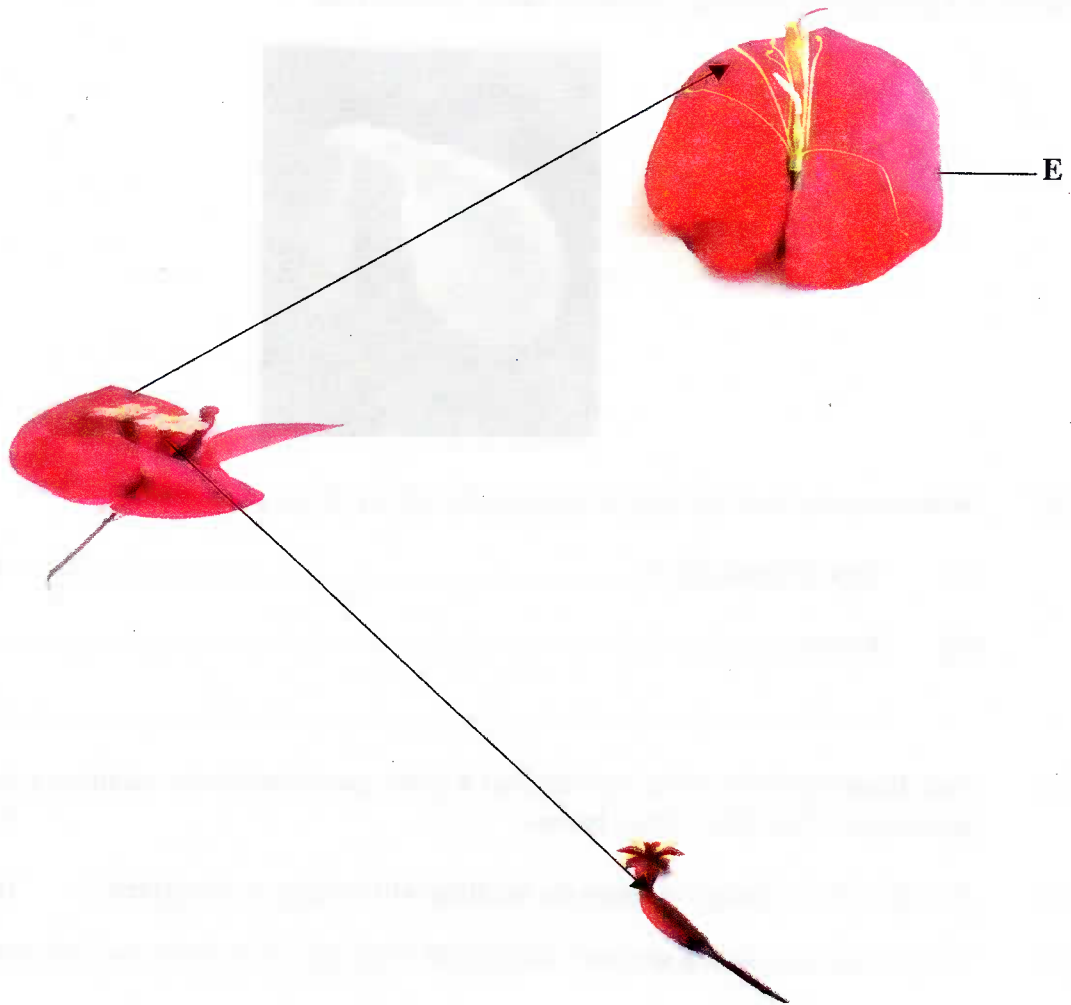
2 (a) You are provided with a specimen labelled **D** which has been grown on a substrate.

(i) Name the specimen (1 mark)

(ii) What type of asexual reproduction occurs in the specimen? (1 mark)

(iii) Using a mounting pin, pick a few strands of specimen **D** and place them on the white tile. Using a hand lens, observe the strands and make a labelled drawing. (3 marks)

(b) The photograph below shows different parts of a flower.



- (i) Name the class of the plant from which the photograph was taken. (1 mark)
- (ii) Using observable features on the photograph, give **three** reasons for your answer in (b) (i) above. (3 marks)
- (iii) Name the agent of pollination for the flower in the photograph. (1 mark)
- (iv) State **three** observations on the photograph that support the answer in (b) (iii) above. (3 marks)
- (v) Name the part labelled **E** on the photograph. (1 mark)

3 You are provided with a potato, a 10 ml measuring cylinder, dilute hydrogen peroxide solution and substances F (pH 4), G (pH 7) and H (pH 9). Cut the potato and remove a piece measuring 1 cm<sup>3</sup> from it.

Cut the 1 cm<sup>3</sup> piece into tiny pieces and crush (macerate) them on a clean white tile using a glass rod.

Divide the macerated potato into **three** equal portions for use in the procedure that follows:

- I. Put 2 cm<sup>3</sup> of substance F (pH 4) into the 10 ml measuring cylinder.  
Add **one** portion of the macerated potato into the measuring cylinder.  
Read and record the volume of the mixture in the table provided below.  
Add one drop of washing-up solution.  
Add 1 cm<sup>3</sup> of dilute hydrogen peroxide solution to the mixture and immediately start a stop clock or watch. At the end of **two minutes**, read the mark to which the foam rises.  
Record the reading in the table provided.  
Clean and rinse the measuring cylinder with distilled water.
- II. Put 2 cm<sup>3</sup> of substance G (pH 7) into the measuring cylinder.  
Add the **second** portion of the macerated potato.  
Read and record the volume of the mixture in the table.  
Add one drop of washing-up solution.  
Add 1 cm<sup>3</sup> of dilute hydrogen peroxide solution to the mixture and immediately start a stop clock or watch. At the end of **two minutes**, read the mark to which the foam rises.  
Record the reading in the table.  
Clean and rinse the measuring cylinder with distilled water.
- III. Put 2 cm<sup>3</sup> of substance H (pH 9) into the measuring cylinder.  
Add the **third** portion of the macerated potato.  
Read and record the volume of the mixture in the table.  
Add one drop of washing-up solution.  
Add 1 cm<sup>3</sup> of dilute hydrogen peroxide solution to the mixture and immediately start a stop clock or watch. At the end of **two minutes**, read the mark to which the foam rises.  
Record the reading in the table.

	F (pH 4)	G (pH 7)	H (pH 9)
<b>Volume of solution + portion of potato</b>			
<b>Volume of solution + portion of potato + foam</b>			
<b>Volume of foam</b>			

(9 marks)

- (a) Using the data obtained in the table, calculate the volume of the foam produced in each of the pH 4, pH 7, and pH 9 substances. Record the volumes in the table.

(b) Account for

- (i) the observation made when hydrogen peroxide was added to the potato mixture (3 marks)
- (ii) the difference in the volume of foam produced in pH 4 and pH 9 substances. (2 marks)