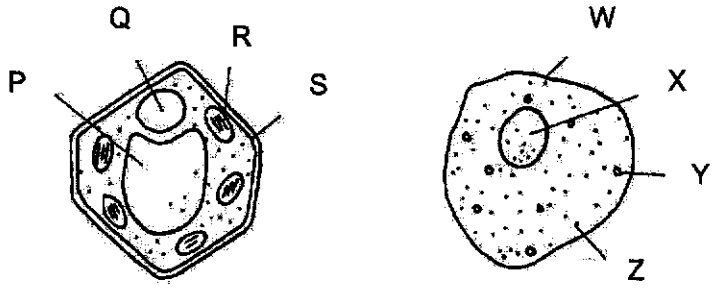
Section A

Answer **all** questions from this section in the boxes provided on Page **8**.

1 The diagram below shows a plant and an animal cell.



Which pair of structures store food and water in the cells?

A P and Y
B Q and X
C R and Z
D S and W

2 In the pancreas, there are groups of cells that synthesise insulin.

What accurately describes these cells?

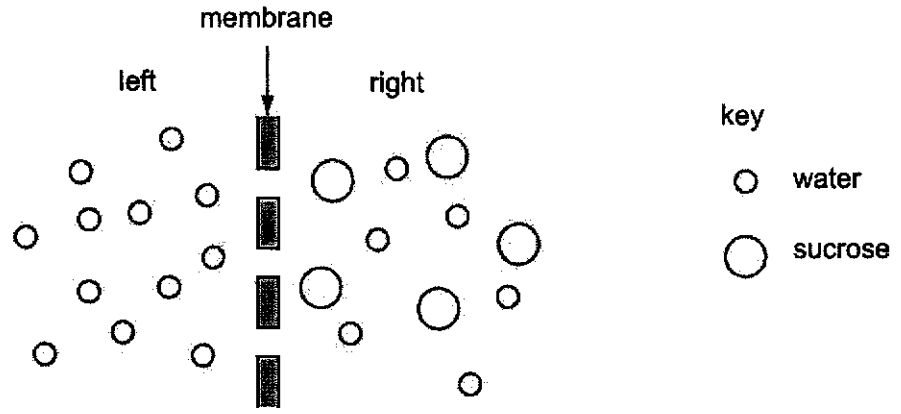
A an organ in an organism
B an organ system in an organism
C cells within a tissue
D tissue in an organ

3 A student suggests that plant cells do not require mitochondria since they have chloroplasts.

Which of the following statements explain why there is a need for both mitochondria and chloroplasts in plant cells?

A Having both chloroplasts and mitochondria would maximise the rate of energy release.
B Having both chloroplasts and mitochondria would maximise the rate of photosynthesis.
C Mitochondria would be necessary at night when chloroplasts are unable to carry out photosynthesis.
D The chemical energy stored in glucose cannot be efficiently utilised in the cell without the mitochondria.

4 The diagram represents two liquids, separated by a membrane.

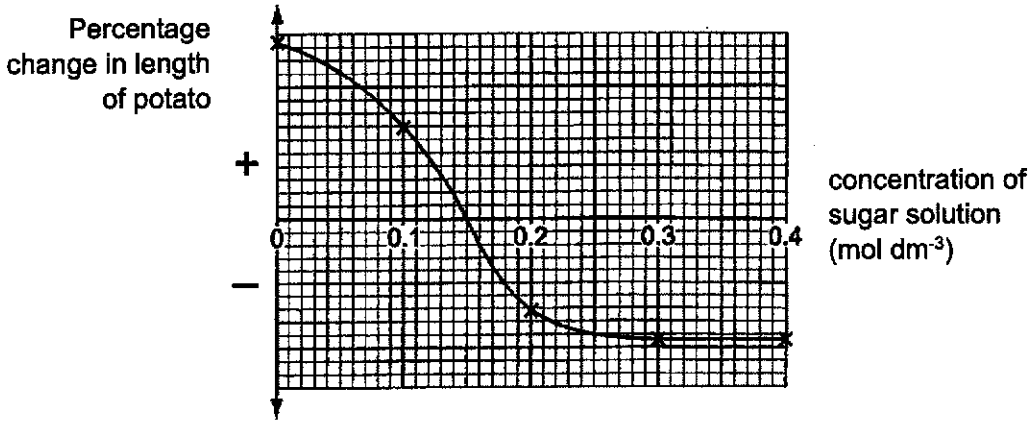


What movement of molecules will occur?

A Overall, water molecules move from left to right.
B Overall, water molecules move from right to left.
C Sucrose moves from left to right.
D Sucrose moves from right to left.

5 Five pieces are cut from a potato, all of equal size and shape. The pieces are then placed in sugar solutions of different concentrations. After four hours, the change in length of each potato piece is measured.

The results are shown in the graph.

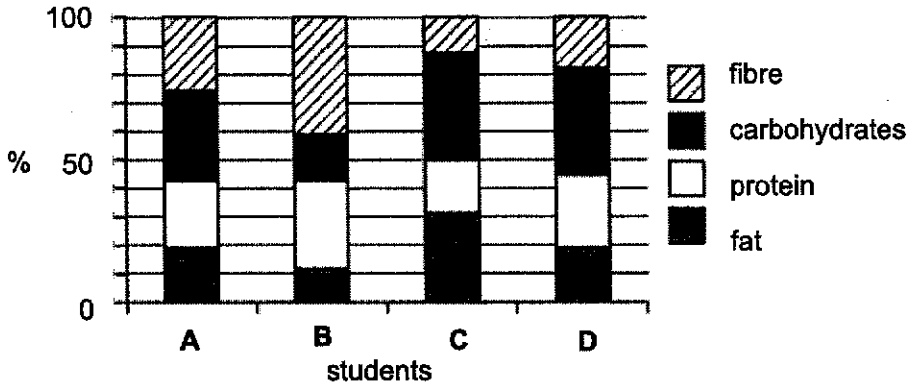


Which concentration of sugar solution has approximately the same water potential as the potato?

A 0.10 mol dm^{-3}
B 0.15 mol dm^{-3}
C 0.30 mol dm^{-3}
D 0.35 mol dm^{-3}

6 The monthly food intake of four students was analysed and the percentages of each nutrient found in their food intake are shown on the graph.

Which student has greatest risk of coronary heart disease due to his diet?



7 One student was asked to identify the types of nutrients present in test tube X and Y respectively.

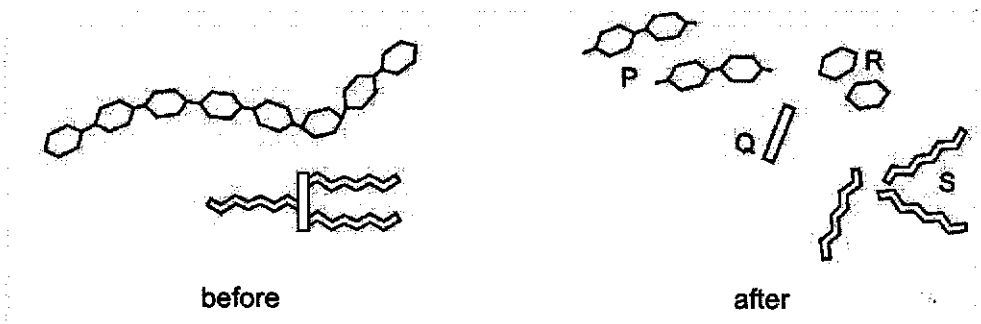
The table shows the results of her experiment.

test tube	reagent(s) added to test tube		
	biuret solution	ethanol + water	iodine solution
X	violet colouration	white emulsion	brown colouration
Y	blue colouration	white emulsion	blue-black colouration

Which conclusion can be drawn from her experimental results?

A Glucose and egg white has been placed in test tube X.
B Oil and glucose has been placed in test tube X.
C Starch and oil has been place in test tube Y.
D Starch, oil and egg white had been placed in test tube Y.

8 The diagram shows two food molecules before and after they have been digested.



What are the products of carbohydrate digestion?

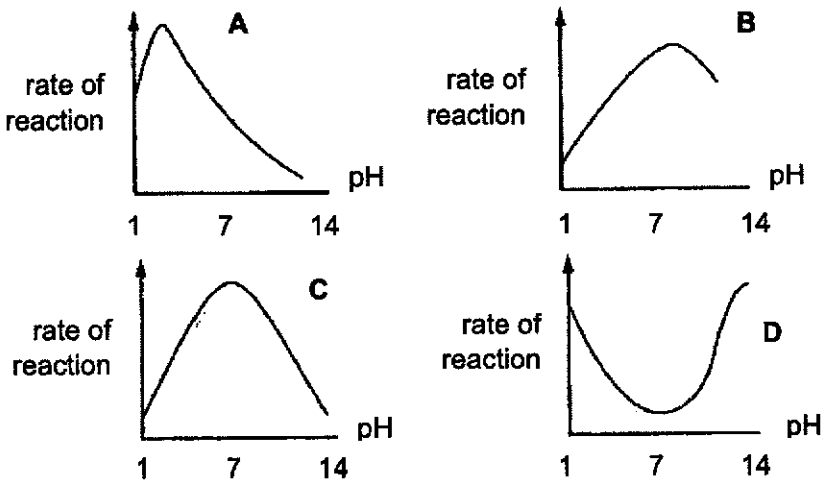
A P and R
B P and S
C Q and R
D Q and S

9 What results in the denaturation of an enzyme?

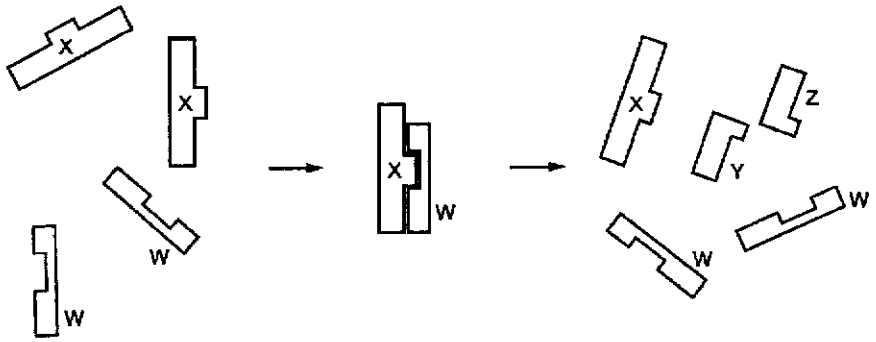
A A change in the activation energy of the reaction
B A change in the amount of nutrients present for the enzyme
C A change in the substrate molecules that bind to enzyme
D A change in the 3-dimensional structure of the enzyme

10 Salivary amylase is an enzyme that is active in human digestive system.

Which graph shows how the rate of reaction of salivary amylase is affected by pH?



11 The diagram illustrates the 'lock and key' hypothesis of enzyme action



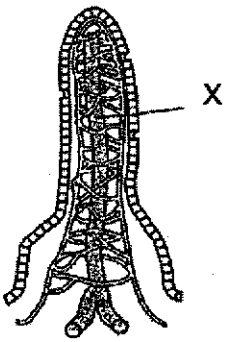
What are the enzyme, product (s) and substrate (s) in this reaction?

	enzyme	product	substrate
A	W	X	Y and Z
B	W	Y and Z	X
C	X	W	Y and Z
D	X	Y and Z	W

12 Which of the following processes is **not** an example of chemical digestion?

A action of amylase on starch
B breakdown of maltose into glucose
C breakdown of proteins into polypeptides
D emulsification of fats

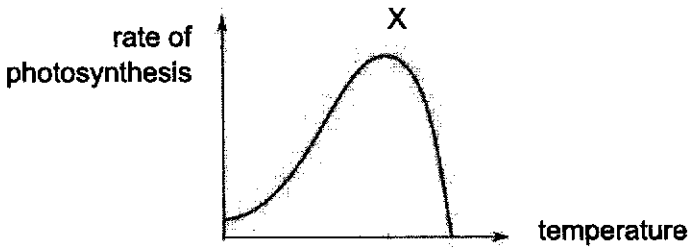
13 The diagram shows a section through a villus.



What is the function of structure X?

A To absorb amino acids
B To allow blood to flow through
C To transport fats
D To transport glucose

14 The graph shows how the rate of photosynthesis changes with the temperature.



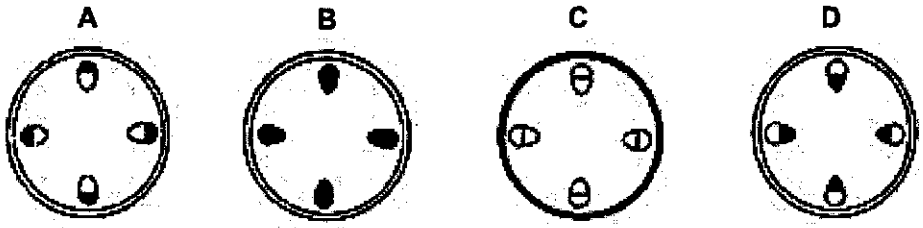
What causes the rate of photosynthesis to decrease after point X in a plant?

A The amount of chlorophyll limits the rate of photosynthesis.
B The enzymes become inactive after point X.
C The enzymes have denatured after point X.
D There is insufficient amount of carbon dioxide for photosynthesis to take place.

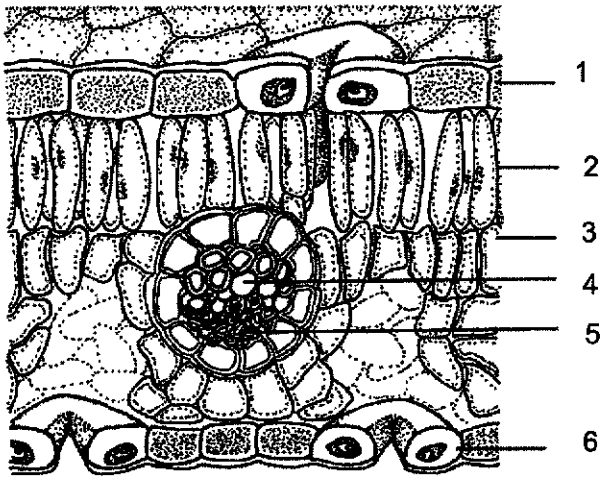
15 A plant was placed in a bell-jar in warm, brightly-lit conditions. The air in the jar contained radioactive carbon dioxide.

After an hour, thin slices were cut from the stem and placed on photogenic film which becomes black when exposed to radioactivity.

Which diagram shows the area where film became black?



16 The following diagram shows the cross section of a leaf.



Which regions in the leaf contain chloroplasts?

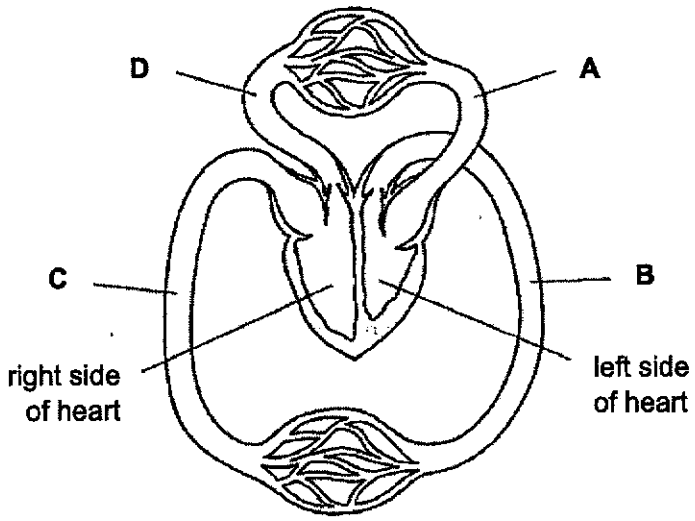
A 1, 2 and 3 only
B 2, 3 and 6 only
C 3, 4 and 6 only
D 3, 5 and 6 only

17 Which statement is true for all arteries in the human body?

A They carry oxygenated blood.
B They contain valves.
C They have thin walls.
D They transport blood away from the heart.

18 The diagram represents part of the human circulatory system.

Which blood vessel contains blood at the highest pressure?



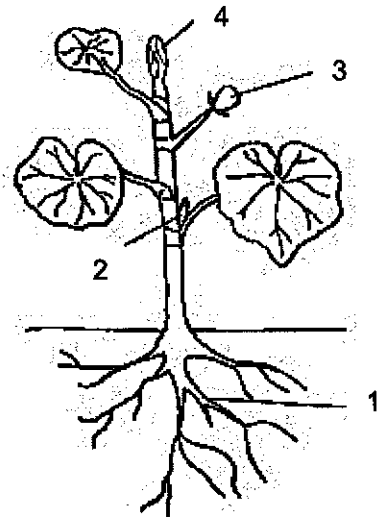
19 Transpiration enables water to reach the top of trees.

Which statement is **not** true about this process?

A water evaporates into the air spaces of the leaf
B water molecules are pulled upwards in the xylem
C water passes by osmosis through the stomata
D water vapour diffuses through the mesophyll cells

20 The diagram shows a green plant.

Where will food made by the leaves be found after translocation?



A 1 only
B 1 and 2 only
C 1, 2 and 3 only
D 1, 2, 3 and 4

Answer all questions from this section in the boxes below.

Q1	Q2	Q3	Q4	Q5
Q6	**Q7**	**Q8**	**Q9**	**Q10**
Q11	**Q12**	**Q13**	**Q14**	**Q15**
Q16	**Q17**	**Q18**	**Q19**	**Q20**

Section B

Answer **all** questions from this section in the spaces provided.

1 Fig. 1.1 shows a vertical section of the root of a corn plant, Zea mays.

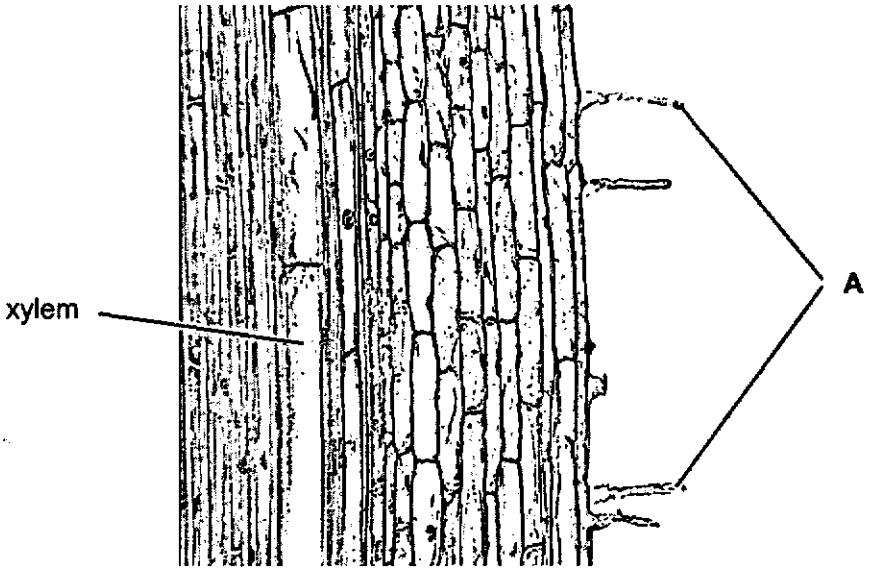


Fig. 1.1

(a) (i) Name the structures labelled **A**.

..... [1]

(ii) Explain how the structures labelled **A** are adapted to its functions.

.....

.....

.....

..... [2]

(b) State one function and adaptation of xylem.

function: .....

.....

adaptation: .....

..... [2]

2 A student tied a potato cube to a plastic rod and suspended it in water. After two hours, the plastic rod is bent slightly as shown in Fig. 2.1.

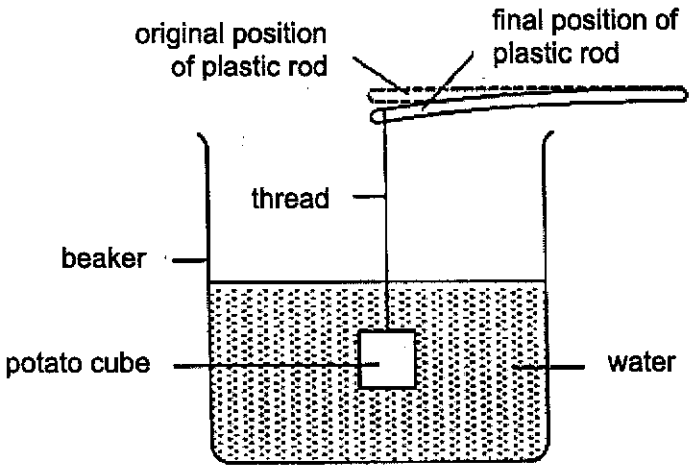


Fig. 2.1

(a) Explain why the plastic rod bent down slightly after two hours.

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.....

.....

..... [3]

(b) Describe the texture of the potato cube after two hours.

..... [1]

(c) Another student carried out a similar experiment using a sucrose solution. After two hours, he viewed the potato cells under a light microscope and drew a cell like the one shown in Fig. 2.2.

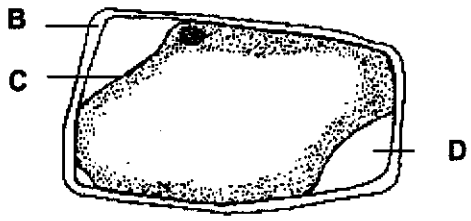

Fig. 2.2

(i) Identify structures **B** and **C**.

B: .....

C: ..... [2]

(ii) Suggest what is found in **D**. Give a reason for your answer with reference to the properties of structures **B** and **C**.

.....

.....

.....

.....

.....

..... [3]

(iii) Describe the state of the potato cell shown in Fig. 2.2.

..... [1]

3 (a) (i) Write the word equation for the breakdown of fats by lipase into its end-products.

..... [1]

(ii) Suggest why the pH of the mixture changes when fat is digested.

..... [1]

(b) One student set up three test-tubes shown in Fig. 3.1 for an investigation.

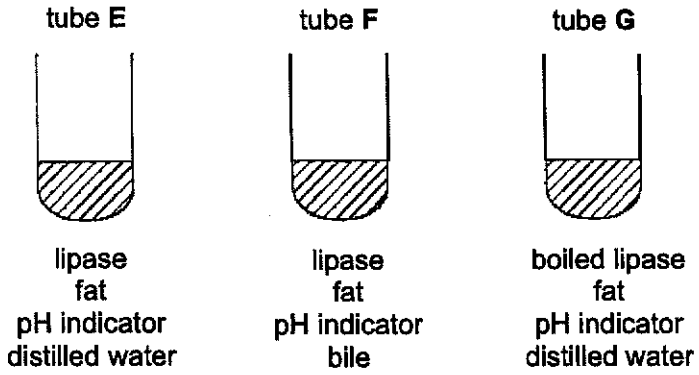

Fig. 3.1

The time taken for the indicator to change colour after lipase was added was recorded in Table 3.2.

Table 3.2

tube	time taken / min
E	5
F	1
G	no change after 30 minutes

(i) Explain why the indicator in tube **F** changed faster than in tube **E**.

.....

..... [2]

(ii) Explain why the indicator in tube **G** remained the same after 30 minutes.

.....

.....

.....

.....

..... [3]

4 Fig. 4.1 shows the human digestive system.

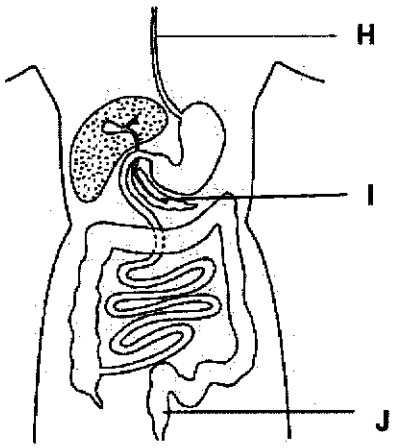

Fig. 4.1

(a) Identify the parts **H**, **I** and **J** on Fig. 4.1.

H: .....

I: .....

J: ..... [3]

(b) Table 4.2 shows the relative amounts of amino acids and maltose found in a person's alimentary canal as the contents of a meal pass through.

Table 4.2

region of alimentary canal	amount of amino acids	amount of maltose
part **H**	low	increase
stomach	increase	high
small intestine	increase, then decrease	increase, then decrease
part **J**	no	no

(i) Explain why the amount of amino acids increases, then decreases in the small intestine.

.....

.....

.....

..... [2]

(ii) Explain why the amount of maltose increase in the mouth and remains unchanged in the stomach.

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..... [2]

5 Fig. 5.1 shows a small part of a circulatory system in humans. The arrows indicate the direction of blood flow.

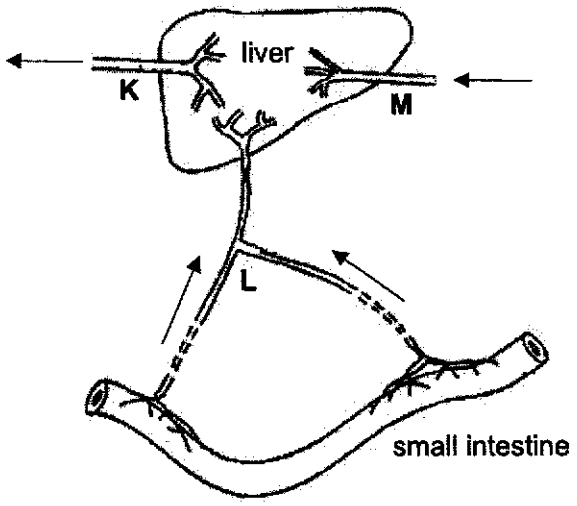

Fig. 5.1

(a) Name blood vessels **K** and **L**.

K: .....

L: ..... [2]

(b) Compare the blood glucose concentration between blood vessels **K** and **L** a few hours after a heavy meal. Explain your answer.

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..... [3]

(c) List **two** functions of liver other than the regulation of blood glucose concentration.

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..... [2]

6 The apparatus was set up in Fig. 6.1 to investigate the effects of light intensity on the rate of photosynthesis on a water plant, *elodea*.

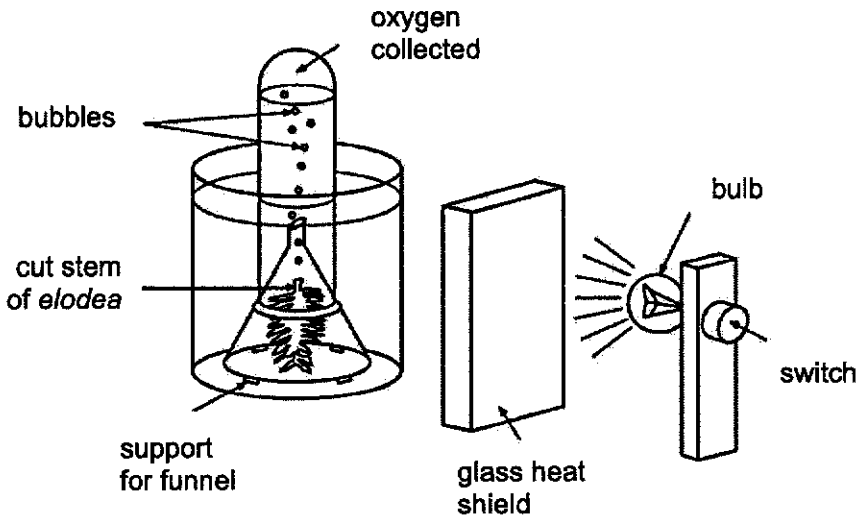


Fig. 6.1

(a) Some sodium hydrogen carbonate was added into the water. State the purpose of adding sodium hydrogen carbonate.

.....

..... [1]

(b) State the purpose of the glass heat shield.

.....

..... [1]

(c) Suggest a way the light intensity for the experiment can be varied.

.....

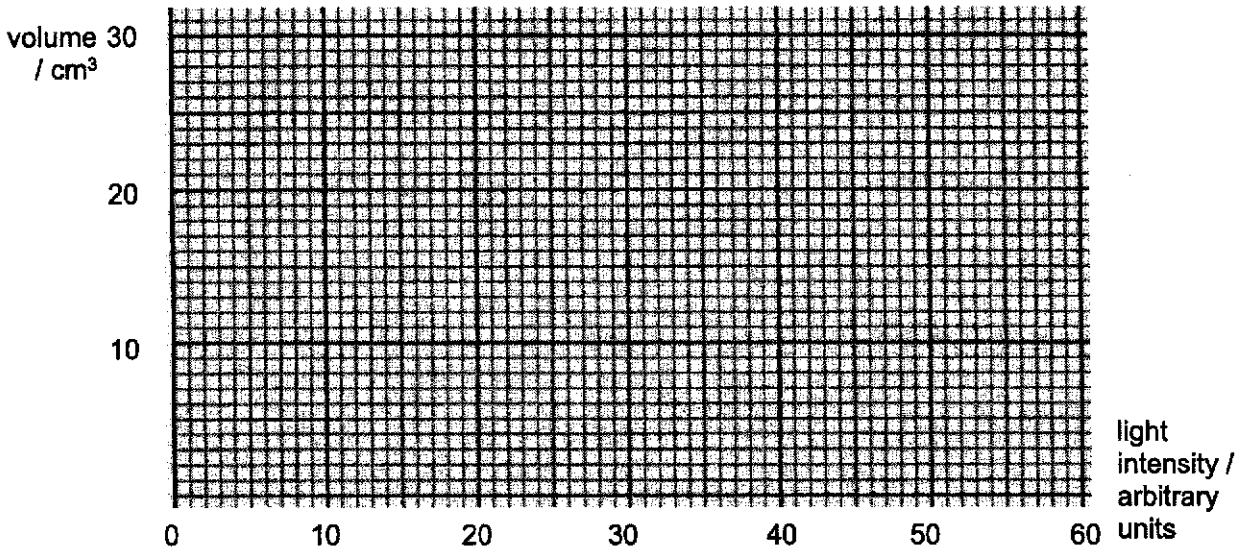
..... [1]

Table 6.2 shows the volume of oxygen collected in the boiling tube at different light intensities used in the experiment.

Table 6.2

light intensity/ arbitrary units	volume/ cm^3
0	0
10	10
20	21
30	25
40	30
50	30
60	30

(d) Draw a graph to represent the results in Table 6.2.



[2]

(e) Using the plotted graph, describe and explain the effects of light intensity on the rate of photosynthesis.

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..... [4]

Section C

Answer **all** questions from this section in the spaces provided.

7 **(a)** The number of white blood cells increases in a patient shortly after surgery.

Suggest and explain the possible cause of this increase.

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..... [4]

(b) Describe how blood from the lungs is forced into the aorta.

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..... [4]

(c) Explain **one** feature of blood capillaries which help them to carry out their function.

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..... [2]

8 Fig. 8.1 shows an experimental set-up to investigate the path and rate of movement of water in a plant.

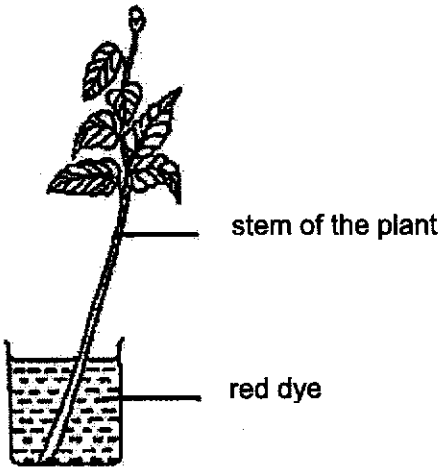

Fig. 8.1

(a) It takes 20 minutes for the stem of plant to turn red. State the main force that is responsible for the rise of red dye in the shoot.

..... [1]

(b) Describe and explain **three** conditions that could increase the rate of red dye rising up the plant.

.....

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..... [6]

(c) (i) Describe how wilting occurs.

.....

..... [1]

(ii) State **one** advantage and one disadvantage of wilting.

advantage: .....

.....

disadvantage: .....

..... [2]

~ END OF PAPER ~

Section A

Q1	Q2	Q3	Q4	Q5
A	D	D	A	B
Q6	Q7	Q8	Q9	Q10
C	C	A	D	C
Q11	Q12	Q13	Q14	Q15
B	D	C	C	A
Q16	Q17	Q18	Q19	Q20
B	D	B	C	D

Section B

Answer **all** questions from this section in the spaces provided.

1 Fig. 1.1 shows a vertical section of the root of a corn plant, Zea mays.

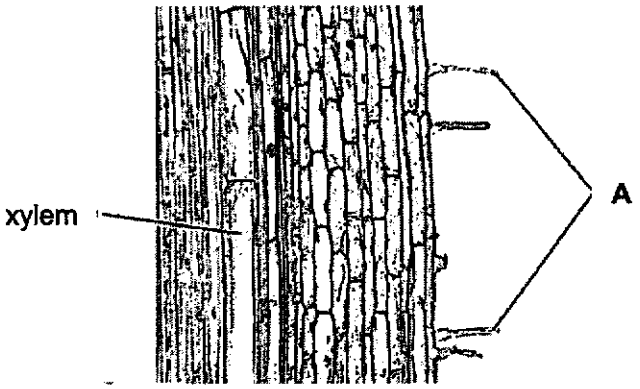


Fig. 1.1

(a) (i) Name the structures labelled **A**. [1]

Root hair

(ii) Explain how the structures labelled **A** are adapted to its functions. [2]

Long and narrow/protruding out, to increase the surface area to volume ratio for faster absorption of water and minerals [1]
Large vacuole to store more water [1]

(b) State one function and adaptation of xylem. [2]

function: **transport water and mineral salts from the roots to other parts of the plant/ provide mechanical support [1]**

Adaptation: **long hollow tube with no protoplasm and cross walls/lignin present [1]**

2 A student tied a potato cube to a plastic rod and suspended it in water. After two hours, the plastic rod is bent slightly as shown in Fig. 2.1.

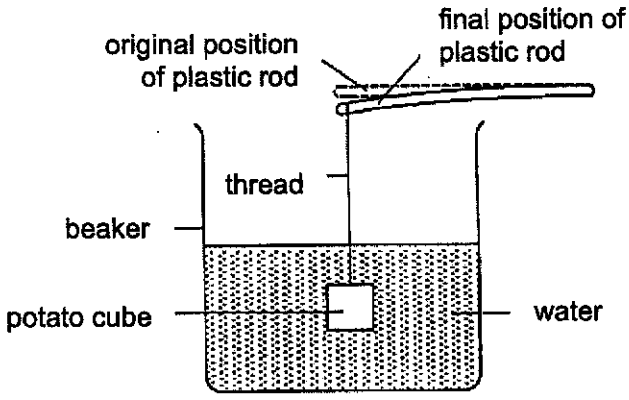


Fig. 2.1

(a) Explain why the plastic rod bent down slightly after two hours. [3]

There is a higher water potential in the water than in the potato cube. [1]
Water enters the potato cube by osmosis [1]
The potato cube gained weight [1] and makes the plastic rod bent down.

(b) Describe the texture of the potato cube after two hours. [1]

Turgid/hard/rough [1]

(c) Another student carried out a similar experiment using a sucrose solution. After two hours, he viewed the potato cells under a light microscope and drew a cell like the one shown in Fig. 2.2.

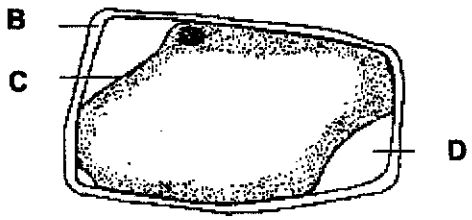


Fig. 2.2

(i) Identify structures **B** and **C**. [2]

B: cell wall [1]

C: cell membrane [1]

(ii) Suggest what is found in **D**. Give a reason for your answer with reference to the properties of structures **B** and **C**. [3]

Sucrose solution is found in D. [1]
Cell wall(B) is fully permeable while cell membrane(C) is partially permeable [1]
Sucrose diffuse in [1]

(iii) Describe the state of the potato cell shown in Fig. 2.2. [1]

Plasmolysed/cell membrane or cytoplasm shrinks away from cell wall [1]

3 **(a) (i)** Write the word equation for the breakdown of fats by lipase into its end-products. [1]

Fat $\xrightarrow{\text{lipase}}$ **fatty acids + glycerol [1]**

(ii) Suggest why the pH of the mixture changes when fat is digested. [1]

Fatty acids are acidic [1]

(b) One student set up three test-tubes shown in Fig. 3.1 for an investigation.

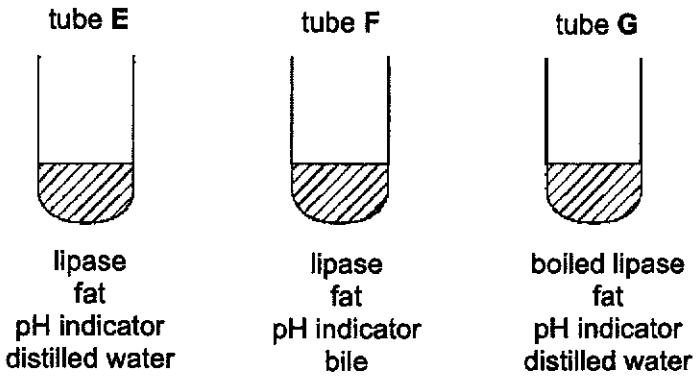


Fig. 3.1

The time taken for the indicator to change colour after lipase was added was recorded in Table 3.2.

Table 3.2

tube	time taken / min
E	5
F	1
G	no change after 30 minutes

(i) Explain why the indicator in tube **F** changed faster than in tube **E**. [2]

Bile breakdown large fat droplets into small fat droplet/emulsification [1]
Increase surface area so lipase can digest faster into fatty acids [1]

(ii) Explain why the indicator in tube **G** remained the same after 30 minutes. [3]

Lipase/enzyme are denatured [1]
The active site changes the 3-D shape [1]
Cannot form enzyme substrate complex/substrate cannot bind to enzyme/fats cannot bind to lipase [1]

4 Fig. 4.1 shows the human digestive system.

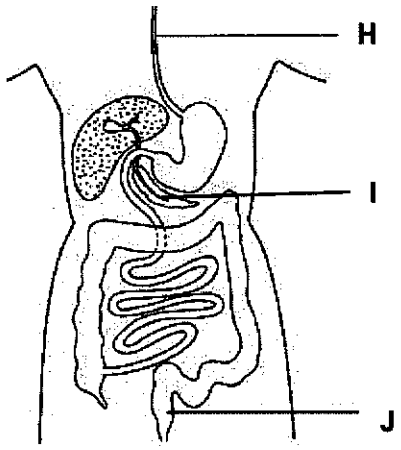


Fig. 4.1

(a) Identify the parts **H**, **I** and **J** on Fig. 4.1. [3]

Reject spelling error
H: oesophagus [1]
I: pancreas [1]
J: rectum [1]

(b) Table 4.2 shows the relative amounts of amino acids and maltose found in a person's alimentary canal as the contents of a meal pass through.

Table 4.2

region of alimentary canal	amount of amino acids	amount of maltose
part **H**	low	increase
stomach	increase	high
small intestine	increase, then decrease	Increase, then decrease
part **J**	no	no

(i) Explain why the amount of amino acids increases, then decreases in the small intestine. [2]

<u>Polypeptides/proteins</u> are digested by <u>protease</u> into amino acids [1] which accounts for the increase in amount of amino acids.

Amino acids are then <u>absorbed</u> into the small intestine [1] which accounts for the decease in amount of amino acids.

(ii) Explain why the amount of maltose increase in the mouth and remains unchanged in the stomach. [2]

<u>Starch</u> is digested by <u>salivary amylase</u> into maltose [1] which accounts for the increase in amount of maltose.
There is <u>no enzyme in the stomach</u> to digest starch /amylase is denatured [1] which makes the amount of maltose constant.

5 Fig. 5.1 shows a small part of a circulatory system in humans. The arrows indicate the direction of blood flow.

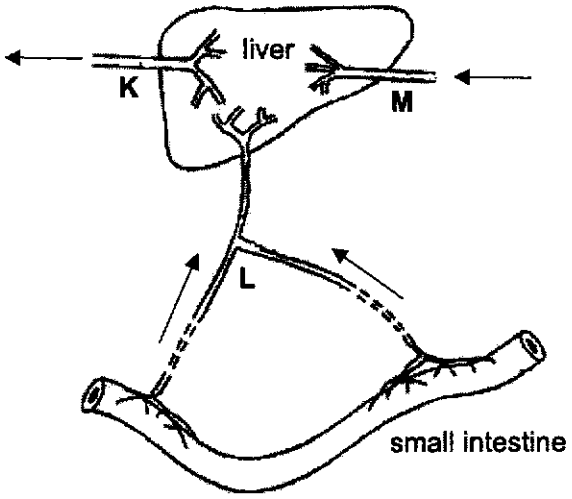


Fig. 5.1

(a) Name blood vessels **K** and **L**. [2]

No spelling error
K: hepatic vein [1]

L: hepatic portal vein [1]

(b) Compare the blood glucose concentration between blood vessels **K** and **L** a few hours after a heavy meal. Explain your answer. [3]

Blood glucose concentration is much higher in hepatic portal vein(L) than hepatic vein(K) [1]
Glucose is absorbed in the ileum/small intestine and transported in hepatic portal vein(L) [1]
Excess glucose are converted into glycogen for storage in the liver [1] which accounts for the decrease in blood glucose concentration in than hepatic vein(K) [1]

(c) List two functions of liver other than the regulation of blood glucose concentration. [2]

Any 2 of the followings
Deamination/convert excess amino acids to urea
detoxification of alcohol
storage of iron
production of bile to emulsify fats
protein synthesis

6 The apparatus was set up in Fig. 6.1 to investigate the effects of light intensity on the rate of photosynthesis on a water plant, *elodea*.

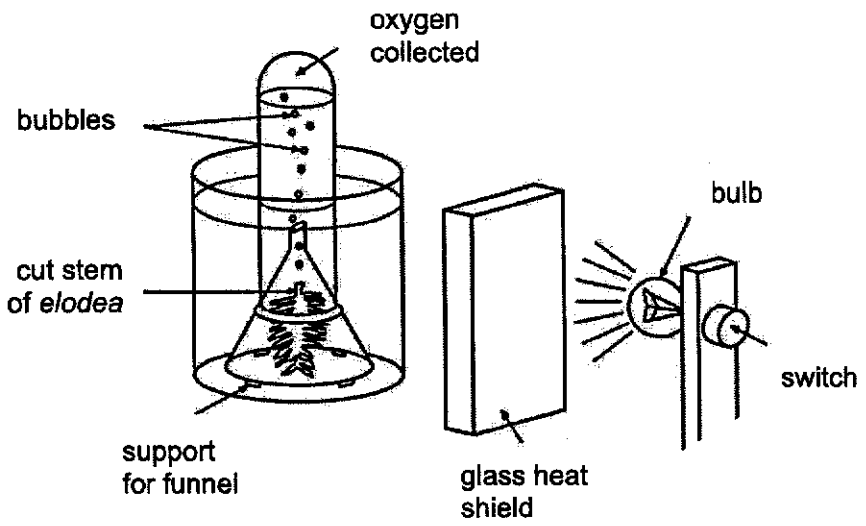


Fig. 6.1

(a) Some sodium hydrogen carbonate was added into the water. State the purpose of adding sodium hydrogen carbonate. [1]

sodium hydrogen carbonate provide carbon dioxide for photosynthesis [1]

(b) State the purpose of the glass heat shield. [1]

To make sure temperature is constant/ temperature is the controlled variable/prevent over heating of the plant [1]

(c) Suggest a way the light intensity for the experiment can be varied. [1]

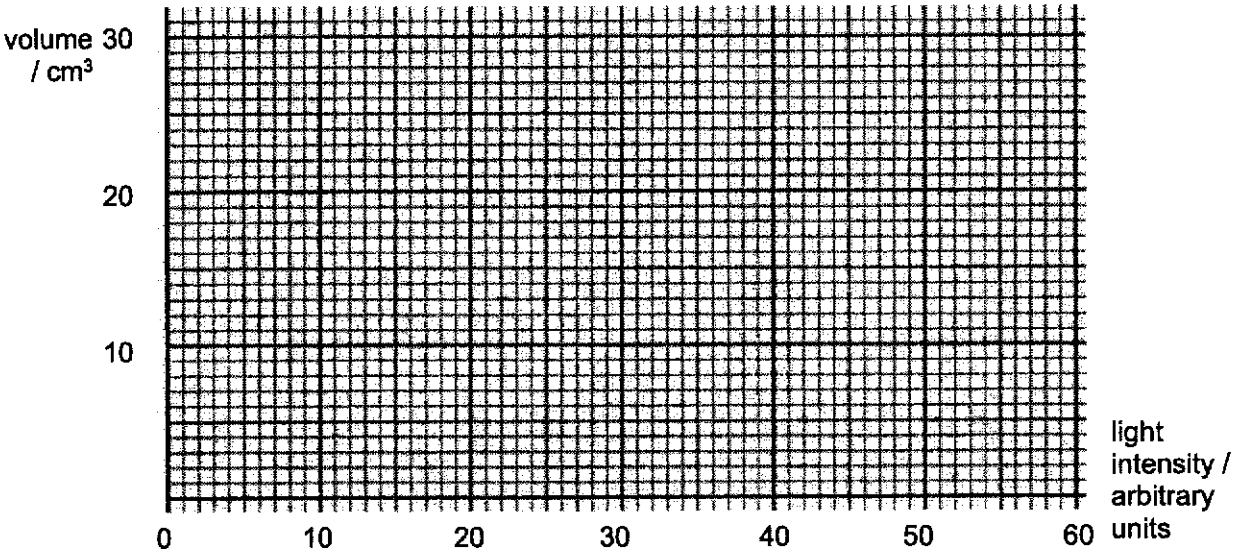
Change the number of light bulbs/change the power of light bulbs/change the distance of the light bulb to the plant [1]

Table 6.2 shows the volume of oxygen collected in the boiling tube at different light intensities used in the experiment.

Table 6.2

light intensity/ arbitrary units	volume/ cm^3
0	0
10	10
20	21
30	25
40	30
50	30
60	30

(d) Draw a graph to represent the results in Table 6.2.
1m for ploting points, 1m for curve



[2]

(e) Describe and explain the effects of light intensity on the rate of photosynthesis. [4]

Any 4
When light intensity is 0, rate of photosynthesis is 0 [1]
When the light intensity increase from 0 to 40 arbitrary units, the rate of photosynthesis increases [1]
When the light intensity increase after 40 arbitrary units, the rate of photosynthesis stays constant [1]
Light intensity is the limiting factor before 40 arbitrary units /Light intensity is no longer the limiting factor 40 arbitrary units [1]

1m for mentioning values for at least once

Section C

Answer **all** questions from this section in the spaces provided.

7 **(a)** The number of white blood cells increases in a patient shortly after surgery.

Suggest and explain the possible cause of this increase. [4]

Bacteria entered the body through open wound/ post-surgical infection [1]
More phagocytes and lymphocytes produced [1]
Phagocytes undergo phagocytosis to engulf and digest the bacteria [1]
Lymphocytes produce antibodies bind to bacteria and cause their surface membranes to rupture. [1]

(b) Describe how blood from the lungs is forced into the aorta. [4]

Any 4
Oxygenated blood from lungs return to left atrium via the pulmonary veins
Left atrium contract, pressure increases to pushing blood into left ventricle via bicuspid valve/ atrio-ventricular valve
Left ventricle contract generate high pressure to push blood into the aorta via semi – lunar valve
Bisuspid/semi-lunar valves prevent backflow of blood

(c) Explain **one** feature of blood capillaries which help them to carry out their function. [2]

partially permeable endothelium/one-cell thick wall [1]
shorter diffusion distance to allow for faster exchange of materials between blood and surrounding tissues [1]

8 Fig. 8.1 shows an experimental set-up to investigate the path and rate of movement of water in a plant.

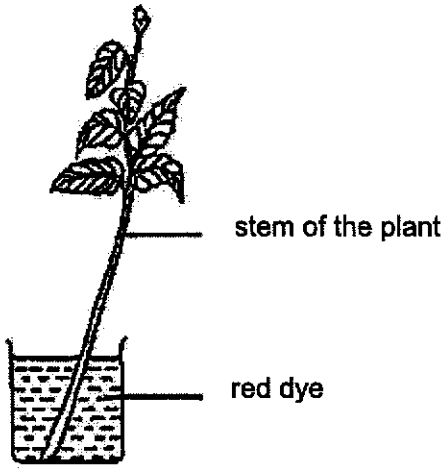


Fig. 8.1

(a) It takes 20 minutes for the stem of plant to turn red. State the main force that is responsible for the rise of red dye in the shoot. [1]

transpiration pull [1]

(b) Describe and explain three conditions that could increase the rate of red dye rising up the plant. [6]

Any 3 conditions

- **Low humidity / decrease in air humidity / drier air;**
  The less humid the air outside the leaf, the steeper the water vapour concentration gradient.

- **Strong wind or increase air movement;**
  The wind blows away the water vapour that accumulates outside the stomata, maintaining the water vapour concentration gradient.

- **High temperature of air / increase in air temperature;**
  The higher the temperature, the higher the rate of evaporation.

- **Increased light intensity;**
  In sunlight, stomata open wider.

All these above increasing rate of transpiration/ faster diffusion of water vapour out of leaves, thereby increasing rate of ascent of red dye.

(c) (i) Describe how wilting occurs. [1]

Rate of water loss exceeds rate of water absorption

(ii) State one advantage and one disadvantage of wilting. [2]

Advantage: **[1] Any 1**
Reduces rate of transpiration;
Prevents excessive water loss;
Cooling of plant;

Disadvantage: **[1] Any 1**
Stomata close, decreasing intake of CO_2 and rate of photosynthesis decreases;
Leaves droop and hence decreasing absorption of sunlight, hence rate of photosynthesis decreases;