



MA-40

UNDERSTANDING O LEVEL BIOLOGY

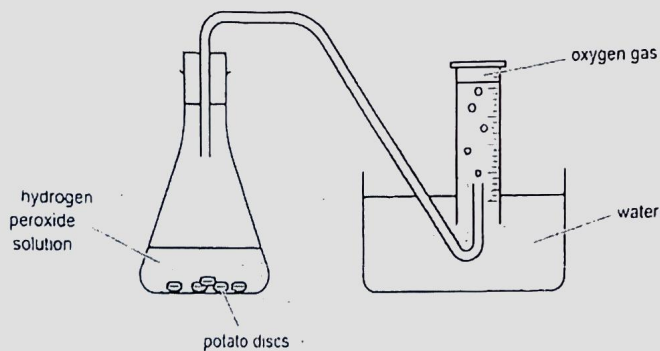
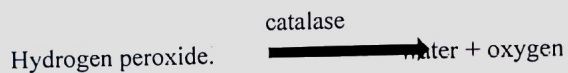
ENZYMES ,OSMOSIS, DIFFUSION AND ACTIVE TRANSPORT

Senior four

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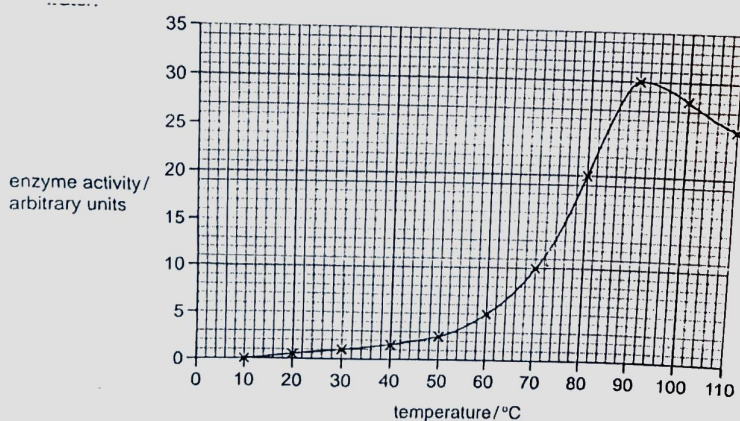
1. An investigation was carried out to study the effect of pH on catalase, using pieces of potato as a source of the enzyme. Oxygen is formed when catalase breaks down hydrogen peroxide, as shown in the equation.



The time taken to collect 10 cm³ oxygen was recorded in the table below under different pH

pH	Time to collect 10cm ³ of oxygen(minutes)	Rate of reaction (cm ³ /min)
4	20	
5	12	
6	10	
7	13	
8	17	

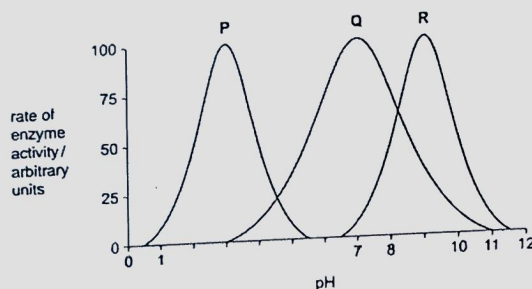
- Complete the table above by filling the rate of reaction for each pH value (2½marks)
 - Plot a graph to show how rate of reaction changes with pH (07marks)
 - Describe the shape of the curve obtained (03marks)
 - Explain for the rate of reaction at
 - At pH 4. (02marks)
 - At pH 6. (02marks)
 - Between PH 6 and pH 8. (02marks)
 - Identify the optimum pH for catalase in the above experiment. Give a reason for your answer.
2. The graph below shows the enzyme activity of an enzyme in cell obtain from an organism living in a certain habitat. Study it carefully



- Describe the effect of temperature on enzyme activity (03marsk)

- b) Explain the changes in enzyme activity between (06marks)
 10C and 50C
 50C and 90C
 90C and 110C
- c) State the habitat from which the organism lives. Give a reason from your answer. (02marks).
- d) What are other structural adaptations that enable the above organism to live in its habitat. (06marks).

3. Three enzymes, **P**, **Q** and **R**, were extracted from different regions of the alimentary canal of a mammal. The effect of pH on the activity of the enzymes was investigated at 40 oC. The results are shown on the graph below.

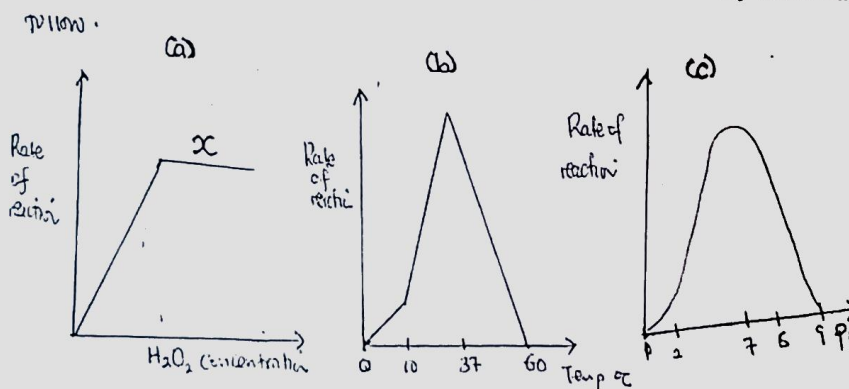


- a) Explain why the investigation was carried out at 40 oC? (02marks)
 - b) Using information in Fig. 3.2, describe the effects of increasing pH on the rate of activity of enzyme Q. (03marks)
 - c) Name enzymes P, Q and R (03marks)
P
Q
R
 - d) State the location of enzyme P and Q (02marks)
4. The table below shows the rate of product formation for two enzymes H and J over a range of pH values.

PH	1	2	3	4	5	6	7	8	9	10
Rate of product formation for enzyme H (mg/ hr)	34.5	40.5	33.5	15.0	—	—	—	—	—	—
Rate of product formation for enzyme J (mg/ hr)	—	—	—	15.0	20.0	30.0	40.5	23.5	11.0	6.0

- Represent the above information on a suitable graph (08marks)
- Account for the rate of product formation of enzyme H between pH 1 and 3
pH 3 and 7
- From the graph determine
 - The pH value at which the rate of product formation in both enzymes was the same
 - The value of the rate of product formation for both enzymes at the stated pH value
 - The optimum pH of enzyme J
- Suggest with a reason the location of enzyme H in the human body (02marks)
- State any other two factors that may affect the rate of product formation in enzymes H and J. (01mark)

5. The figures below shows the factors that affect enzyme catalase. Study them carefully.



- State what each figure represent. (03marks).
- From figure (a) explain for the rate of reaction along region X (02marks)
- Explain for the reaction in figure (b). (06marks)
- Account for the rate of reaction at pH (06marks)

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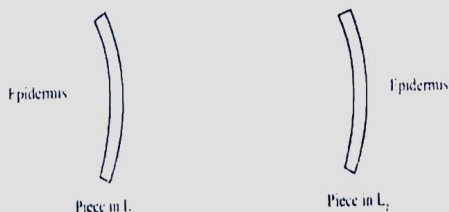
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e) What is the significance of enzyme catalase in a human body (03marks)

6. In experiment to investigate the effect of sodium chloride on the growth of spinach seedlings. Seeds were treated with different concentration of sodium chloride. The results are shown in the table below.

Concentration of sodium chloride (M)	Percentage of spinach seeds which started to grow roots
0.00	100
0.06	99
0.12	98
0.18	54
0.24	20
0.30	0

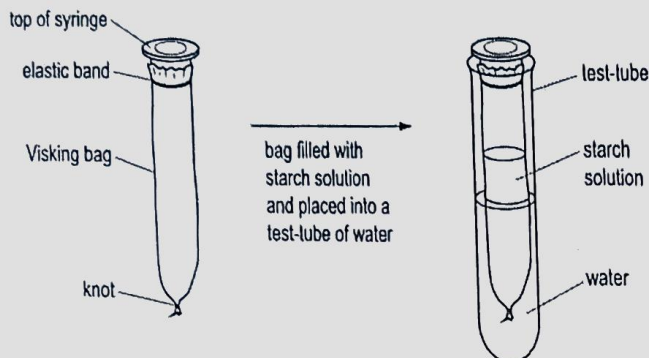
- a) Plot a graph to represent the above results (06marks)
 b) Account for the results obtained at 0.00M sodium chloride concentration (03marks)
 c) Explain the effect of increasing sodium chloride concentration on the growth of roots of spinach seedlings. (03marks)
 d) Identify the process being examined (01mark)
 e) How is the above process important to plants (04marks).
7. A freshly obtained **dandelion stem** measuring 5cm long was split lengthwise to obtain two similar pieces. The pieces were placed in two different solution in petri dishes (**L1 and L2**) for 20minutes. The appearance after 20/minutes is shown.



- a) Account for the appearance the pieces of the stem placed (06marks)
 Solution L1
 Solution L2
 b) Identify the process that caused the above changes
 c) State any two roles of the above process to plants
 d) What other changes are likely to occur to piece place in solution L1

8. A student investigated a certain physiological process through a visking tube, an artificial membrane which has some properties of cell membrane. The student made a bag of visking tube as shown below.

The student added some iodine solution to the water in the test-tube.



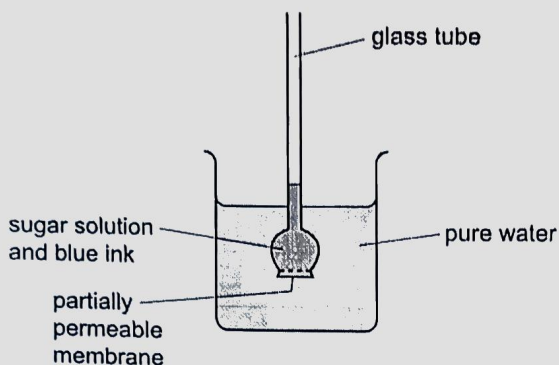
After 30 minutes at room temperature, the contents of the Visking bag were stained blue-black, but the water outside remained a yellow colour

- Explain these results (04marks)
 - Identify the process being investigated (01mark)
 - Explain what would happen if a student added amylase solution instead of iodine in the test tube (03marks)
 - Comment on the nature of the visking tube (02mark)
9. A group of students investigated the effect of soaking small onion bulbs in different concentrations of sodium chloride solution. They peeled off the outer papery leaves of the onion bulbs and divided the onions into 6 batches, each with 10 onions.
- The onions surface were dried with paper towels and weighed. The mean mass of the onions in each batch was calculated. The onions were then left in sodium chloride solutions for three hours.
- After three hours the students dried the surface of the onions and weighed them again. Their results are given in Table.

Concentration of sodium chloride solution in g/dcm ⁻³	Mean mass of onions / g		Percentage change in mass
	Before soaking	After soaking for 3hours	
0	147	173	
25	153	165	
50	176	172	
100	154	149	
150	149	142	
200	183	175	

- Calculate the percentage change in mass(06marks)
- Plot a graph of percentage change in mass against concentration of sodium chloride solution (06marks)
- Use the graph to estimate the concentration of the sodium chloride solution that has the same concentration as the onions. (01mark)
- Explain why the onions
 - Gained mass when placed in dilute solution of sodium chloride. (03marks)
 - Lost mass when placed in concentrated solution sodium chloride. (03marks).

10. The figure below shows an investigation about two physiological process, study it carefully and answer the questions that follow.



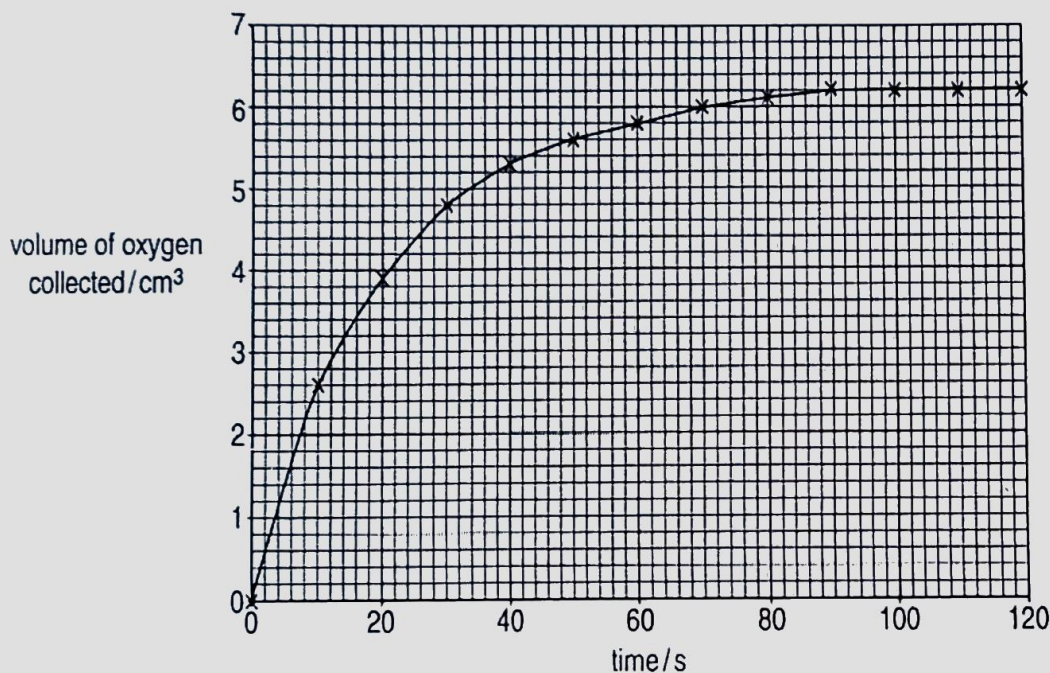
- Explain what would be observed to the volume of solution in glass tube and in the colour of water in beaker at the end of the experiment. (06marks)
Beaker
Glass tube
 - What process caused the observation in (02marks)
Beaker
Glass tube
 - What are the factors that affect the process which caused a change in the beaker (02marks).
11. An investigation was carried out to determine how changes in oxygen concentration affects the uptake of potassium ions when freshly uprooted roots were put in a bathing fluids containing potassium ions

Oxygen concentration (%)	0	2	5	10	20	30	50	70
Potassium ion concentration (mg cm ⁻³)	7	10	21	49	52	51	47.7	44

- Plot a graph to represent the above results (06marks)
- Describe the shape of the graph plotted (03marks)
- Explain the following observation from the graph
Potassium ions are present are absorbed even at 0 % oxygen concentration (02marks)
Increase in potassium ion concentration in the roots (03marks)
- State the process responsible for absorption of potassium ions (01mark)

e) What other factors affect the uptake of potassium ion uptake. (03mark)

12. The enzyme catalase is found in lettuce leaves. Student investigated the activity of this enzyme by grinding some lettuce leaves and adding them to a solution of hydrogen peroxide. The volume of oxygen produced was measured until the reaction stopped.



- Describe the changes in concentration of oxygen during the experiment (03marks)
 - Explain the changes described in a) above (06marks)
 - From the graph,
 - Determine the volume of oxygen at 48 minutes (01 mark)
 - Calculate the rate of reaction at 20 minutes and 80 minutes (04marks)
 - Write a word equation to show how oxygen is produced and state the importance of the reaction in organisms (02marks)
 - Explain what would be observed to the production of oxygen if the lettuce leaves were first boiled.(04marks)
13. In an experiment , slices of onions epidermis were placed in sucrose solution of different concentrations .The percentage of plasmolysed cells

were determined after 30minutes .the results were recorded in the table below

Concentration of sucrose (M)	0.55	0.60	0.65	0.70	0.75
Percentage of plasmolysed cells	0	5	20	80	100

- a) using a graph paper , represent the above results graphically(8½mrks)
- bi) What is meant by plasmolysis (02mrks)
- ii)What causes plasmolysis? (01mrk)
- c) Explain the results of 0.55 molar sucrose (03mrks)
- d) From your graph describe the relationship between molar concentration of sucrose solution and percentage of plasmolysed cells(02mrks)
- e) What term would be used on a plant where 100% of its cells are plasmolysed (01mrk)
- f) In which ways is the process that has led to plasmolysis, important to plants(03mrks)