



The National Orthodox School / Shmaisani

Subject: Biology

Worksheet : Enzymes

Name:

Date:

Grade 9 IB

Question 1 :

- (a) The 'lock and key hypothesis' is often used as a model to describe the action of enzymes.

Using this model, explain how enzymes work.

The enzyme is the lock and the substrate is the key . This is because the shape of the active site is complementary to the shape of the substrate.

- (b) **Figure 4** illustrates the results of two enzyme controlled reactions involving two different types of enzymes.

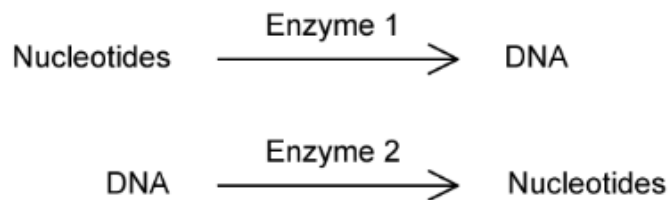


Figure 4

From these reactions , what conclusion can be drawn about the function of enzymes ?

Enzymes are biological catalysts that speed up chemical reactions within cells. They are essential for life as they are needed for important functions in the body such as digestion. Some enzymes may help break down large molecules into smaller ones, while others help join small molecules to make larger ones.



Question 2 :

Figure 1 below represents the reactants and products in a chemical reaction and four different enzymes (**A, B, C** or **D**).

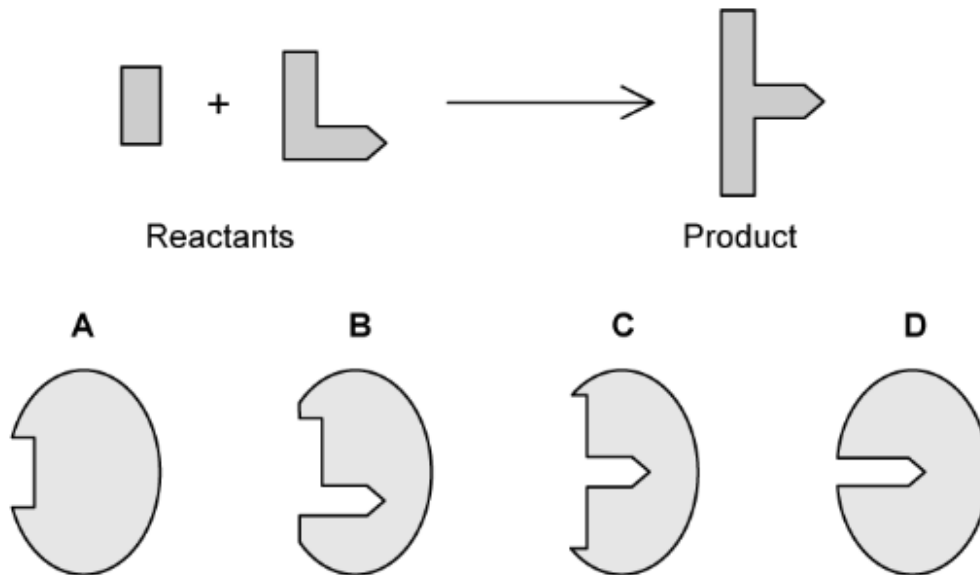


Figure 1

Explain which enzyme (**A, B, C** or **D**) is responsible for catalysing this reaction?

1'

..... **C**

Question 3 :

- a) **Figure 2** shows the effect of temperature on the rate of an enzyme catalysed reaction.

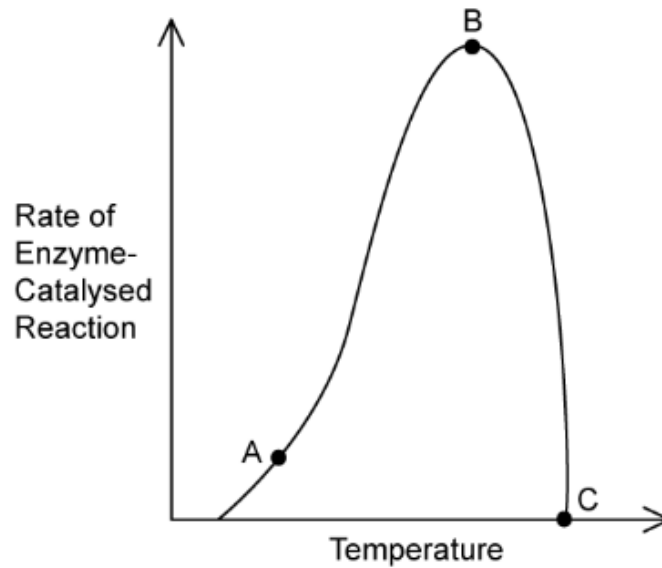


Figure 2

- (ii) Explain why the rise in temperature as shown in **Figure 2**, initially increases the rate of an enzyme catalysed reaction

As the temperature increases, the enzyme activity increases causing an increase in the rate of reaction

(i) Describe the effect of temperature at points **A**, **B** and **C** on the rate of the enzyme catalysed reaction.

A : As the temperature increases, the enzyme activity and the rate of reaction increase.

B : At the optimum temperature, the maximum rate of reaction is reached.

C : Beyond the optimum temperature, the enzyme begins to lose its shape, including the shape of the active site. Therefore, the enzyme will no longer fit the substrate so the rate of reaction start to decrease .

Question 4 :

Enzymes are necessary for many biological processes, such as the digestion of fat.



(a) (i) Explain why enzymes are necessary for biological processes.

.....
Without enzymes reactions, occur too slowly or not at all ;enzymes speed up reactions.
Some enzymes may help break down large molecules into smaller ones, while others help join small molecules to make larger ones.
.....

[3]



(ii) Lipase, protease and amylase are enzymes secreted into the alimentary canal.

Name **one** organ that secretes each enzyme. Choose your answers from this list.

- colon gall bladder liver
pancreas rectum salivary glands

You can use each organ **only once**.

lipase *Pancreas*
protease *pancreas*
amylase *salivary glands and pancreas* [3]

- They added lipase and bile salts to some of the test-tubes, as shown in Table 5.1. They did this at the same time for each test-tube.
- They kept all test-tubes at 40 °C.
- After 5 minutes, they added Universal Indicator solution to each test-tube.

Table 5.1

test-tube		colour of pH indicator after 5 minutes at 40 °C
A	milk, alkaline solution, lipase and bile salts	orange
B	milk, alkaline solution, bile salts and water	blue
C	milk, alkaline solution, lipase and water	yellow
D	milk, alkaline solution and water	blue

Fig. 5.1 shows the colour of the indicator at different pH values.

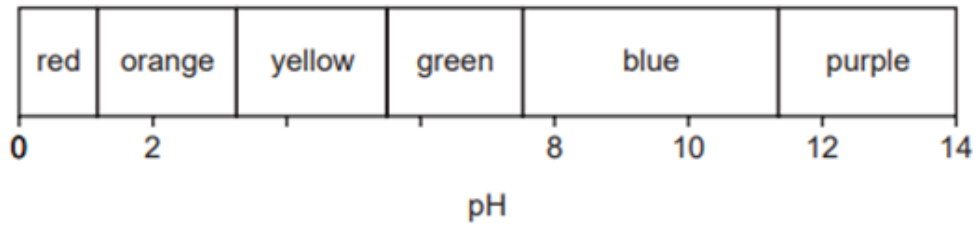


Fig. 5.1

(i) Explain why test-tube **D** was included in the investigation.

used for comparing, colours / pH ;

.....

.....

.....

..... [2]

(ii) Explain why the colour in test-tube **A** was orange.

Bile emulsifies the fat turning them into small droplets , then the lipase enzyme digest the fat into fatty acids and glycerol , the solution become acidic this will lower the pH .

[3]

(iii) Explain the results for test-tubes B and C.

test-tube B

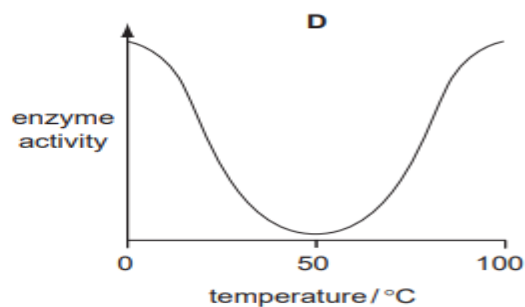
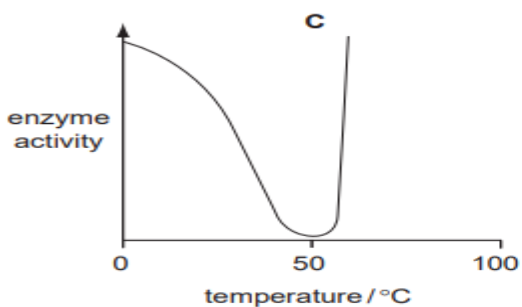
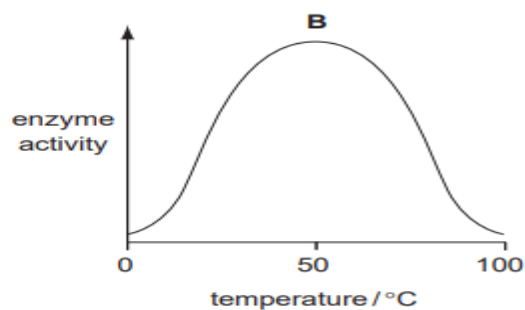
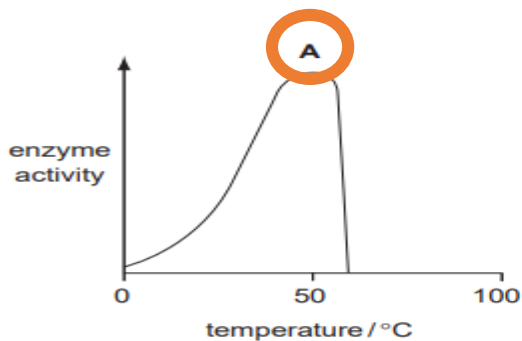
no lipase is present , no break down of fat , the solution is alkaline , universal indicator is blue

test-tube C

lipase is present it will break down the fat into fatty acids and glycerol , the solution is slightly acidic (universal indicator - yellow) [4]

Question 5 :

Which graph shows the effect of temperature on the activity of an enzyme ?



Question 6 :

The diagram represents enzyme action.

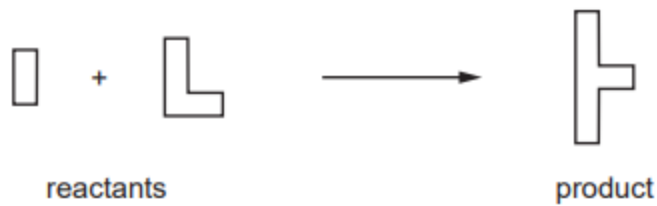


What are parts W, X and Y in this chemical reaction?

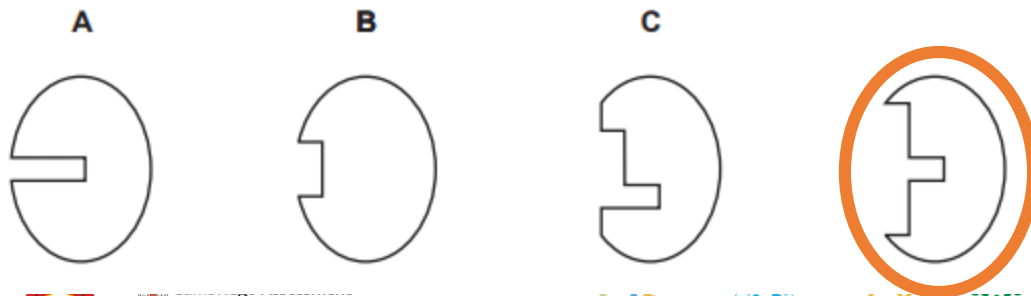
	enzyme	product	substrate
A	W	X	Y
B	X	W	Y
C	X	Y	W
D	Y	W	X

Question 7 :

The diagram represents a chemical reaction.



Which diagram represents the enzyme for this reaction?

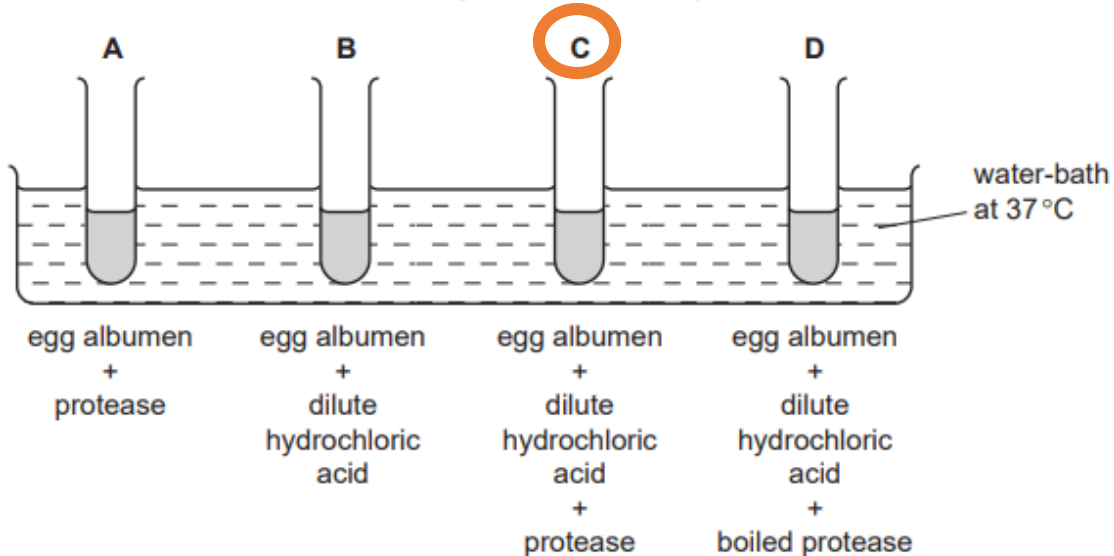


Question 8 :

The diagram shows an experiment on the digestion of the protein in egg albumen by protease.

The protease was taken from a human stomach.

In which test-tube will the protein be digested most quickly?



Explain your answer :

Hydrochloric acid creates acidic conditions needed for the protease enzyme to function and break down protein in egg albumin into small molecules of polypeptides , if protease enzyme was boiled it will be denatured .

Question 9 :

An enzyme in potato cells causes oxygen to be produced from hydrogen peroxide.
Cubes of potato were incubated with hydrogen peroxide at different temperatures.
The numbers of bubbles of oxygen released per minute were counted at each temperature.
The table shows the results.

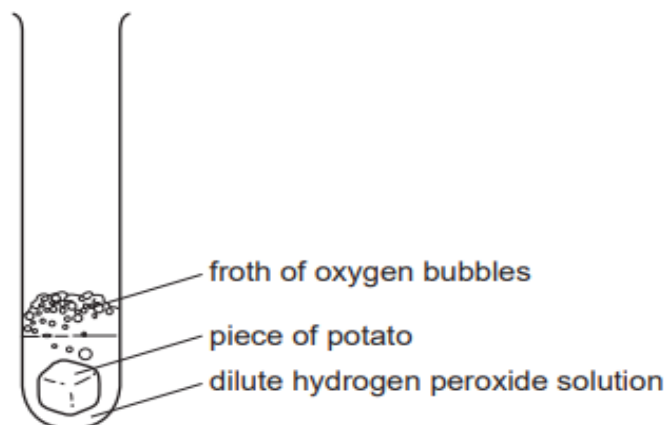
temperature / °C	15	25	35	45	55
number of bubbles / bubbles per minute	96	98	82	36	1

The results suggest the optimum temperature for the enzyme is between which two values?

- A** 15 °C and 35 °C
- B** 35 °C and 45 °C
- C** 35 °C and 55 °C
- D** 45 °C and 55 °C

Question 10 :

The diagram shows an experiment to find the effect of changes in pH on the rate of this reaction.



The table shows the time taken for the froth of bubbles to reach the top of the test-tube at different pH values.

pH	minutes
4	4
5	3
6	1
7	2

Which pH is nearest to the optimum (best) for this enzyme?

A pH 4

B pH 5

C pH 6

D pH 7

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