3.1 Mode of Action of Enzymes

Question Paper

Course	CIE A Level Biology (9700) exams from 2022
Section	3. Enzymes
Topic	3.1 Mode of Action of Enzymes
Difficulty	Hard

Time allowed: **10**

Score: **/10**

Percentage: **/100**

Question 1

The breakdown of hydrogen peroxide to water and oxygen is catalysed by the enzyme catalase. In an investigation into the effect of pH on the rate of reaction of catalase, potato cubes were added to hydrogen peroxide.

Which of these would not be a control variable in this experiment?

A the temperature

B the mass of potato cubes added at the start

C the amount of oxygen

D the volume of hydrogen peroxide added at the start

[1 mark]

Question 2

Phenylalanine is one of the nine amino acids necessary to sustain human life. Other molecules can bind directly to the surface of phenylalanine and undergo chemical reactions. The chemical reaction facilitated involves the breakdown of a large molecule into two parts, a process termed hydrolysis.

Which level of protein structure is most important for this hydrolysis reaction?

A None

B Secondary

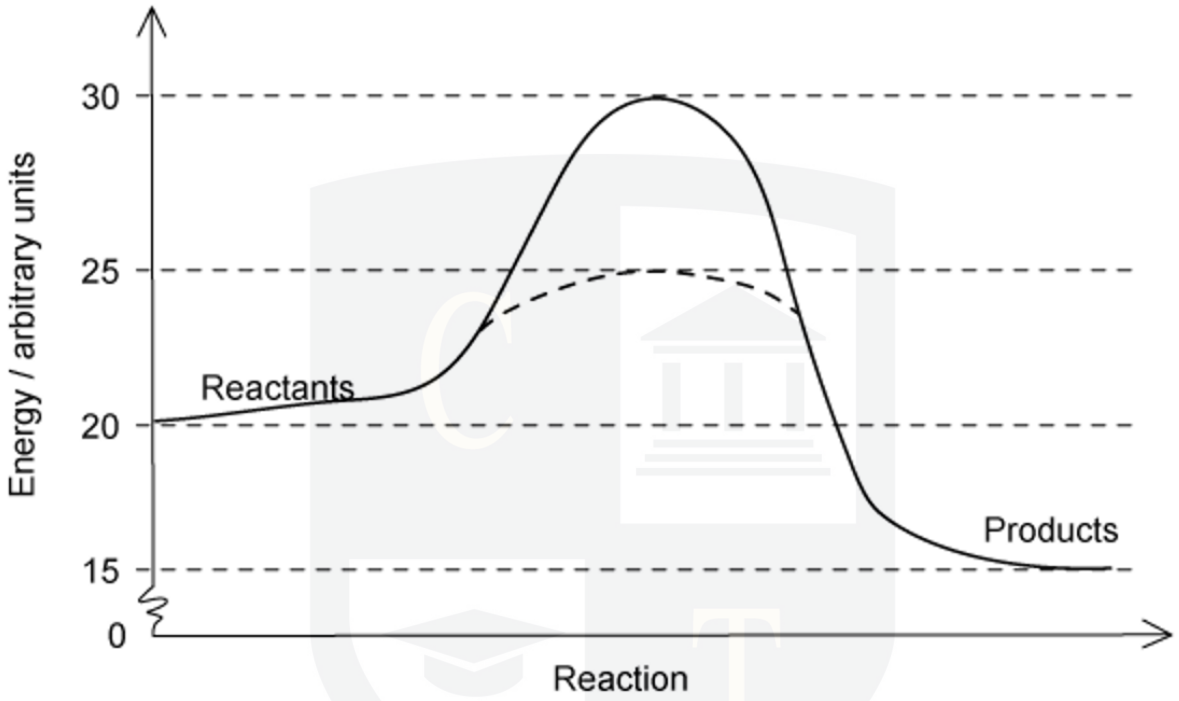
C Tertiary

D Quaternary

[1 mark]

Question 3

The graph shows the activation energy of an enzyme-catalysed reaction and the same reaction without a catalyst.



Which of the following statements is not true?

A The reaction is exothermic.

B The activation energy of the catalysed reaction is double the uncatalyzed reaction.

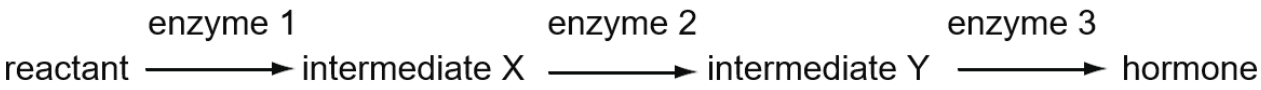
C The enzyme has almost halved the activation energy.

D The products have less energy than the reactants.

[1 mark]

Question 4

The diagram below shows a metabolic pathway that generates an important hormone:



A metabolic poison is able to slow the production of the hormone by inhibiting one or more of the enzymes in the pathway. The effect of adding this poison is a large increase in the amount of reactant, a decrease in the amount of intermediate X, a slight increase in amount of intermediate Y and a large decrease in the amount of the hormone

Which enzymes is the metabolic poison targeting?

A enzyme 1 only

B enzymes 1 and 2 only

C enzymes 2 and 3 only

D enzymes 1 and 3 only

[1 mark]

Question 5

The HIV virus produces a long polypeptide that is hydrolysed by a protease enzyme to producing several smaller peptides. The smaller peptides help the virus to successfully invade their host, so this viral protease is the target of many anti-AIDS drugs.

Which feature is important if this drug is to be successful in preventing AIDS?

A The ability to inhibit many types of bacterial enzyme.

B The ability to competitively inhibit protease enzymes.

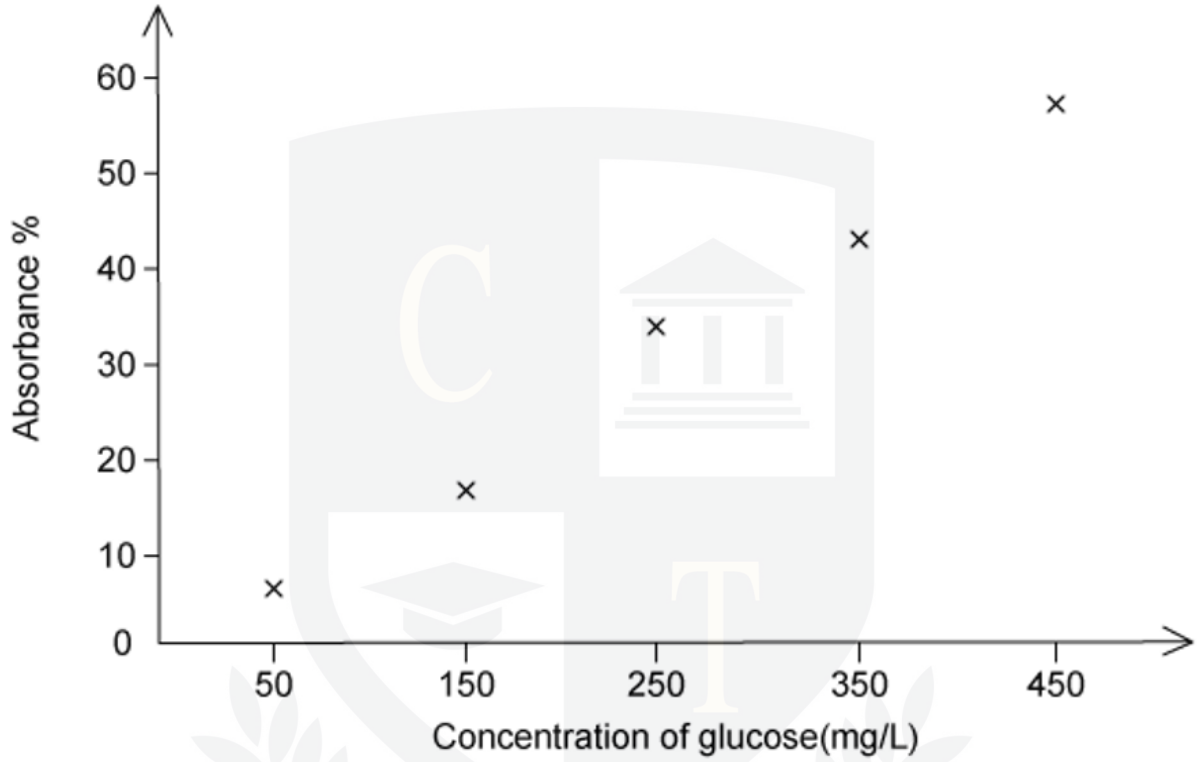
C The ability to disrupt only specific viral protease enzymes.

D The ability to non-competitively inhibit protease enzymes.

[1 mark]

Question 6

This figure shows a calibration curve for of blood samples at 5% concentration with known amounts of glucose. An average person has a blood glucose level of around 350 mg/l when measured 30 minutes after consuming a starchy meal.



The blood of a person with type 2 diabetes was sampled 30 minutes after eating a starchy meal. A colorimeter was used to assess the amount of glucose present in the person's blood. To do this, first the blood sample was diluted to 1/20th of its original concentration with water (so that light could penetrate more easily). Then Benedict's reagent was added, and the solution was heated in a water bath for five minutes. The final step was to measure the absorbance of red light by the sample using a colorimeter.

What absorbance value could reflect the diabetic blood sample?

A 10%

B 20%

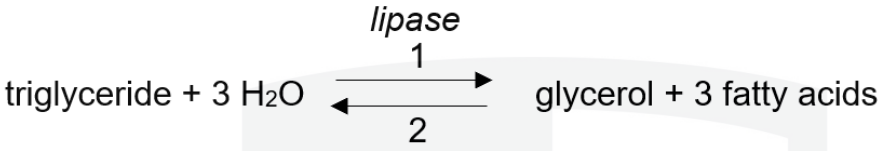
C 30%

D 60%

[1 mark]

Question 7

The following equation shows a reversible reaction:



In this reaction, which row best describes what is occurring?

	active site present on	reaction at 1	reaction at 1	reaction at 2
A	lipase	hydrolysis	increases pH	Condensation
B	glycerol	condensation	decrease pH	Hydrolysis
C	glycerol	condensation	increase pH	Hydrolysis
D	lipase	hydrolysis	decreases pH	Condensation

[1 mark]

Question 8

4-Oxalocrotonate tautomerase forms part of a bacterial metabolic pathway that catabolises several small molecules together into a larger molecule. With a monomer size of just 62 amino acid residues, this enzyme is one of the smallest enzymes known. However, in solution, the enzyme forms a hexamer of six identical subunits, so the active site is formed by amino acid residues from several subunits.

Which level of protein structure is most important in the catabolic reaction in the bacterial metabolic pathway?

A Primary

B Secondary

C Tertiary

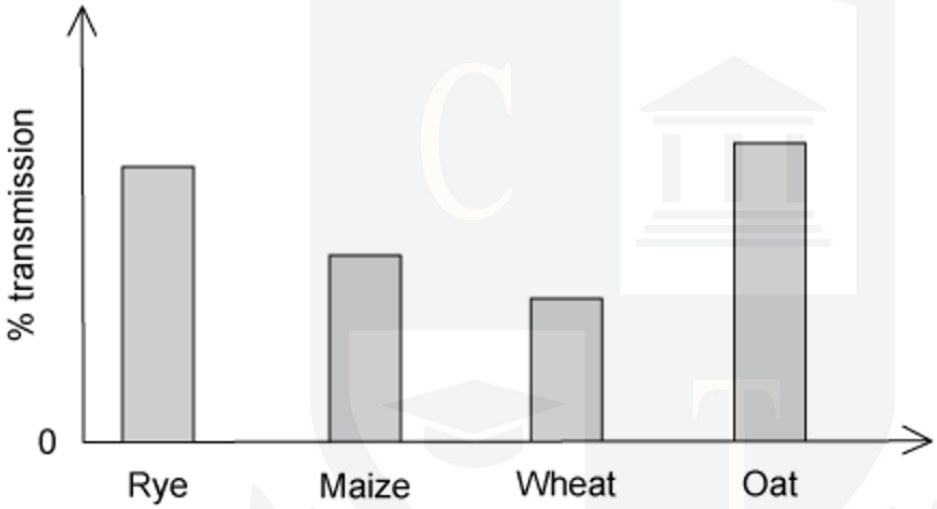
D Quaternary

[1 mark]

Question 9

In an experiment, students were trying to determine the amount of starch in different types of flour. They blended equal amounts of the different foods in 100 cm^3 of water and then added iodine to each of the solutions. They then took a sample from each of the blended food mixtures and analysed them with a colourimeter. The colourimeter was set to measure the percentage transmission of dark blue light.

The graph below shows their results:



Which food substance contained the most starch?

A Rye flour

B Maize flour

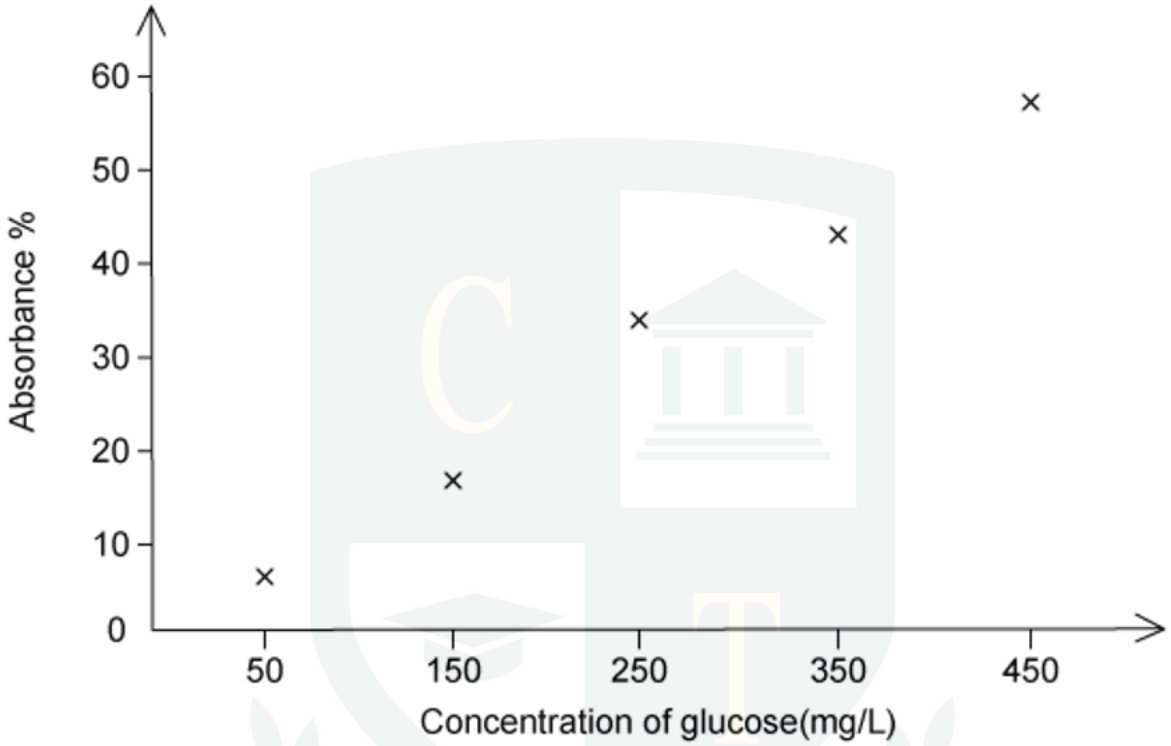
C Wheat flour

D Oat flour

[1 mark]

Question 10

The graph below shows a calibration curve for the absorbance of different concentrations of glucose in solution.



Calibration curves can be used to determine the concentration of unknown samples. A student was wanted to determine how much sucrose they had in an unknown sample using the figure above. To make their results comparable, they first added sucrase to hydrolyse the sucrose into glucose and fructose. They then set their colourimeter to the same settings as the one used in the calibration curve and tested the unknown sample. The sample had an absorbance of 25%.

How much sucrose was present in the unknown solution?

A 0 mg/l

B 200 mg/l

C 400 mg/l

D 800 mg/l

[1 mark]