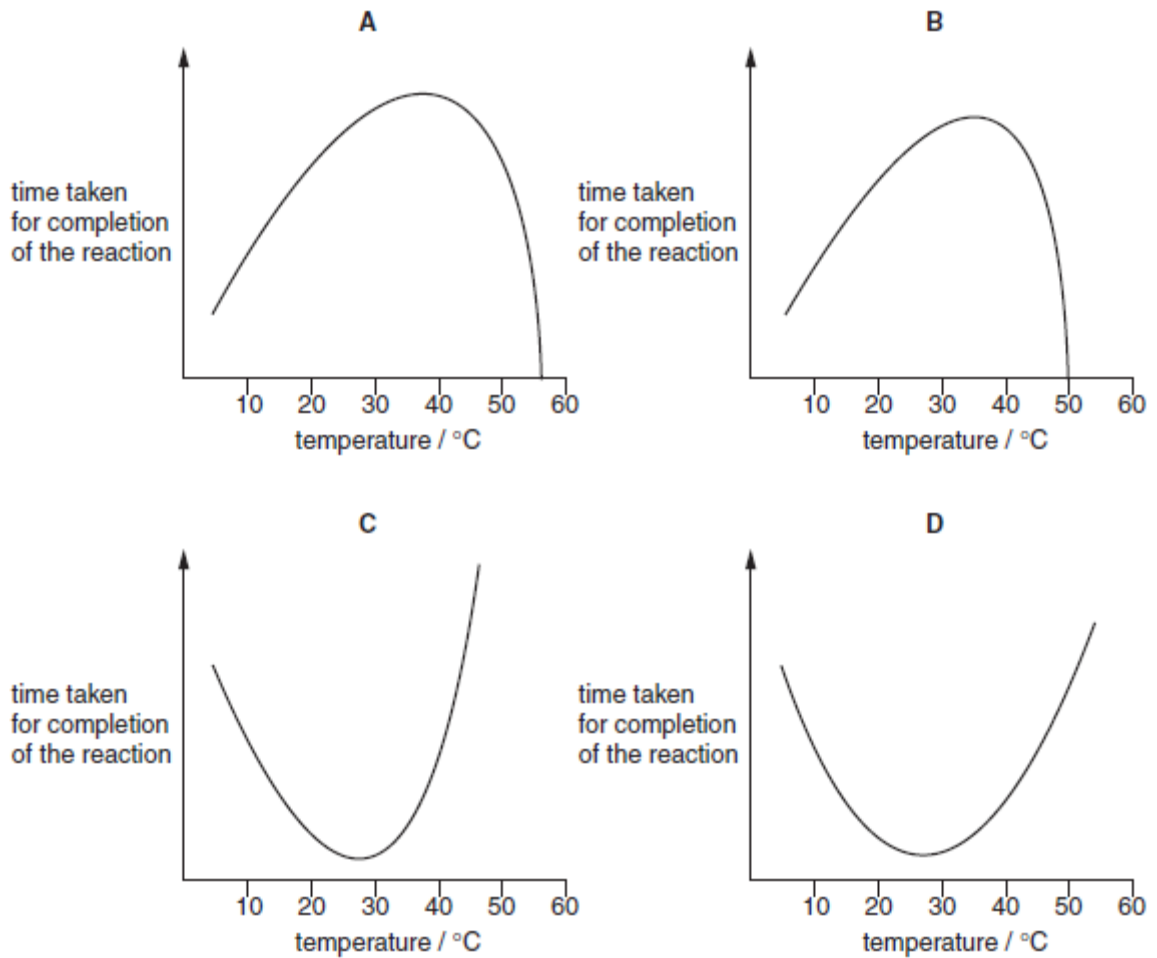


1.

14 An enzyme is completely denatured at 50 °C. A fixed concentration of this enzyme is added to a fixed concentration of its substrate. The time taken for completion of the reaction is measured at different temperatures.

Which graph shows the results?



2.

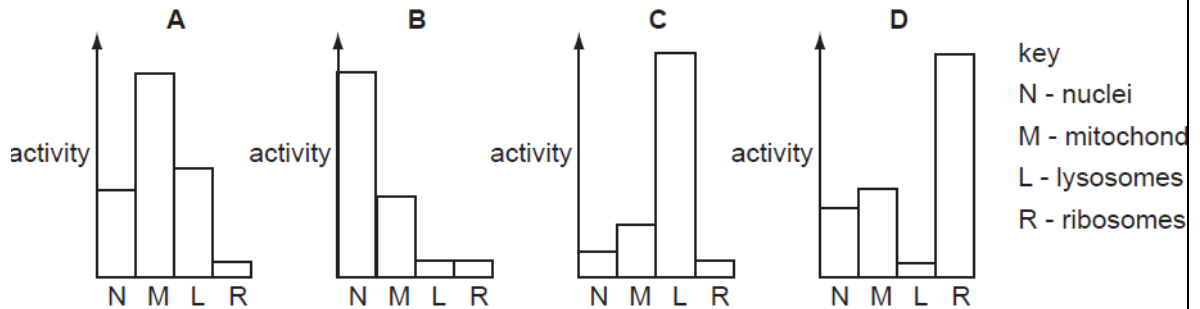
Which properties are characteristic of a non-competitive inhibitor of an enzyme?

	binding	effect of adding more substrate
A	at active site	reduces inhibition
B	at active site	does not reduce inhibition
C	not at active site	reduces inhibition
D	not at active site	does not reduce inhibition

3.

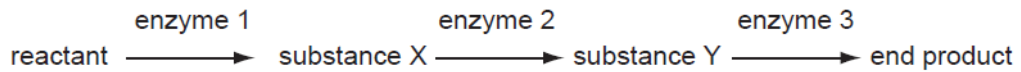
1 A piece of mammalian tissue was homogenised and subjected to differential centrifugation yield four subcellular fractions. The activity within each fraction, of four different types of enzyme **A**, **B**, **C** and **D**, was investigated.

Which bar chart shows the results of investigating hydrolytic enzyme activity?



4.

A metabolic pathway is



What would be the effect of adding a small amount of a non-competitive inhibitor of enzyme 2?

- A** Enzyme 2 would be partially denatured.
- B** Substance X would increase in concentration.
- C** Substance Y would no longer be formed.
- D** The initial reactant would no longer be metabolised.

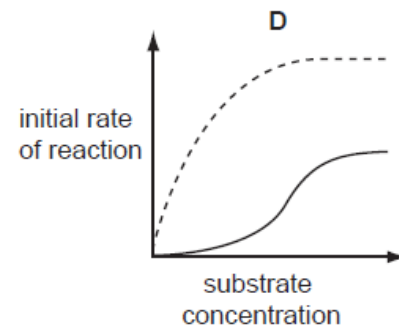
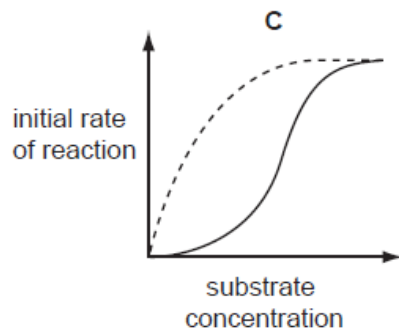
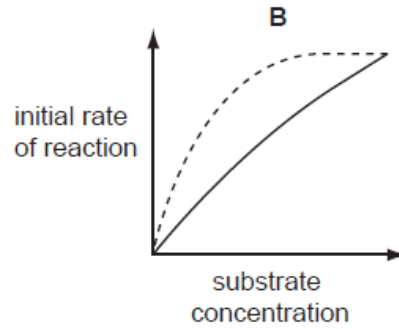
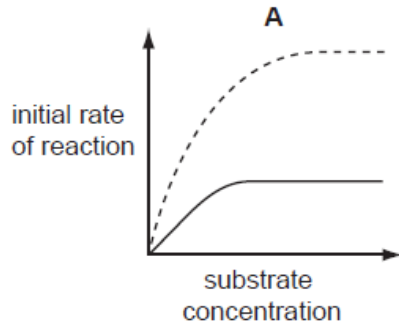
5.

The initial rate of a reaction catalysed by an enzyme was measured at various substrate concentrations.

Which graph shows the effect of a low concentration of non-competitive inhibitor on the reaction?

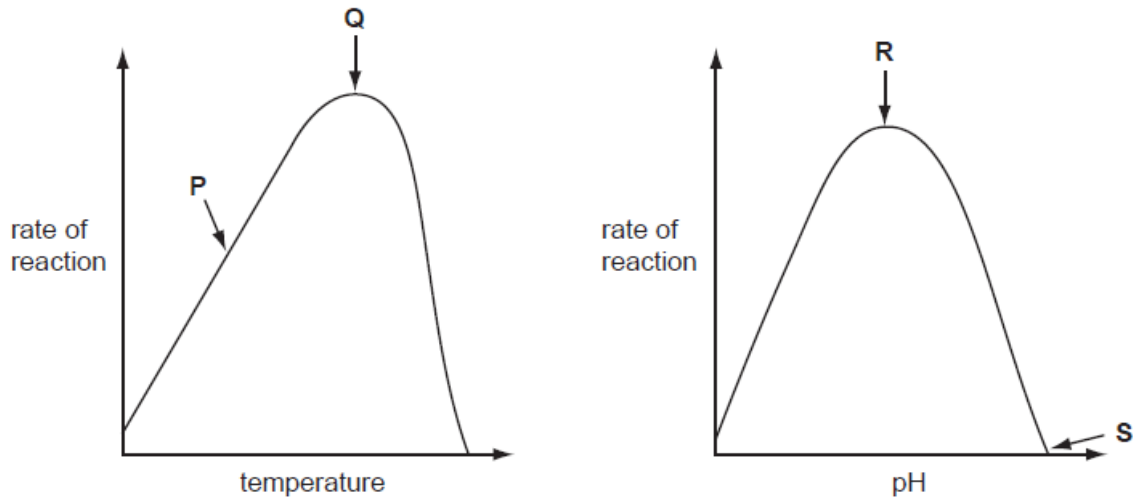
key

----- uninhibited reaction
—— inhibited reaction



6.

The graphs show the effects of temperature and pH on enzyme activity.



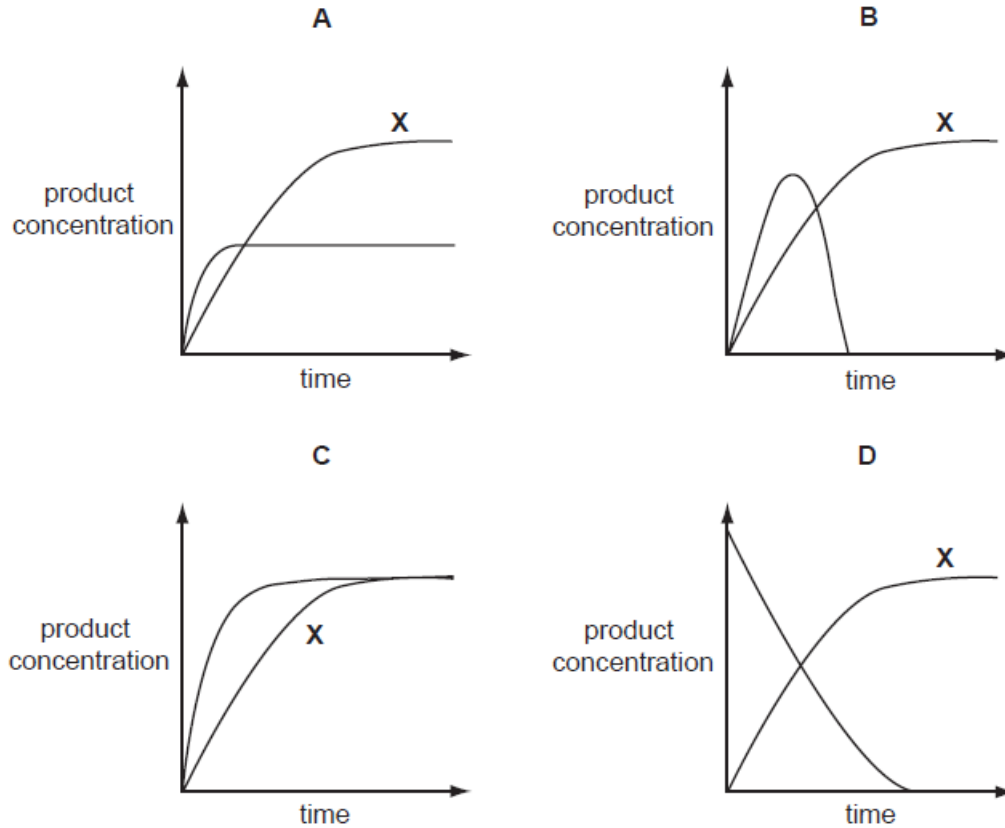
Which statement explains the enzyme activity at the point shown?

- A** At **P**, hydrogen bonds are formed between enzyme and substrate.
- B** At **Q**, the kinetic energy of enzyme and substrate is highest.
- C** At **R**, peptide bonds in the enzyme begin to break.
- D** At **S**, the substrate is completely denatured.

7.

Two enzyme experiments were carried out. The first, experiment **X**, was carried out at a constant temperature of 37 °C. During the second experiment the temperature was increased from 37 °C to 80 °C.

Which graph shows the results?



8.

Which properties are characteristic of a non-competitive inhibitor of an enzyme?

	binding	effect of adding more substrate
A	at active site	reduces inhibition
B	at active site	does not reduce inhibition
C	not at active site	reduces inhibition
D	not at active site	does not reduce inhibition

9.

The rate of enzyme catalysed reactions in human cells is regulated.

Which of the following may be involved in such regulation?

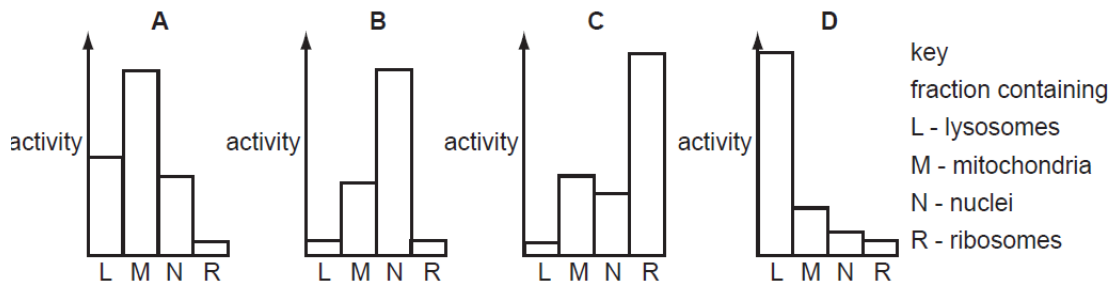
- 1 a change in enzyme concentration
- 2 a change in substrate concentration
- 3 inhibition by the final product of the reaction

- A** 1 only
- B** 3 only
- C** 1 and 2 only
- D** 1, 2 and 3

10.

5 A piece of mammalian tissue was homogenised and subjected to differential centrifugation to yield four subcellular fractions. The activity of four different types of enzyme, **A**, **B**, **C** and **D**, was investigated within each fraction.

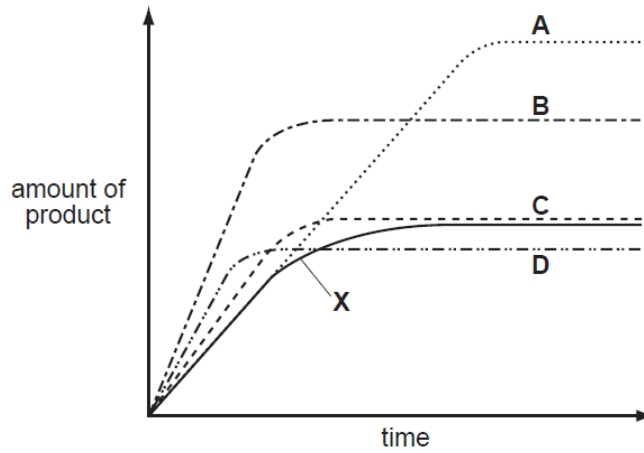
Which bar chart shows the results of investigating hydrolytic enzyme activity?



11.

The curve **X** shows the activity of an enzyme at 20 °C. Curves **A**, **B**, **C** and **D** show the effect of different conditions on the activity of the enzyme.

Which curve shows the effect of increasing the temperature by 10 °C and adding extra substrate?



12.

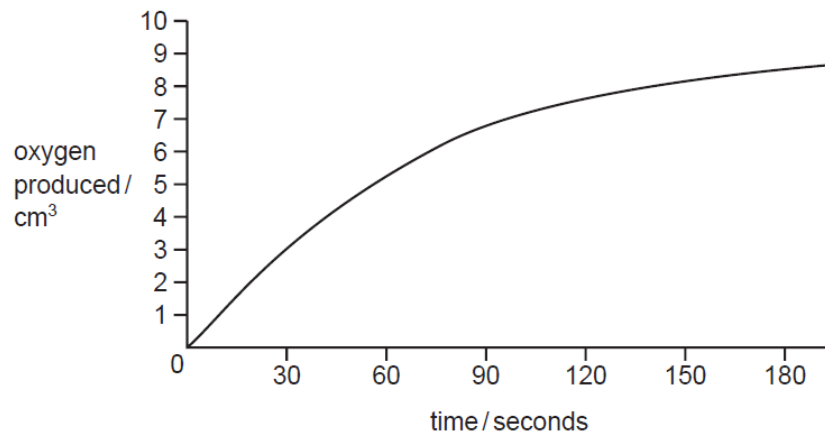
When investigating the rate of reaction of the enzyme lipase on the hydrolysis of triglycerides, the pH must be maintained at an optimum to prevent the lipase denaturing.

What is the reason for this?

- A** The addition of water molecules produced by hydrolysis increases pH.
- B** The products of hydrolysis decrease the pH.
- C** The products of hydrolysis increase the pH.
- D** The removal of water molecules used in hydrolysis decreases pH.

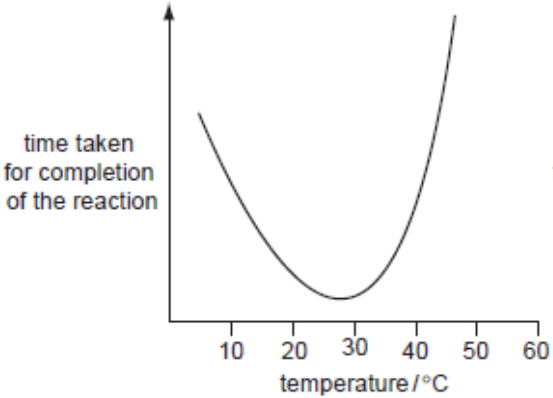
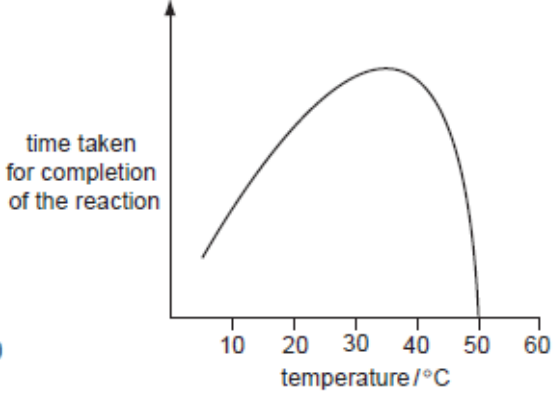
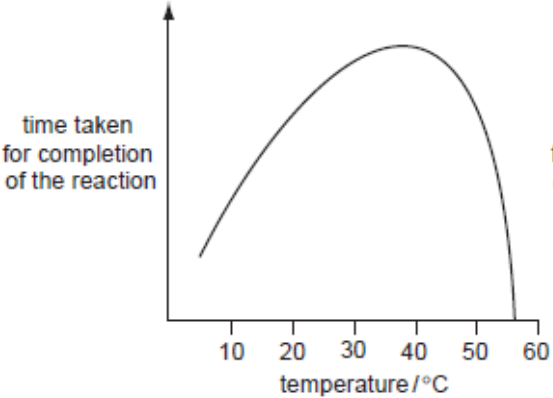
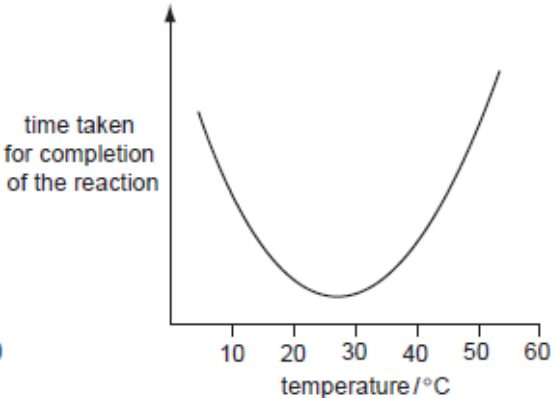
13.

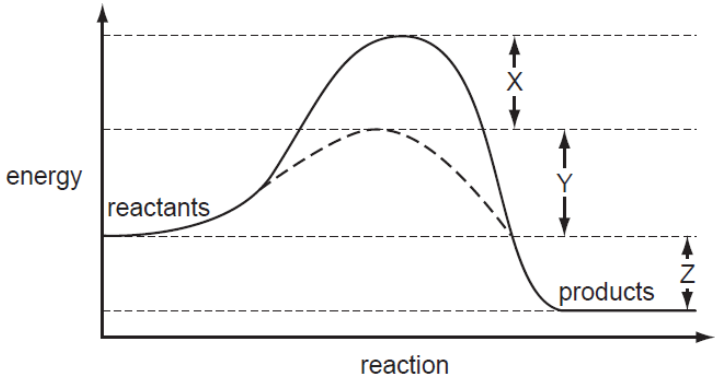
Catalase was added to hydrogen peroxide solution. The volume of oxygen produced was measured at intervals. The results are shown on the graph.



What was the initial rate of reaction?

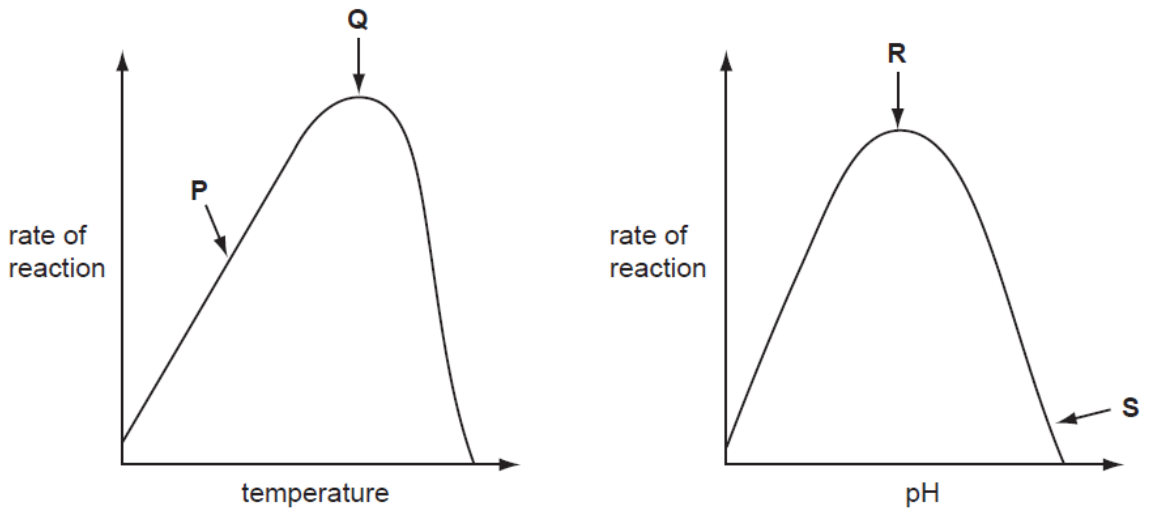
- A** 0.05 cm³ s⁻¹
- B** 0.10 cm³ s⁻¹
- C** 1.00 cm³ s⁻¹
- D** 10.0 cm³ s⁻¹

<p>14.</p>	<p>14 An enzyme is completely denatured at 50 °C. A fixed concentration of this enzyme is added to a fixed concentration of its substrate. The time taken for completion of the reaction is measured at different temperatures.</p> <p>Which graph shows the results?</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>A</p>  <p>time taken for completion of the reaction</p> <p>temperature / °C</p> </div> <div style="text-align: center;"> <p>B</p>  <p>time taken for completion of the reaction</p> <p>temperature / °C</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;"> <p>C</p>  <p>time taken for completion of the reaction</p> <p>temperature / °C</p> </div> <div style="text-align: center;"> <p>D</p>  <p>time taken for completion of the reaction</p> <p>temperature / °C</p> </div> </div>
<p>15.</p>	<p>The breakdown of hydrogen peroxide to water and oxygen is catalysed by the enzyme catalase.</p> <p>In an investigation into the effect of pH on the rate of reaction of catalase, potato cubes were added to hydrogen peroxide.</p> <p>Which dependent variable should be recorded?</p> <ul style="list-style-type: none"> A the change in mass of the potato after a given time B the pH of the solution at regular time intervals C the number of potato cubes added at the start D the volume of oxygen given off at regular time intervals

16.	<p>Some inhibitors of enzyme reactions bind to the enzyme/substrate complex.</p> <p>Which statements about this type of inhibition are correct?</p> <ol style="list-style-type: none"> 1 The active site changes shape. 2 The inhibitor is non-competitive. 3 The initial rate of reaction is reduced. 4 The maximum rate of reaction (V_{max}) is increased. <p>A 1 and 2 only B 1 and 3 only C 2 and 3 only D 2, 3 and 4 only</p>
17.	<p>The graph shows the activation energy of an enzyme-catalysed reaction and the same reaction without a catalyst.</p>  <p>Which of the following shows the activation energy of the uncatalysed reaction?</p> <p>A $X + Y - Z$ B $X + Z - Y$ C $X + Y$ D $Y + Z$</p>
18.	<p>Which of the following statements are true of all enzymes?</p> <ol style="list-style-type: none"> 1 soluble in water 2 catalyse the breakdown of large molecules into smaller molecules 3 only have one active site 4 have a quaternary structure <p>A 1, 2 and 3 only B 2, 3 and 4 only C 1 only D 4 only</p>

19.

The graphs show the effects of temperature and pH on enzyme activity.



Which statement explains the enzyme activity at the point shown?

- A** At **P**, hydrogen bonds are formed between enzyme and substrate.
- B** At **Q**, the kinetic energy of enzyme and substrate is highest.
- C** At **R**, peptide bonds in the enzyme begin to break.
- D** At **S**, the enzyme is completely denatured.

20.

Some inhibitors of enzyme reactions bind to the enzyme/substrate complex.

Which statements about this type of inhibition are correct?

- 1 The active site changes shape.
- 2 The inhibitor is non-competitive.
- 3 The initial rate of reaction is reduced.
- 4 The maximum rate of reaction (V_{max}) is increased.

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

21.

The breakdown of hydrogen peroxide to water and oxygen is catalysed by the enzyme catalase.

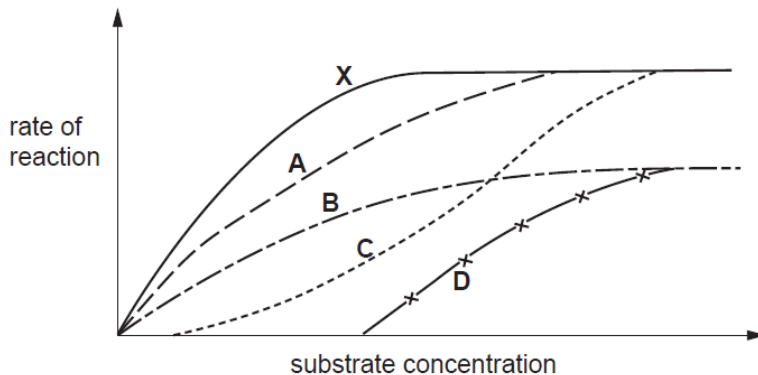
In an investigation into the effect of pH on the rate of reaction of catalase, potato cubes were added to hydrogen peroxide.

Which dependent variable should be recorded?

- A** the change in mass of the potato after a given time
- B** the pH of the solution at regular time intervals
- C** the number of potato cubes added at the start
- D** the volume of oxygen given off at regular time intervals

22. In the graph, **X** represents the relationship between the initial rate of reaction of an enzyme and the concentration of its substrate under optimal conditions and without an inhibitor.

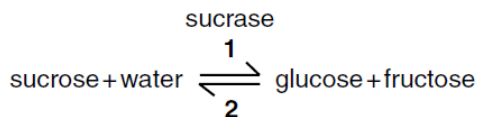
Which curve represents the result when the same experiment is carried out in the presence of a fixed, low concentration of a non-competitive inhibitor?



23. Which bonds hold substrate molecules to the active site of an enzyme?

- A** disulphide
- B** glycosidic
- C** hydrogen
- D** peptide

24. The equation shows a reversible reaction.

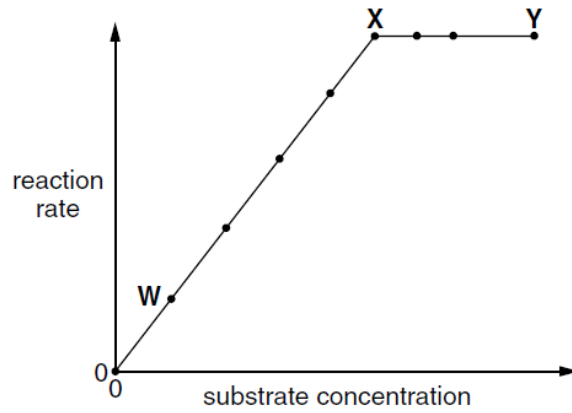


In this reaction, on which molecule or molecules do active sites occur and what types of reaction occur at **1** and **2**?

	active site present on	reaction at 1	reaction at 2
A	glucose and fructose	condensation	hydrolysis
B	glucose and fructose	hydrolysis	condensation
C	sucrase only	condensation	hydrolysis
D	sucrase only	hydrolysis	condensation

25.

The graph shows the effect of substrate concentration on the rate of an enzyme-controlled reaction. The enzyme concentration is constant.



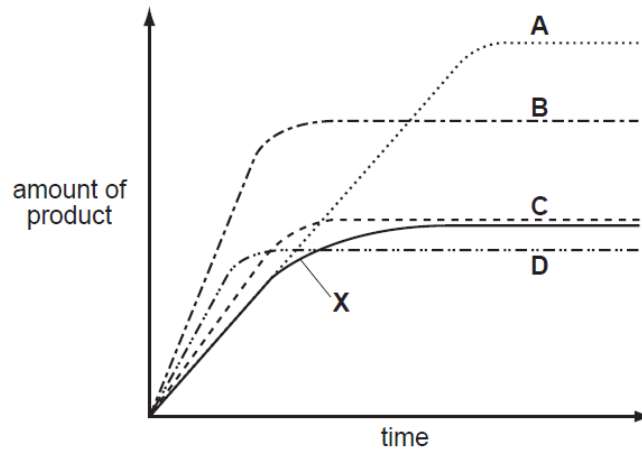
Which statement about the graph is correct?

- A Between W and X, the number of enzyme molecules is limiting.
- B Between X and Y, the number of enzyme molecules is limiting.
- C Between X and Y, the number of substrate molecules is limiting.
- D Between X and Y, the product concentration remains the same.

26.

The curve X shows the activity of an enzyme at 20 °C. Curves A to D show the effect of different conditions on the activity of the enzyme.

Which curve shows the effect of increasing the temperature by 10 °C and adding extra substrate?

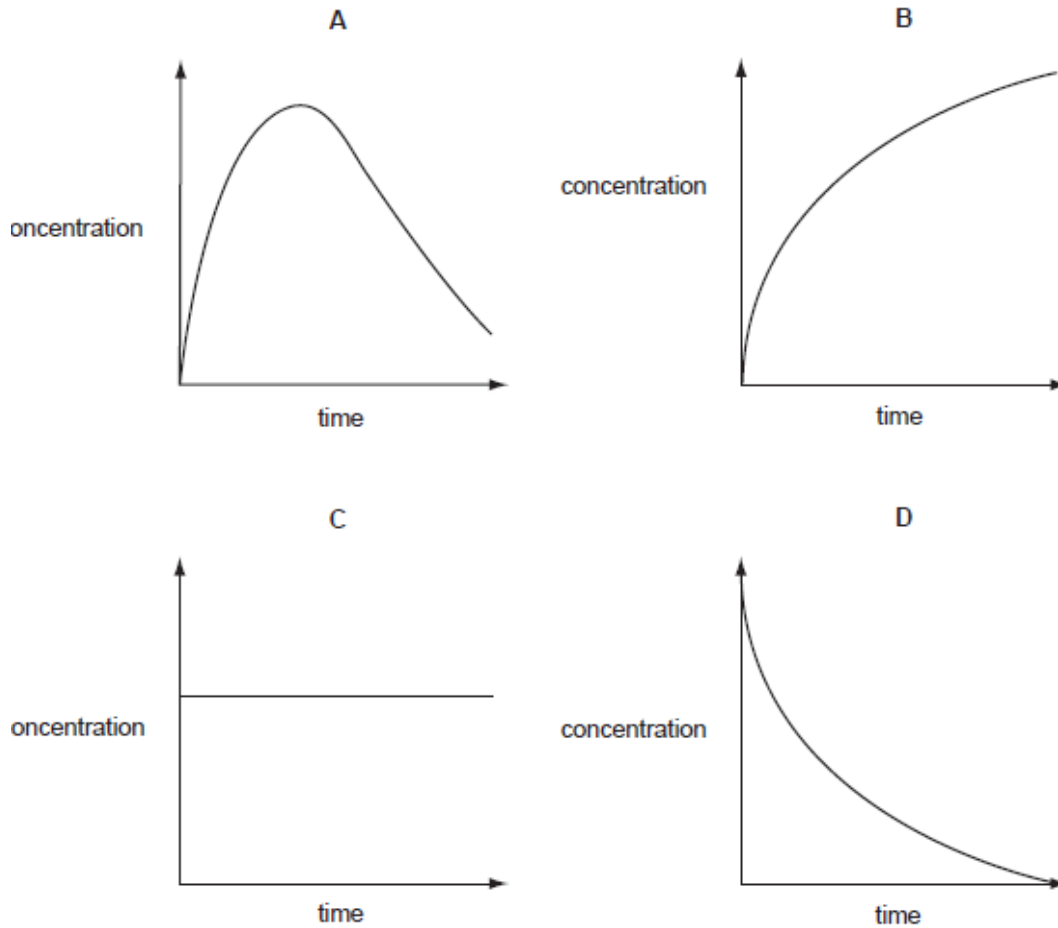


27.	<p>What is the effect of increasing substrate concentration on the degree of inhibition of an enzyme-controlled reaction?</p> <table border="1" data-bbox="289 289 1101 573"> <thead> <tr> <th data-bbox="289 289 363 352"></th> <th data-bbox="363 289 680 352">competitive inhibition</th> <th data-bbox="680 289 1101 352">non-competitive inhibition</th> </tr> </thead> <tbody> <tr> <td data-bbox="289 352 363 415">A</td> <td data-bbox="363 352 680 415">decreased</td> <td data-bbox="680 352 1101 415">increased</td> </tr> <tr> <td data-bbox="289 415 363 478">B</td> <td data-bbox="363 415 680 478">decreased</td> <td data-bbox="680 415 1101 478">no change</td> </tr> <tr> <td data-bbox="289 478 363 541">C</td> <td data-bbox="363 478 680 541">increased</td> <td data-bbox="680 478 1101 541">decreased</td> </tr> <tr> <td data-bbox="289 541 363 573">D</td> <td data-bbox="363 541 680 573">no change</td> <td data-bbox="680 541 1101 573">increased</td> </tr> </tbody> </table>		competitive inhibition	non-competitive inhibition	A	decreased	increased	B	decreased	no change	C	increased	decreased	D	no change	increased
	competitive inhibition	non-competitive inhibition														
A	decreased	increased														
B	decreased	no change														
C	increased	decreased														
D	no change	increased														
28.	<p>Which statement is true of all enzymes?</p> <p>A They are denatured at temperatures above 60 °C.</p> <p>B They are inactivated at low pH values.</p> <p>C They catalyse the breakdown of large molecules into smaller ones.</p> <p>D They reduce the amount of energy required to start a reaction.</p>															

29.

A quantity of an enzyme was added to a quantity of its substrate. The graphs show the changes in concentration of the enzyme, the substrate, the enzyme-substrate complex and the product over time.

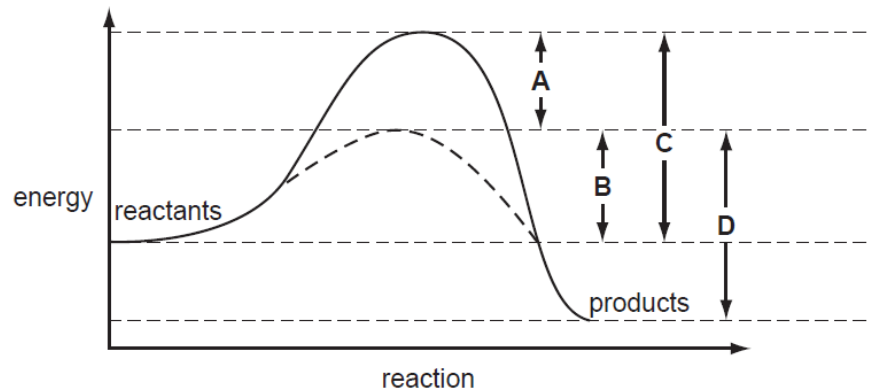
Which graph shows the change in the concentration of the enzyme-substrate complex?



30.

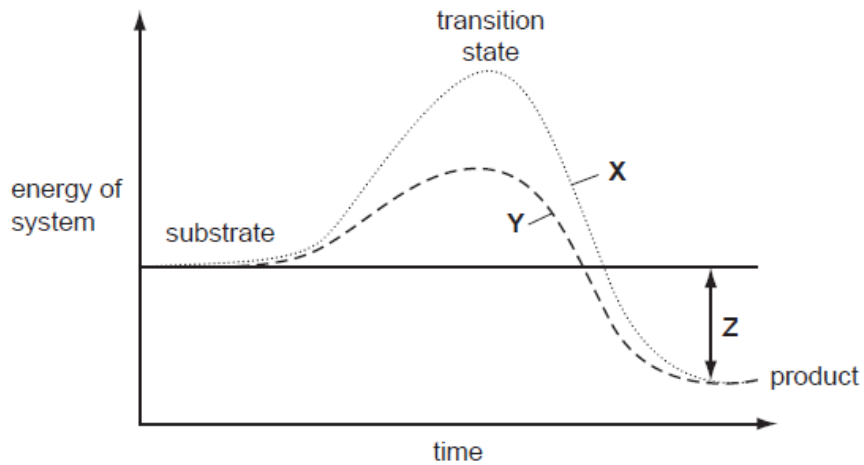
The graph shows the activation energy of an enzyme-catalysed reaction and the same reaction without a catalyst.

Which arrow shows the activation energy of the uncatalysed reaction?



31. How does increasing substrate concentration affect the rate of an enzyme-catalysed reaction in the presence of a competitive inhibitor?
- A The rate of the reaction decreases.
 - B The rate of the reaction decreases initially and then recovers.
 - C The rate of the reaction increases.
 - D The rate of the reaction is not affected.

32. The graph shows the effect of an enzyme on a reaction.

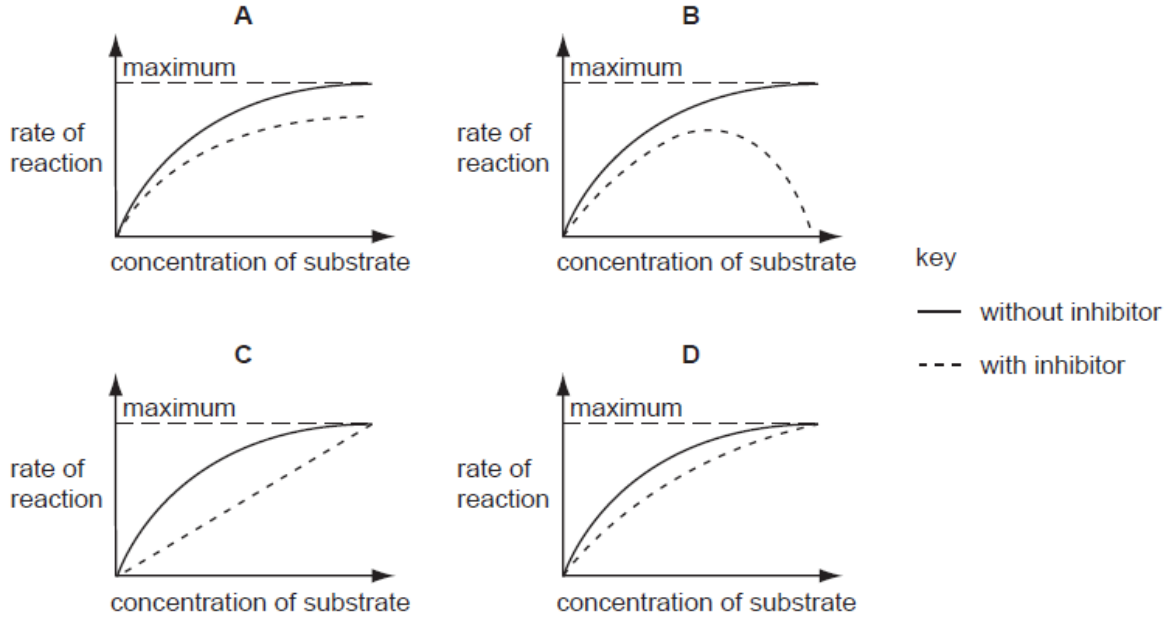


Which combination identifies X, Y and Z?

	X	Y	Z
A	catalysed reaction	uncatalysed reaction	activation energy
B	catalysed reaction	uncatalysed reaction	energy lost during reaction
C	uncatalysed reaction	catalysed reaction	energy gained by product
D	uncatalysed reaction	catalysed reaction	overall energy change

33.

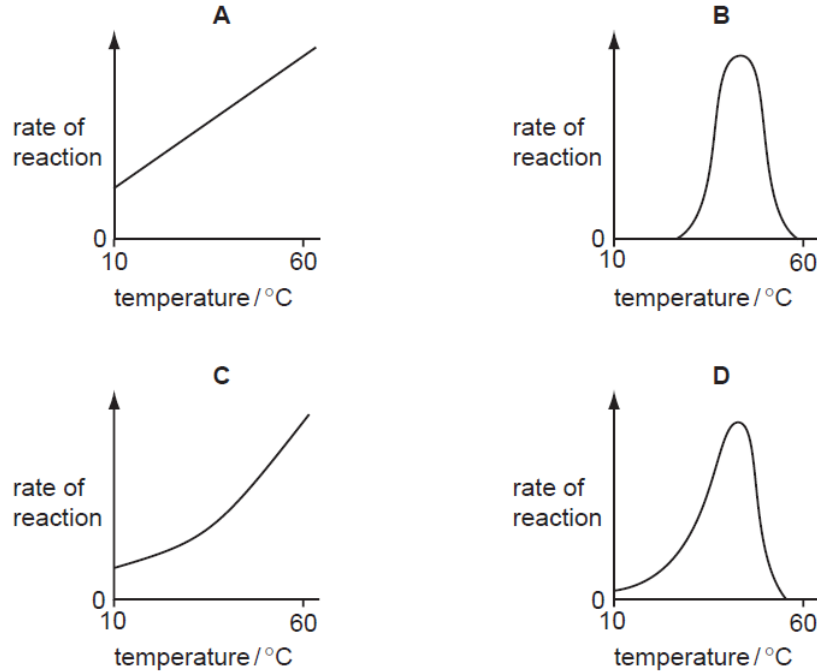
14 Which graph represents the action of a non-competitive inhibitor?



34.

The rate of an enzyme controlled reaction was measured at temperatures within the range 10-60°C.

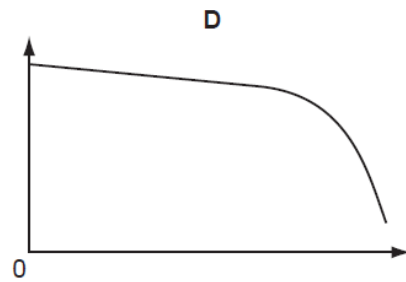
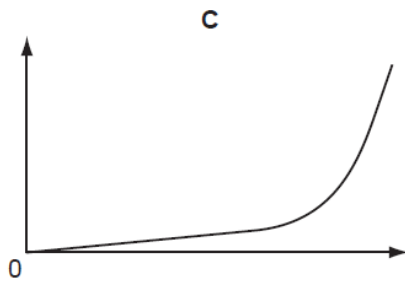
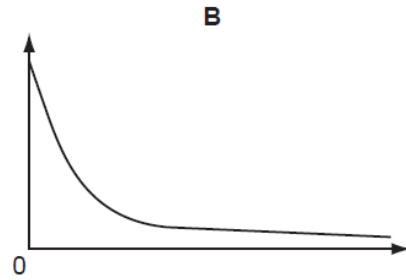
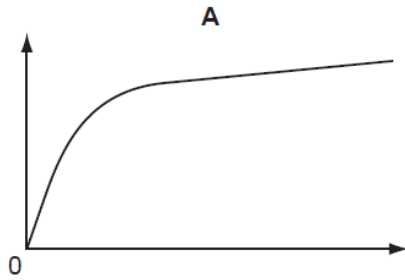
Which curve represents the most usual relationship between temperature and enzyme activity?



35.

In an experiment, 5 cm^3 of 1% salivary amylase are added to 100 cm^3 of different concentrations of starch.

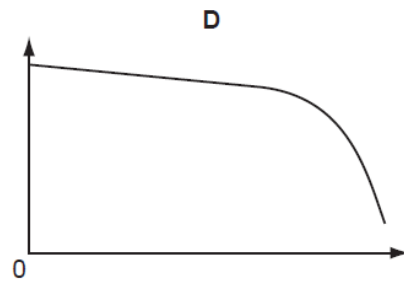
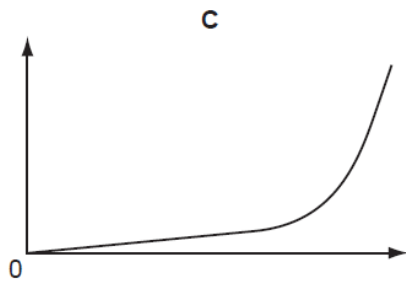
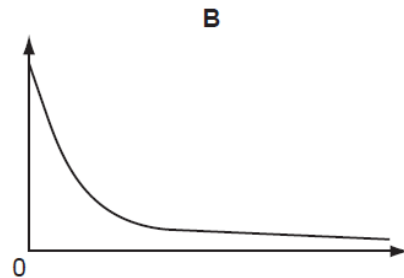
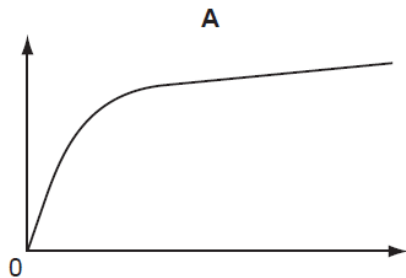
Which graph shows the results of plotting the initial rate of reaction (y-axis) against the concentration of substrate (x-axis)?



36.

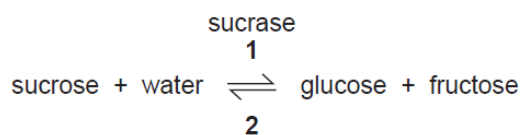
In an experiment, 5 cm^3 of 1% salivary amylase are added to 100 cm^3 of different concentrations of starch.

Which graph shows the results of plotting the initial rate of reaction (y-axis) against the concentration of substrate (x-axis)?



37.

The equation shows a reversible reaction.

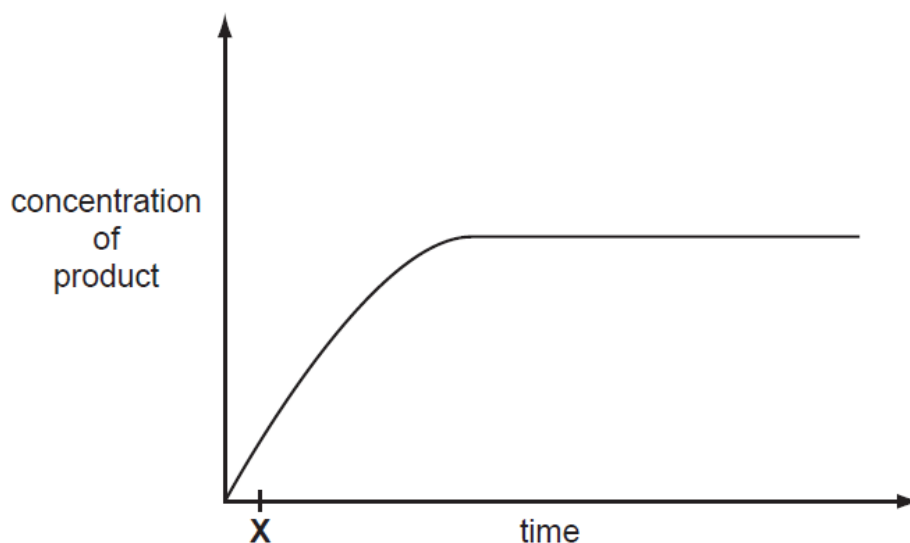


In this reaction, on which molecule does an active site occur and what types of reaction occur at **1** and **2**?

	active site present on	reaction at 1	reaction at 2
A	sucrase	condensation	hydrolysis
B	sucrase	hydrolysis	condensation
C	sucrose	condensation	hydrolysis
D	sucrose	hydrolysis	condensation

38.

The graph shows the course of an enzyme-catalysed reaction at 30 °C.



What is true at time **X**?

- A** Most enzyme molecules will have free active sites.
- B** The number of available substrate molecules is high.
- C** The number of enzyme-substrate complexes is low.
- D** The rate remains the same if more enzyme is added.

39.

The rate of enzyme-catalysed reactions in human cells is regulated.

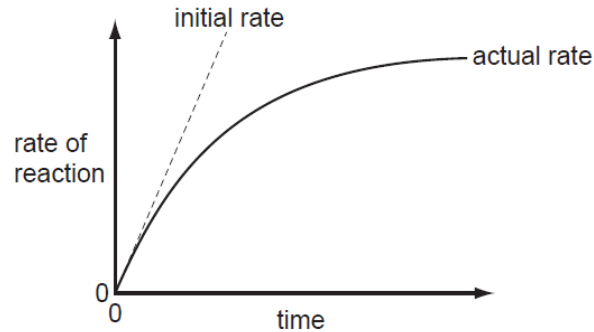
Which may be involved in such regulation?

- 1 a change in enzyme concentration
- 2 a change in substrate concentration
- 3 inhibition by the final product of the reaction

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

40.

A fixed volume of the enzyme catalase was added to a fixed volume of hydrogen peroxide solution. The diagram shows how the rate of the reaction changed over the course of the reaction.



Why did the actual rate of reaction decrease over time?

- A** The enzyme active sites become saturated.
- B** The enzymes were denatured.
- C** The product inhibited the reaction.
- D** The substrate molecules were used up.

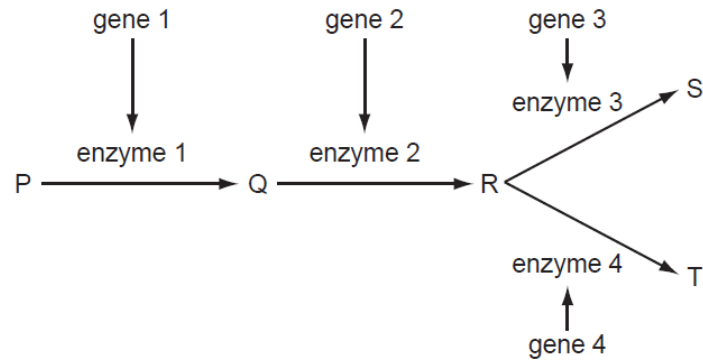
41.

Which levels of protein structure are always involved when competitive and non-competitive inhibitors bind to enzymes?

	competitive	non-competitive
A	primary, secondary and tertiary	secondary
B	quaternary and tertiary	quaternary and tertiary
C	secondary	primary and tertiary
D	tertiary	tertiary

42.

S and T are products of a biochemical pathway. A different enzyme, coded for by different specific genes, catalyses each step in the pathway.

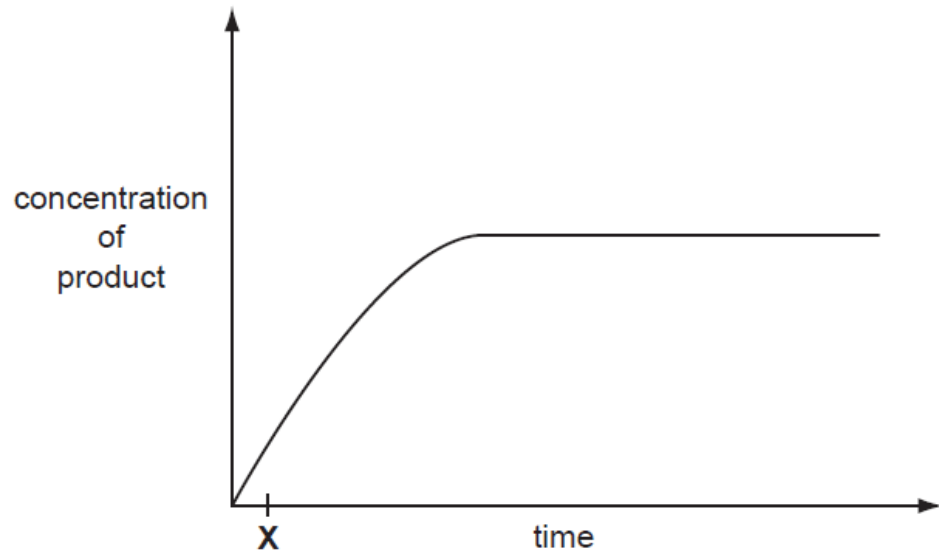


What is the possible outcome to the pathway if a mutation in gene 3 leads to an inactive enzyme?

- A There is a decrease in the activity of gene 1 and gene 2.
- B There is an accumulation of product S.
- C There is an increase in the rate of reaction of enzyme 4.
- D There is an increase in the production of T.

43.

The graph shows the course of an enzyme-catalysed reaction at 30 °C.



What is true at time **X**?

- A** Most enzyme molecules will have free active sites.
- B** The number of available substrate molecules is high.
- C** The number of enzyme-substrate complexes is low.
- D** The rate remains the same if more enzyme is added.

44.

The rate of enzyme-catalysed reactions in human cells is regulated.

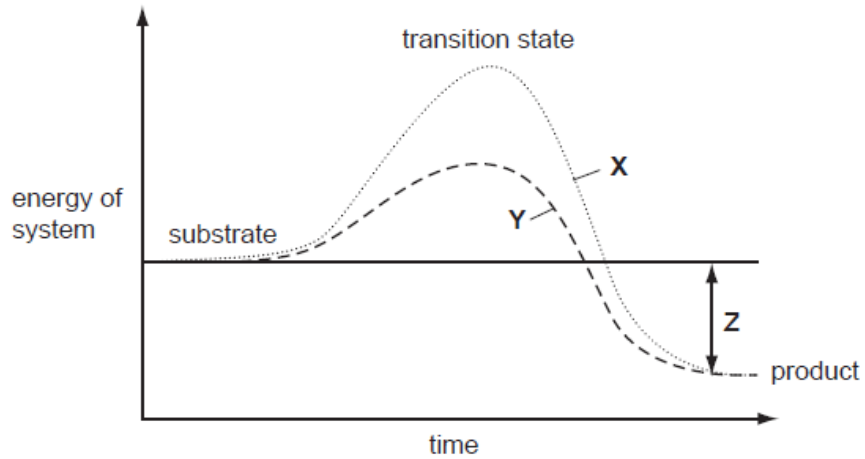
Which may be involved in such regulation?

- 1 a change in enzyme concentration
- 2 a change in substrate concentration
- 3 inhibition by the final product of the reaction

- A** 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

45.

The graph shows the effect of an enzyme on a reaction.



Which combination identifies X, Y and Z?

	X	Y	Z
A	catalysed reaction	uncatalysed reaction	energy lost by product
B	catalysed reaction	uncatalysed reaction	total energy lost during reaction
C	uncatalysed reaction	catalysed reaction	energy gained by product
D	uncatalysed reaction	catalysed reaction	total energy change during reaction

46.

In an enzyme-catalysed reaction, which combination of inhibitor and substrate would result in the highest rate of reaction?

	inhibitor	substrate concentration
A	competitive	high
B	competitive	low
C	non-competitive	high
D	non-competitive	low

47.

Which statements about the effect of **all** enzyme inhibitors are correct?

- 1 alter the shape of the active site
- 2 denature the enzyme
- 3 reduce the rate of the enzyme catalysed reaction

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