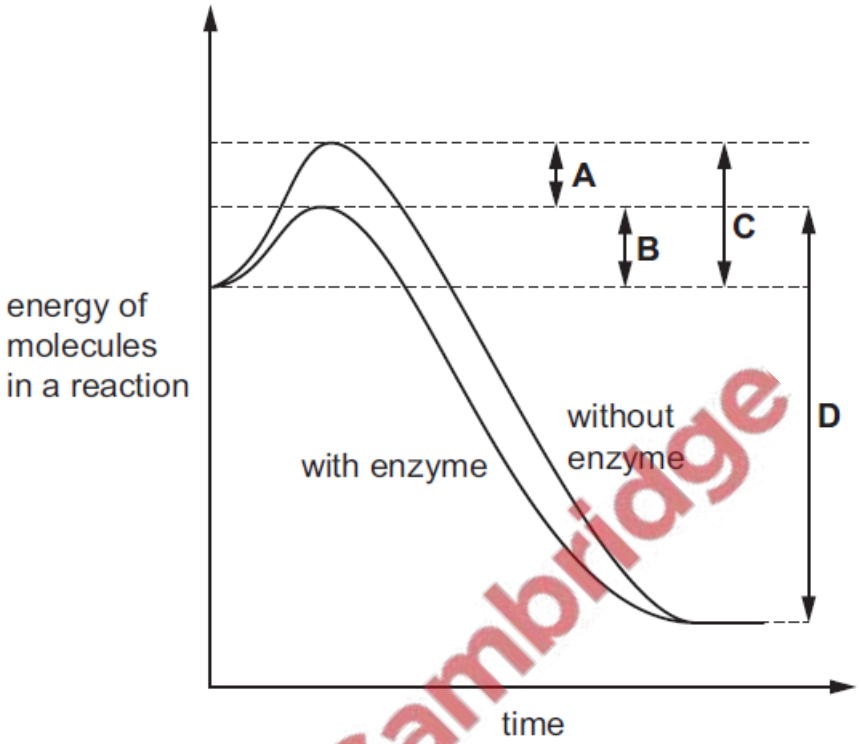
Enzymes – AS 9700 June 2022

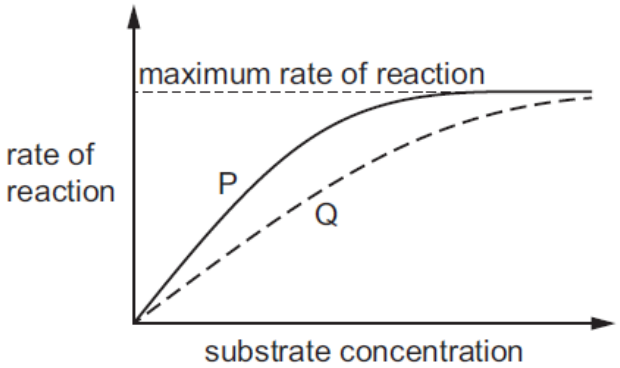
1. June/2023/Paper_9700/11/No.12

Which region on the graph shows the activation energy of an enzyme-catalysed reaction?



2. June/2023/Paper_9700/11/No.13

The graph shows the effect of an increasing substrate concentration on the rate of an enzyme-catalysed reaction.



Line P represents the result when the enzyme is used at its optimum pH and optimum temperature and without an inhibitor.

Line Q represents the result when the reaction conditions are changed.

Which descriptions of changes to the reaction conditions could result in line Q if all other conditions were kept the same?

1 Add an inhibitor that attaches to a site other than the active site.

2 Add an inhibitor that has a similar shape to the substrate.

3 Add an inhibitor that blocks the active site of the enzyme.

4 Carry out the reaction at a higher temperature.

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

3. June/2023/Paper_9700/12/No.13

CYP3A4 is an important enzyme in the human digestive system where it is needed to break down a range of different toxins. The activity of CYP3A4 has been shown to be reduced by substances called furanocoumarins. Furanocoumarins are found in some fruits and so dangerous concentrations of toxins may develop in the human digestive system when fruits containing furanocoumarins are eaten.

From the information provided, what can be concluded about molecules of the enzyme CYP3A4?

A They lower the activation energy of the toxin breakdown reactions.

B They bind specifically through the active site to a substrate found in some fruits.

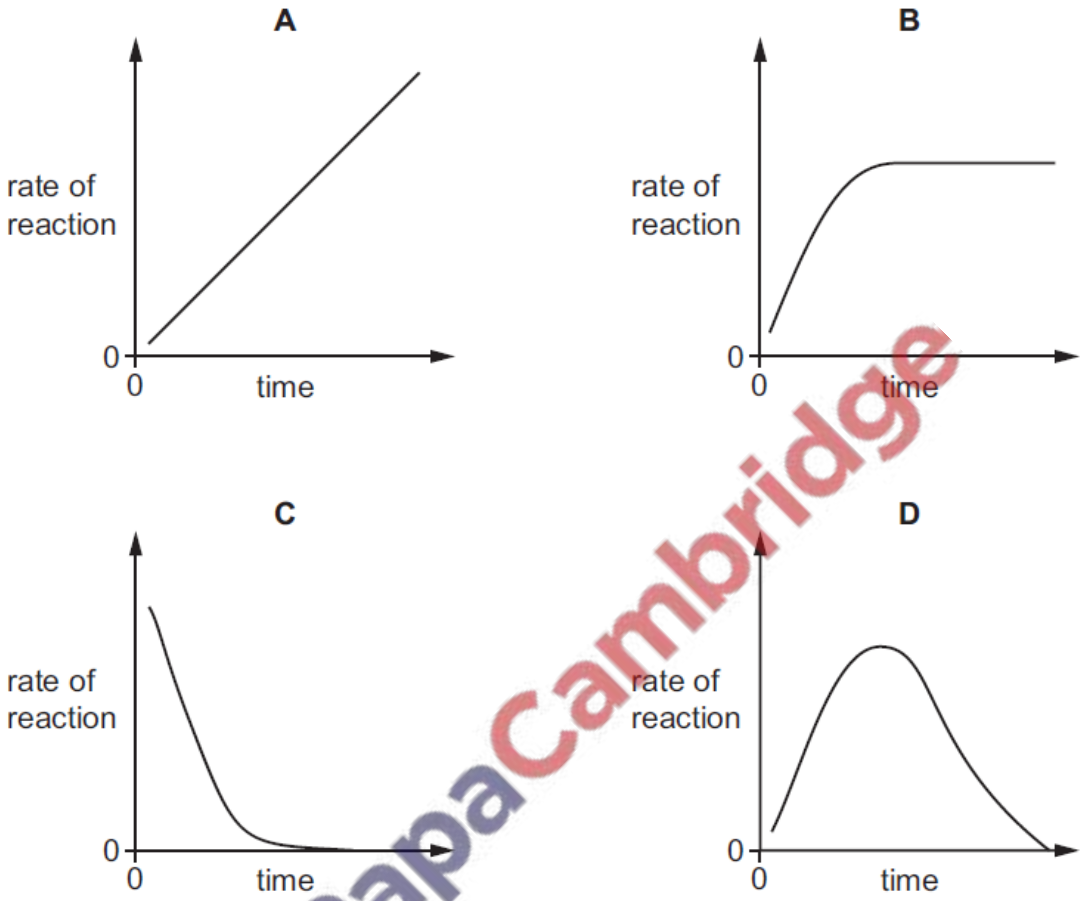
C They change permanently when acted upon by furanocoumarin molecules.

D They resume normal activity when concentrations of furanocoumarins decrease.

4. June/2023/Paper_9700/12/No.14

A fixed volume and concentration of substrate and enzyme were mixed. All other variables were kept constant. The enzyme-catalysed reaction was left until it was complete.

Which graph shows how the rate of reaction changes with time?



5. June/2023/Paper_9700/13/No.14

Some animals produce antimicrobial proteins which protect them from pathogens. These proteins could be used to kill human pathogens, however when used as a medicine they are broken down by protein-digesting enzymes.

Replacing one of the amino acids found in the protein with an amino acid that had been synthesised in the laboratory resulted in a modified protein that was **not** broken down.

What could explain why this modified protein was not broken down by the protein-digesting enzymes?

1 The modified protein has a different tertiary structure to the original protein.

2 The modified protein is **not** complementary in shape to the enzyme's active site.

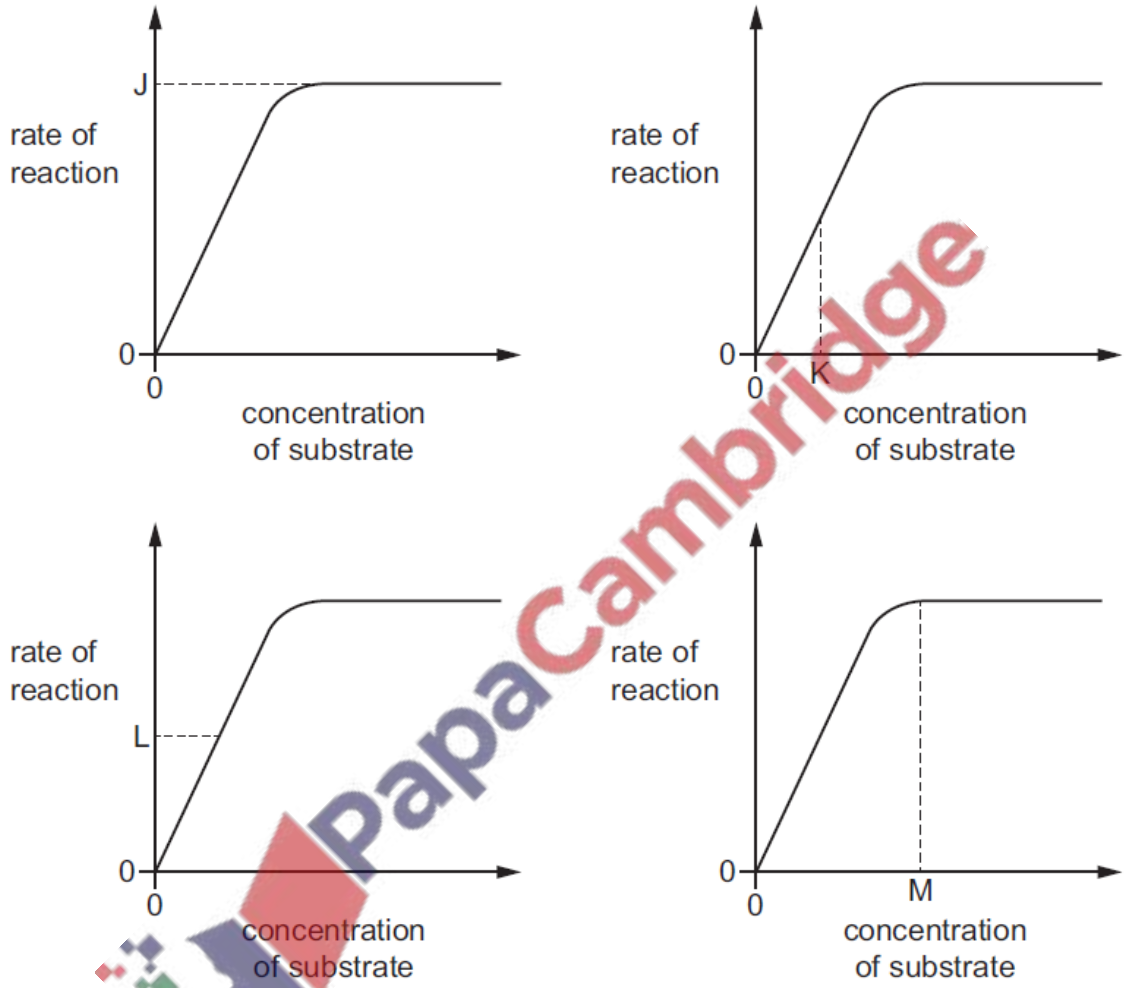
3 The modified protein is unable to induce a fit with the protein-digesting enzyme.

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

6. June/2023/Paper_9700/13/No.15

A student investigated the effect of substrate concentration on the rate of an enzyme-catalysed reaction. A graph was plotted to show the relationship between these two variables. The student was asked to take readings from the graph that could be used to determine the Michaelis–Menten constant, K_m, for this enzyme.

J, K, L and M show points read from the graphs which the student could use to determine the value of K_m.



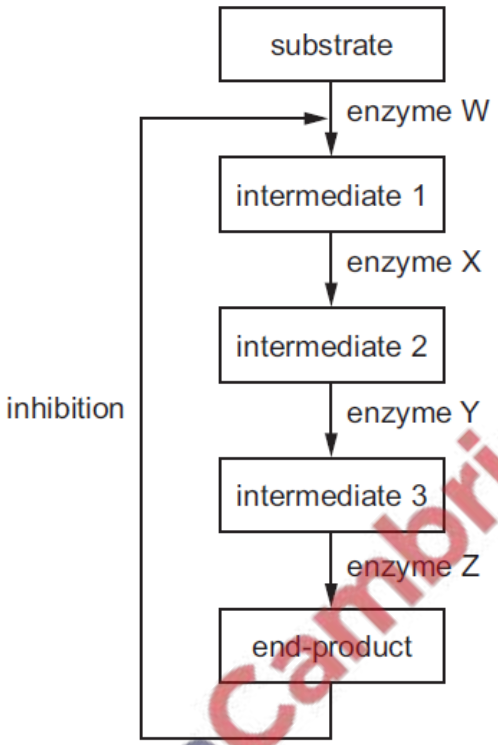
Which two readings must the student use to determine the value of K_m?

A J and K **B** J and M **C** K and L **D** L and M

7. June/2023/Paper_9700/13/No.16

The end-product of a metabolic pathway can act as a competitive inhibitor. This is called end-product inhibition and allows a cell to control a metabolic pathway.

The diagram shows a metabolic pathway where the end-product could act as an inhibitor of enzyme W.



What would be the effect if enzyme Z was inhibited by the end-product instead of enzyme W?

	quantity of intermediate 1	quantity of end-product
A	increase	decrease
B	increase	unchanged
C	decrease	decrease
D	decrease	unchanged

8. March/2023/Paper_9700/12/No.19

Which events are part of the mitotic cell cycle?

1 interphase

2 telophase

3 cytokinesis

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

9. March/2023/Paper_9700/22/No.16

(c) Mitogens are short chains of amino acids that function as cell-signalling molecules. Mitogens are released from secretory cells and travel in the blood to target cells, where the mitogens bind to cell surface receptors. The target cells respond by progressing from the G_1 phase to the S phase of the mitotic cell cycle.

(i) Outline what happens in the G_1 phase and S phase of the mitotic cell cycle.

G_1 phase .....

.....

.....

S phase .....

.....

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[2]

(ii) As a result of mutation, the production and release of mitogens into the blood can be greatly increased.

Suggest a possible consequence for target cells of increased concentrations of mitogens in the blood.

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