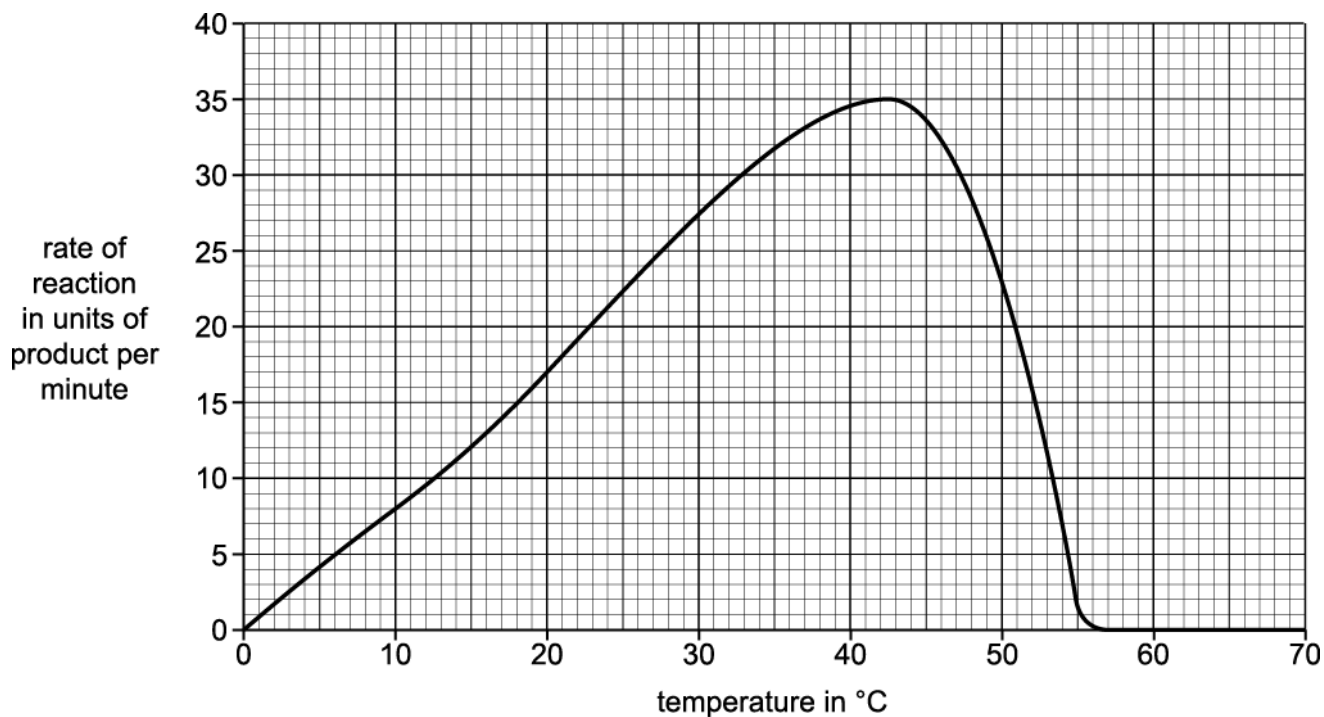


1. The graph below shows the effect of temperature on the rate of an enzyme-controlled reaction.



$Q_{10}$  is a measure of the increase in the rate of reaction with a 10 °C increase in temperature.

It is calculated with the formula below, where  $t$  is any given temperature.

$$Q_{10} = \frac{\text{rate at } t + 10\text{ }^{\circ}\text{C}}{\text{rate at } t\text{ }^{\circ}\text{C}}$$

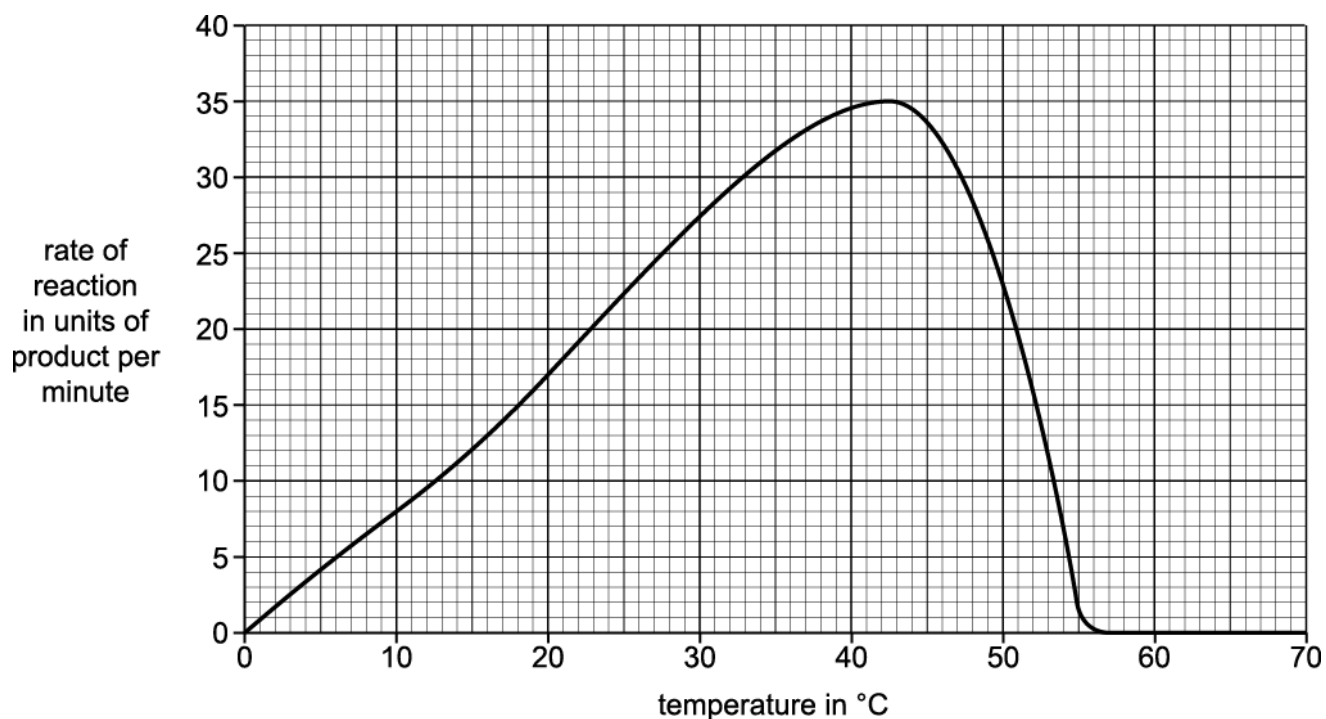
Which of the options, A to D, is the correctly calculated value for  $Q_{10}$  where  $t = 10\text{ }^{\circ}\text{C}$ ?

- A 0.44
- B 0.47
- C 2.13
- D 2.43

Your answer

[1]

2. The graph below shows the effect of temperature on the rate of an enzyme-controlled reaction.



Which of the following statements is/are correct?

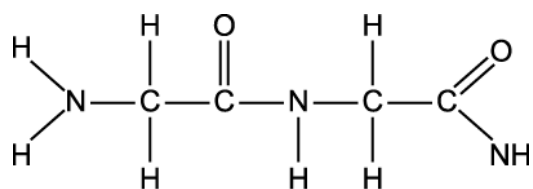
- 1 The kinetic energy of enzyme **and** substrate molecules increases with increasing temperature.
- 2 At 43 °C, all enzyme molecules have a substrate molecule bound to the active site.
- 3 Covalent bonding in enzyme molecules is disrupted by temperatures greater than 43 °C.

- A 1, 2 and 3 are correct  
B Only 1 and 2 are correct  
C Only 2 and 3 are correct  
D Only 1 is correct

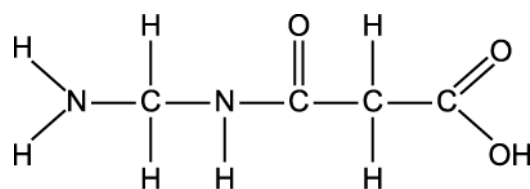
Your answer

[1]

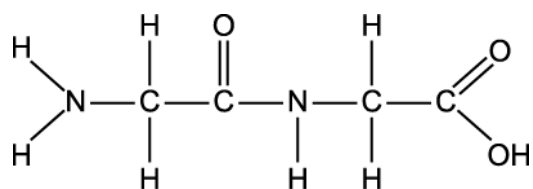
3. Which of the diagrams, A to D, represents a dipeptide molecule?



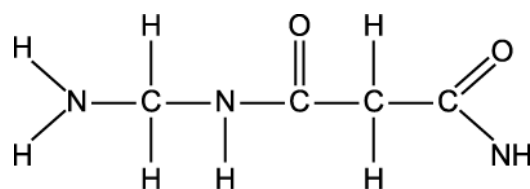
**A**



**B**



**C**

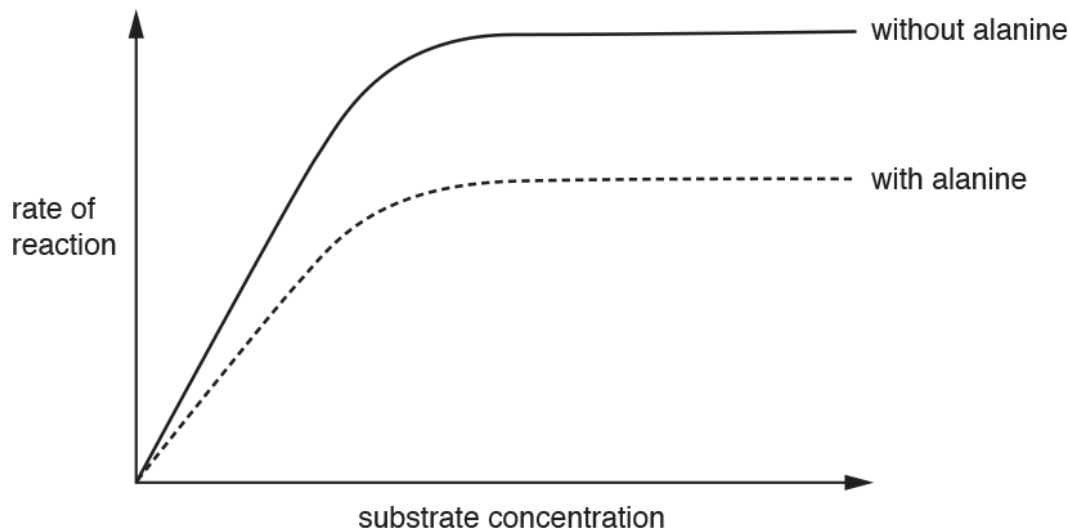


**D**

Your answer

[1]

4. The graph below shows the effect of alanine on the rate of a reaction catalyzed by the enzyme, pyruvate kinase.



Which of the following statements is/are correct?

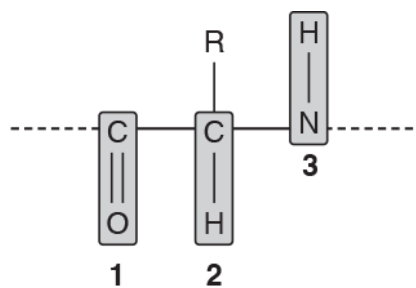
- 1 Alanine binds to an allosteric site of pyruvate kinase.
  - 2 Pyruvate kinase is inactive when alanine is bound.
  - 3 A change in pH could affect the rate of reaction both with and without alanine present.
- A 1, 2 and 3 are correct
  - B Only 1 and 2 are correct
  - C Only 2 and 3 are correct
  - D Only 1 is correct

Your answer

[1]

5. The diagram below represents an amino acid within a polypeptide sequence.

Three regions of the amino acid are labelled 1 to 3.



Which of the options, A to D, gives the regions that form bonds in the secondary structure of a protein?

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

Your answer

[1]

6. Fibrin is involved in the blood clotting cascade.

Which of the options, A to D, identifies the factors required for the conversion of fibrinogen to fibrin?

- A phospholipids and  $\text{Ca}^{2+}$  ions
- B platelets and  $\text{K}^+$  ions
- C thrombin and  $\text{Ca}^{2+}$  ions
- D thromboplastin and  $\text{K}^+$  ions

Your answer

[1]

7. The table below shows features of the blood types of four patients, 1, 2, 3 and 4.

	Antigens on erythrocytes	Antibodies in blood plasma
Patient 1	A and B	none
Patient 2	none	anti-A and anti-B
Patient 3	A	anti-B
Patient 4	B	anti-A

Which of the options, A to D, shows the patient with the correct blood type for receiving blood from a donor with blood group AB?

- A Patient 1
- B Patient 2
- C Patient 3
- D Patient 4

Your answer

[1]

8. The table shows the type of bond present in the different levels of structure for a protein molecule.

Which of the rows, A to D, is correct?

	Primary structure	Secondary structure	Tertiary structure
A	peptide	hydrogen	disulfide
B	hydrogen	peptide	ionic
C	peptide	disulfide	ionic
D	peptide	disulfide	hydrogen

Your answer

[1]

9. Which of the rows, A to D, from the table below indicates the type of bond present (✓) or absent (✗) in the secondary structure of a protein?

	Disulfide	Hydrogen	Hydrophobic	Ionic	Peptide
A	✗	✓	✗	✗	✓
B	✗	✓	✗	✓	✓
C	✓	✓	✗	✗	✓
D	✓	✗	✓	✓	✓

Your answer

[1]

10. Which of the options, A to D, is a molecule that requires vitamin C for its synthesis?

A collagen

B deoxyribonucleic acid

C haemoglobin

D rhodopsin

Your answer

[1]

11. The blood clotting process is a series of enzyme-controlled reactions.

Which of the reactions, **A** to **D**, occurs in the blood clotting process?

- A** Fibrinogen is converted to fibrin by the enzyme thromboplastin.
- B** Thrombin is converted to prothrombin by the enzyme thromboplastin.
- C** Prothrombin is converted to thrombin by the enzyme thromboplastin.
- D** Prothrombin is converted to thromboplastin by the enzyme thrombin.

Your answer

[1]

12. Donated blood is processed into different products which can be used to treat patients with specific conditions.

Which of the patients, **A** to **D**, would be treated by using a transfusion of **platelets**?

- A** receiving regular blood transfusions
- B** has bone marrow failure
- C** has low concentration of clotting factors
- D** undergoing cardiac surgery

Your answer

[1]

13. After a cut, the body responds by forming a blood clot. Platelets release thromboplastin and an enzyme-controlled reaction begins.

Why does this cause the rate of blood clotting to increase?

- A** there is less enzyme inhibition
- B** there are more active sites available
- C** there are more substrates to collide with the active site
- D** there is an increase in kinetic energy

Your answer

[1]



14. Which protein in the blood clotting process is indicated by line X in Fig. 11.1 below?

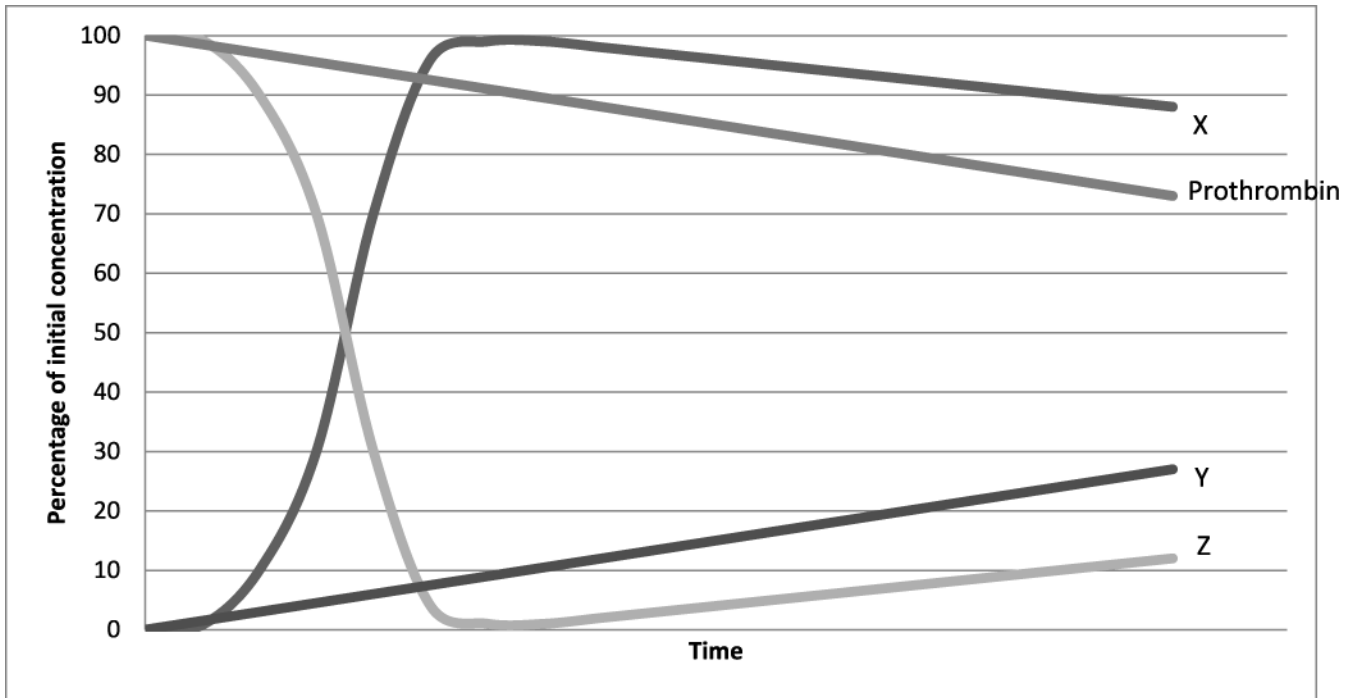


Fig. 11.1

- A Thromboplastin
- B Thrombin
- C Fibrin
- D Fibrinogen

Your answer

[1]

15. Some proteins act as hormones.

Oxytocin is a hormone which is released during labour.

Fig. 14.1 is a diagram of a molecule of oxytocin. Each circle represents an amino acid. The two molecules of the amino acid cysteine (Cys) are joined by their R groups so part of the molecule is circular.

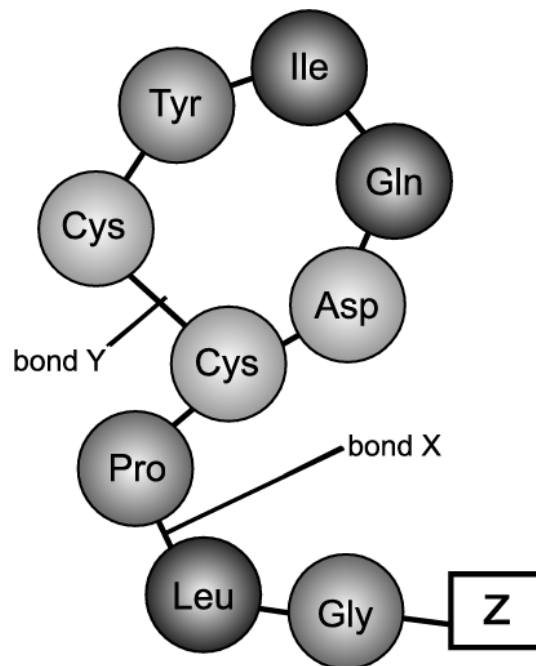


Fig. 14.1

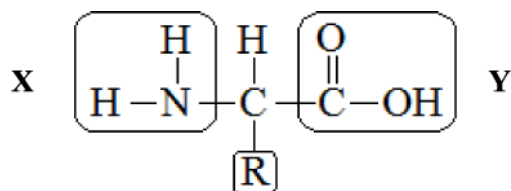
Which row best describes the structure of oxytocin?

Row	Bond X	Bond Y	Group Z
A	peptide	disulfide	amine
B	hydrogen	peptide	amine
C	peptide	disulfide	phosphate
D	disulfide	hydrogen	phosphate

Your answer

[1]

16. Fig. 20.1 shows the general structure of an amino acid.



**Fig. 20.1**

Which of the following statements is correct?

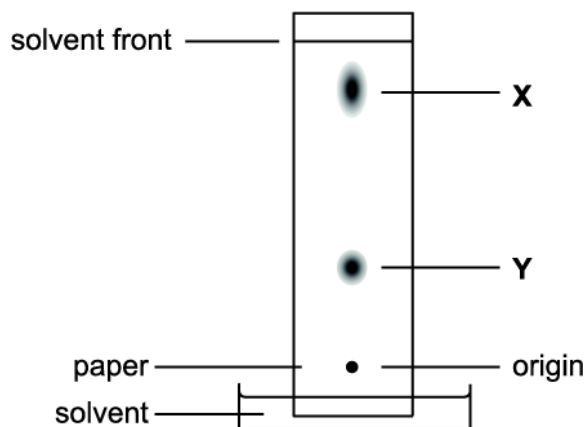
- A R groups can form hydrogen bonds in the secondary structure of a protein.
- B R groups can form hydrogen bonds in the tertiary structure of a protein.
- C Groups X and Y can form peptide bonds in the secondary structure of a protein.
- D Groups X and Y can form peptide bonds in the tertiary structure of a protein.

Your answer

[1]

17. Amino acids X and Y were separated from a solution by paper chromatography.

The resulting chromatogram is shown below.



Which of the following statements is / are correct?

**Statement 1:** X has a greater  $R_f$  value than Y.

**Statement 2:** The rates at which X and Y migrate are determined by their relative affinities for the paper and the solvent.

**Statement 3:** The pH of the solvent influences the rates at which X and Y migrate.

- A 1, 2 and 3 are correct
- B Only 1 and 2 are correct
- C Only 2 and 3 are correct
- D Only 1 is correct

Your answer

[1]

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Guidance
1			C ✓	1	
			Total	1	
2			D ✓	1	
			Total	1	
3			C ✓	1	
			Total	1	
4			A ✓	1	<b>Examiner's Comments</b> This question contained a lot of information for candidates to process and proved to be quite challenging to candidates.
			Total	1	
5			B ✓	1	<b>Examiner's Comments</b> A surprising number of candidates could not identify the region of bond formation in a secondary structure of a protein.
			Total	1	
6			C ✓	1	<b>Examiner's Comments</b> This was straightforward recall and the majority of candidates chose the correct response.
			Total	1	
7			A	1	<b>Examiner's Comments</b> It was pleasing to see many candidates able to correctly apply their knowledge of antigens and antibodies to blood groups. It should be noted that some candidates put the number "1" in the answer box rather than the correct response i.e. the letter, A. As there was no ambiguity, candidates were given the benefit of the doubt in this case. However candidates need to be aware that, in multiple choice questions, the options for each question are A to D and that it may not always be possible for examiners to apply benefit of the doubt.
			Total	1	

Question			Answer/Indicative content	Marks	Guidance
8			A	1	<b>Examiner's Comments</b> There were many correct responses to this question. However, this biochemistry-based question regarding level of protein structure proved challenging for some candidates.
			<b>Total</b>	<b>1</b>	
9			A	1	
			<b>Total</b>	<b>1</b>	
10			A	1	
			<b>Total</b>	<b>1</b>	
11			C	1	<b>Examiner's Comments</b> This should have been fairly straightforward for candidates who could recall the enzyme-controlled reactions of blood clotting. However, many candidates incorrectly suggested option A, possibly failing to spot that, whilst the conversion of fibrinogen to fibrin was the correct reaction, the enzyme thromboplastin, in this distractor, was incorrect.
			<b>Total</b>	<b>1</b>	
12			B	1	<b>Examiner's Comments</b> Some candidates confuse platelets (cell fragments) with clotting factors (proteins) and therefore C was the most commonly seen incorrect option.
			<b>Total</b>	<b>1</b>	
13			B	1	
			<b>Total</b>	<b>1</b>	
14			C	1	
			<b>Total</b>	<b>1</b>	
15			A	1	
			<b>Total</b>	<b>1</b>	

Question			Answer/Indicative content	Marks	Guidance
16			B	1	
			Total	1	
17			A	1	
			Total	1	