

Enzymes practice questions

5 questions • 16 marks • mark scheme at the back

For Cambridge IGCSE Combined Science 0653. **Supplement** is Extended content, only examined on Papers 2 and 4.

Name

Total / 16

1 **Supplement** [1 mark]

The shape of the active site of an enzyme is complementary to the shape of its substrate. What does this show?

- A. ☐ The enzyme can act on many different substrates
- B. ☐ The substrate fits into the active site
- C. ☐ The substrate and enzyme have identical shapes
- D. ☐ The product is the same shape as the substrate

2 **Supplement** [4 marks]

Amylase breaks down starch but cannot break down protein. Explain this, using the terms active site, substrate, enzyme-substrate complex and product.

3 **Supplement** [3 marks]

Explain why the rate of an enzyme-controlled reaction increases as the temperature rises from 10 °C to the optimum temperature.

- 4** A student investigated the effect of temperature on the breakdown of starch by amylase. [4 marks]
 She measured the time taken for all of the starch to be broken down. (a) State the optimum temperature shown by the results. [1] (b) Calculate the rate of reaction at 30 °C, using rate = $1000 \div \text{time}$. [2] (c) Describe what the results show about amylase at 60 °C. [1]

Time taken for the starch to be broken down	
temperature / °C	time taken / s
20	240
30	125
40	50
50	80
60	no change after 300

Answer =

- 5** **Supplement** [4 marks]

Pepsin has an optimum pH of about 2. Explain what happens to the activity of pepsin when it is placed in a solution at pH 10.

Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [1] Supplement

B B (1)

2. [4] Supplement

- amylase is specific / only acts on one substrate (1)
- the active site of amylase is complementary in shape to starch (1) reject 'same shape'
- starch fits into the active site forming an enzyme-substrate complex (1)
- starch is changed into the product(s) (1)
- protein has a different shape and does not fit the active site (1) so no complex forms / no products made
- Max 4

3. [3] Supplement

- particles have more kinetic energy / move faster (1)
- higher frequency of effective collisions between substrate and active site (1) allow more (frequent) collisions
- more enzyme-substrate complexes formed per unit time (1) allow more products formed per second

4. [4]

- (a) 40 °C (1)
- (b) $1000 \div 125$ (1)
- = 8 (1) allow 8.0; credit correct working
- (c) no starch broken down / no reaction (1) allow the enzyme is denatured / shape of active site has changed

5. [4] Supplement

- activity decreases / stops (1)
- pH change alters the bonds / shape of the enzyme (1)
- the shape of the active site changes (1)
- substrate no longer fits / no enzyme-substrate complex forms / enzyme is denatured (1) reject 'killed'