

Biological molecules and enzymes: practice questions

7 questions • 26 marks • mark scheme at the back

For Pearson Edexcel International GCSE Biology 4BI1 and Science (Double Award) 4SD0. **Biology only** is not in the Double Award and is only examined on Paper 2.

Name

Total / 26

1 Which elements are always present in a protein? [1 mark]

- A. ☐ carbon, hydrogen and oxygen only
- B. ☐ carbon, hydrogen, oxygen and nitrogen
- C. ☐ carbon, oxygen and nitrogen only
- D. ☐ carbon, hydrogen and nitrogen only

2 Complete the table to show the smaller units that make up each large molecule. [4 marks]

Large molecules and their units	
Large molecule	Smaller units
Starch	
Protein	
Lipid	

3 A student is given a food sample. Describe how the student could test the sample for (a) protein and (b) starch. Include the result for a positive test in each case. [4 marks]

- 4** The table shows the rate of an enzyme-controlled reaction at different temperatures. (a) [4 marks]
State the optimum temperature for this enzyme. (b) Explain why the rate is lower at 50 °C than at 40 °C.

Rate of reaction at different temperatures	
Temperature in °C	Rate in arbitrary units
10	2
20	5
30	9
40	12
50	3
60	0

- 5** A student investigates the effect of temperature on the time taken for amylase to break down starch. Describe how the student could carry out the investigation and how they would know when the starch had been broken down. **[4 marks]**

- 6** **Biology only** **[3 marks]**

A student investigates how pH affects the activity of amylase. (a) State the independent variable. (b) State the dependent variable. (c) Suggest how the student could keep the temperature the same in every test.

7 Explain how changes in temperature and changes in pH affect the activity of an enzyme. **[6 marks]**

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Mark scheme

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

1. [1]

B B (1)

2. [4]

- starch: (simple) sugars / glucose (1)
- protein: amino acids (1)
- lipid: fatty acids (1)
- lipid: glycerol (1)

3. [4]

- (a) add biuret reagent (1)
- turns from blue to purple / lilac (1) allow violet
- (b) add iodine solution (1)
- turns from orange-brown / yellow-brown to blue-black (1)

4. [4]

- (a) 40 °C (1)
- (b) the enzyme is denatured (1)
- the shape of the active site changes (1)
- the substrate no longer fits / is no longer complementary to the active site (1)

5. [4]

- mix amylase and starch (solution) in a test tube at a set temperature, using a water bath (1)
- repeat at several different temperatures (1)
- keep pH / volumes / concentrations the same (1)
- take samples at regular intervals and add to iodine solution; starch is gone when iodine stays orange-brown / does not turn blue-black (1) allow time recorded for this

6. [3] **Biology only**

- (a) pH (1)
- (b) time taken for the starch to be broken down / rate of reaction (1)
- (c) use a water bath / thermostatically controlled water bath (1)

7. [6]

Level 3 5-6	A clear, detailed explanation covering both temperature and pH, including the optimum, the increase in rate and the denaturing of the enzyme with the change in shape of the active site.
Level 2 3-4	Explains the effect of one factor in detail, or gives a partial explanation of both, with some correct use of terms such as active site or denatured.
Level 1 1-2	Gives simple statements, for example that temperature or pH changes the rate, with little or no explanation.

Indicative content

- as temperature increases the rate increases because particles have more kinetic energy and collide more often
- there is an optimum temperature where the rate is highest
- above the optimum the shape of the active site changes
- the substrate no longer fits so the enzyme is denatured and the rate falls
- each enzyme has an optimum pH where the rate is highest
- pH higher or lower than the optimum reduces the rate
- extreme pH changes the shape of the active site and denatures the enzyme