

Exercise walk-through

Proteins ■ 1.7

eXercise

You must be able to

- describe proteins as polymers of **amino acids** 氨基酸 joined by **peptide bonds** 肽键
- name the four levels of protein structure
- explain that **shape determines function** and how **denaturation** 变性 works

Method — The amino-acid monomer

Proteins are polymers of **amino acids** joined by **peptide bonds**. There are 20 different amino acids; their order determines the protein.

Method — Four levels of structure

- **Primary** — the sequence of amino acids.
- **Secondary** — local folds (helices and sheets) from hydrogen bonds.
- **Tertiary** — the overall 3-D shape of one chain.
- **Quaternary** — two or more chains together.

Method — Shape determines function

A protein's **specific shape** lets it do its job — as an enzyme, transporter, receptor, or structural part. Change the shape and the function is lost.

Method — Denaturation

Heat or a pH change can **denature** a protein — breaking the bonds that hold its shape, so it unfolds and stops working. The primary sequence is unchanged, but the function is lost.

Practice 2.1 ■ 2 marks

Name the monomer of proteins and the bond joining them.

Solution 2.1

Method: The amino-acid monomer

Worked steps

Amino acids; peptide bonds **B1** **B1**.

Practice 2.2 ■ 1 mark

What is the primary structure of a protein?

Solution 2.2

Worked steps

The sequence (order) of amino acids **B1**.

Practice 2.3 ■ 1 mark

What can denature a protein?

Solution 2.3

Method: Denaturation

Worked steps

Heat or a change in pH **B1**.

Exam-style 3.1 ■ 1 mark

A protein's function is determined mainly by its

A color

B three-dimensional shape

C mass

D charge only

Solution 3.1

A color

B three-dimensional shape 

C mass

D charge only

Worked steps

B — its three-dimensional shape.

Exam-style 3.2 ■ 1 mark

An enzyme is heated strongly and stops working.

- (a) Name the process that has occurred.
- (b) Explain why the enzyme no longer functions.

Solution 3.2

Method: Denaturation

Worked steps

(a) Denaturation **B1**. (b) Heat breaks the bonds holding the protein's shape, so it unfolds; its active site no longer fits the substrate, so it cannot function **M1 A1**.

Exam-style 3.3 ■ 2 marks

Explain how a change in a single amino acid (primary structure) could affect a protein's function.

Solution 3.3

Method: Denaturation

Worked steps

A different amino acid can change how the chain folds, altering the 3-D shape; if the active site or key region changes, the protein's function can be reduced or lost

M1 **A1**.