AP BIOLOGY • EXERCISE SHEET

1.7 Proteins

Name: _____ Class: _____ Date: _____ **Total: 10 marks**

Objective

Build the skills to answer exam questions on **proteins**.

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

1 Worked examples

Study these first. Each one shows the method for a question type used later —follow the steps and you can do the Practice and Exam-style questions yourself.

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.

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.

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.

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.

2 Practice

Now apply the methods above.

2.1 Name the monomer of proteins and the bond joining them. [2]

2.2 What is the primary structure of a protein? [1]

2.3 What can denature a protein? [1]

3 Exam-style questions

3.1 A protein's function is determined mainly by its [1]

- **A** color
- **B** three-dimensional shape
- **C** mass
- **D** charge only

3.2 An enzyme is heated strongly and stops working.

(a) Name the process that has occurred. [1]

(b) Explain why the enzyme no longer functions. [2]

3.3 Explain how a change in a single amino acid (primary structure) could affect a protein's function. [2]

4 Go further

You are now ready for the real exam questions on this subtopic:

- work through the **1.7 Proteins** lesson on the **Learn** page;
- read the **Proteins** section of the AP Biology handout on the **Know** page.

Solutions

2.1 Amino acids; peptide bonds.

2.2 The sequence (order) of amino acids.

2.3 Heat or a change in pH.

3.1 B —its three-dimensional shape.

3.2 (a) Denaturation. (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.

3.3 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.