AP BIOLOGY • EXERCISE SHEET

1.3 Introduction to Macromolecules

Name: _____ Class: _____ Date: _____ **Total: 11 marks**

KEY WORDS monomers 单体 • hydrolysis 水解 • dehydration synthesis 脱水缩合 • polymers 聚合物 • nucleic acids 核酸

Objective

Build the skills to answer exam questions on **macromolecules** — polymers, monomers, and how they are built.

You must be able to:

- describe **polymers** 聚合物 built from **monomers** 单体
- explain **dehydration synthesis** 脱水缩合 and **hydrolysis** 水解
- name the four classes of biological macromolecule

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.

■ Monomers and polymers

Large biological molecules (**macromolecules**) are **polymers** — long chains of repeating subunits called **monomers**. The four classes are carbohydrates, lipids, nucleic acids, and proteins.

■ Dehydration synthesis (building)

Cells join two monomers by **removing a water molecule** to form the bond — **dehydration synthesis** (condensation). Building a polymer removes one water per bond formed.

■ Hydrolysis (breaking)

The reverse — **adding water** to break a bond between monomers — is **hydrolysis**. Digestion breaks polymers into monomers by hydrolysis.

■ A worked link

Two monosaccharides join by dehydration synthesis (losing water) to form a disaccharide; adding water (hydrolysis) splits it back into two monosaccharides.

2 Practice

Now apply the methods above.

2.1 What is a polymer? [1]

2.2 What is removed when two monomers join by dehydration synthesis? [1]

2.3 Name the four classes of macromolecule. [2]

3 Exam-style questions

3.1 Breaking a polymer into monomers by adding water is called [1]

- **A** dehydration synthesis
- **B** hydrolysis
- **C** condensation
- **D** denaturation

3.2 A cell links many glucose monomers into a starch polymer.

(a) Name the process and what is removed at each bond. [2]

(b) State how the starch could later be broken back into glucose. [2]

3.3 Explain why dehydration synthesis and hydrolysis are described as opposite pro-

cesses. [2]

Solutions

2.1 A long chain of repeating monomers.

2.2 A water molecule.

2.3 Carbohydrates, lipids, nucleic acids, proteins.

3.1 B — hydrolysis.

3.2 (a) Dehydration synthesis; a water molecule is removed at each bond. (b) By hydrolysis — adding water to break the bonds back into glucose.

3.3 Dehydration synthesis **removes** water to form a bond and build a polymer; hydrolysis **adds** water to break the bond — each reverses the other.