

# 4.1 Biological molecules

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_ Total: 21 marks

**KEY WORDS** proteins • starch • molecule • elements  
• carbohydrates

## Objective

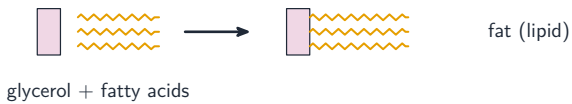
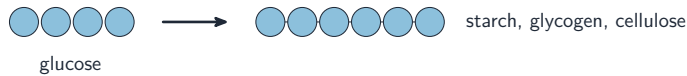
Build the skills to answer exam questions on **biological molecules** – the elements in food, building large molecules from small units, **food tests**, and DNA.

You must be able to:

- give the elements in carbohydrates, fats and proteins
- state the small units that build starch, proteins and fats
- carry out the food tests and recall the DNA base pairs

## 1 Key knowledge and worked examples

### ■ Building blocks and food tests



*Starch ← glucose; protein ← amino acids; fat ← 3 fatty acids + glycerol*

| Food substance (test)                       | start                                                                               | positive result                                                                                  |
|---------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <b>Starch</b><br>(iodine)                   |  |  blue-black   |
| <b>Reducing sugar</b><br>(Benedict's, heat) |  |  brick-red    |
| <b>Protein</b><br>(biuret)                  |  |  purple       |
| <b>Fat</b><br>(ethanol emulsion)            |  |  cloudy white |
| <b>Vitamin C</b><br>(DCPIP)                 |  |  colourless   |

*Starch + iodine → blue-black; reducing sugar + Benedict's (heat) → brick-red;  
protein + biuret → purple*

- carbohydrates/fats = C, H, O; proteins also contain N. DNA bases pair A–T, C–G.

## 2 Practice

2.1 Name the elements found in a protein. [1]

2.2 Name the small units that join to make a protein. [1]

## 3 Exam-style questions

3.1 The test for a reducing sugar uses Benedict's solution and: [1]

- ☐ A cooling  
☐ B heat  
☐ C iodine  
☐ D no change

**3.2** A student tests a food sample.

(a) Describe the test for starch and its positive result. [2]

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(b) Describe the test for protein and its positive result. [2]

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**3.3** One strand of DNA has the base sequence A–C–G–T. Write the sequence of the matching strand. [2]

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**3.4** A student tested a food sample for three nutrients.

(a) For **starch**, **reducing sugar** and **protein**, name the reagent used, describe the method, and give the positive result. [6]

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(b) The sample was positive for starch and protein but negative for reducing sugar. Name the small units that starch and protein are each built from. [2]

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(c) Explain why the reducing sugar test needs heating but the starch test does not. [2]

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(d) Name the three elements found in every carbohydrate, and the extra element always present in a protein. [2]

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## Solutions

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Each answer shows the steps, then the **result**.

### 2.1

- a protein contains **carbon, hydrogen, oxygen and nitrogen**

### 2.2

- proteins are made of **amino acids**

### 3.1 B

- Benedict's test needs **heat**
- A would slow it; C is starch; D is false

### 3.2

(a)

- add **iodine** solution
- orange-brown turns **blue-black**

(b)

- add **biuret** solution
- blue turns **purple**

### 3.3

- A pairs with T, C pairs with G
- matching strand: **T-G-C-A**

### 3.4

(a)

- **starch**: iodine; orange-brown → **blue-black**
- **reducing sugar**: Benedict's + heat; blue → **brick red**
- **protein**: biuret; blue → **purple/lilac**

(b)

- starch is built from **glucose**
- protein is built from **amino acids**

(c)

- Benedict's is a chemical reaction that needs **heat**
- iodine just **changes colour** when it meets starch

(d)

- carbohydrates: **C, H, O**

- proteins also always contain **nitrogen**