4.1 Biological molecules

Name: _____ Class: _____ Date: _____ **Total: 21 marks**

KEY WORDS proteins • starch • molecule • elements • carbohydrates

Objective

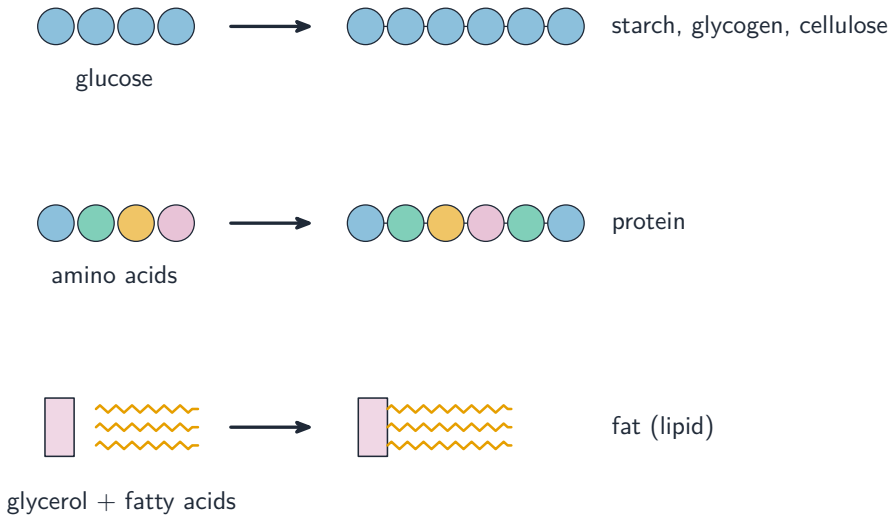
Build the skills to answer exam questions on **biological molecules** – the elements in food, building large molecules from small units, **food tests**, and DNA.

You must be able to:

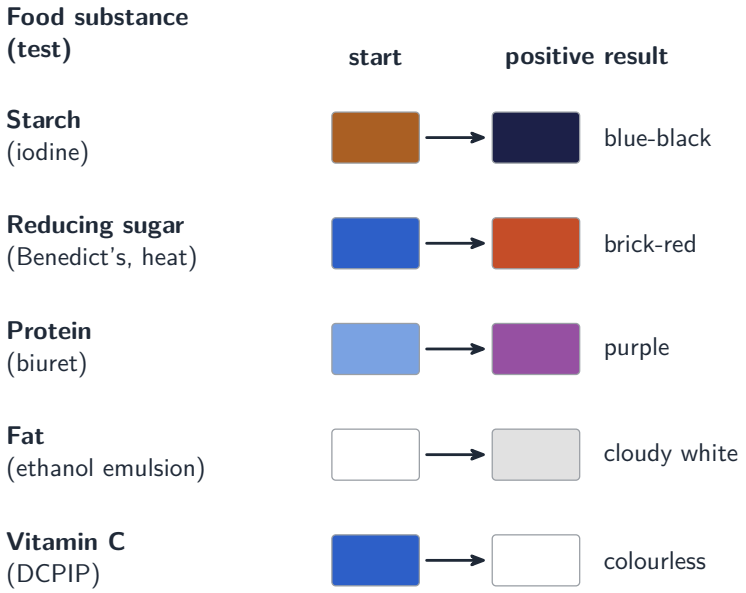
- give the elements in carbohydrates, fats and proteins
- state the small units that build starch, proteins and fats
- carry out the food tests and recall the DNA base pairs

1 Key knowledge and worked examples

Building blocks and food tests



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



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]

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

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

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]

(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]

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

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

Solutions

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**