

Biological Molecules
IGCSE Biology ■ Topic 4

IGCSE Biology

Biological Molecules

What we will cover

1

Elements in food

2

Building large molecules

3

Food tests

4

Test colours

5

The structure of DNA

base pairs

the structure of DNA

1

Molecules

Biological Molecules

Elements in food

carbohydrates and fats
C H O

proteins
C H O N

■ Carbohydrates 碳水化合物 and fats 脂肪 contain three elements: carbon 碳 (C), hydrogen 氢 (H) and oxygen (O).

■ Proteins 蛋白质 contain carbon, hydrogen and oxygen too, plus nitrogen 氮 (N). (Some proteins also contain sulfur, S.)

Biological Molecules

Building large molecules

glucose

→

starch, glycogen, cellulose

amino acids

→

protein

glycerol + fatty acids

→

fat (lipid)

Large molecules are made by joining many small molecules together, like beads on a string.

| Large molecule | Built from

| | — | — | | starch 淀粉,

glycogen 糖原 and cellu-

lose 纤维素 | many glu-

cose 葡萄糖 units | | proteins |

amino acids 氨基酸 | | fats and

oils | fatty acids 脂肪酸...

Biological Molecules

Food tests

Food substance (test)

Starch (iodine)

Reducing sugar (Benedict's, heat)

Protein (biuret)

Fat (ethanol emulsion)

Vitamin C (DCPIP)

start

positive result

blue-black

brick-red

purple

cloudy white

colourless

Add a test chemical & watch the colour (**biuret** 双缩脲 for protein, an **emulsion** 乳浊液 for fat).

Only **Bene-dict's** 本尼迪特试剂 needs **heat**. DCPIP goes **colourless**; the others gain a colour.

Test colours

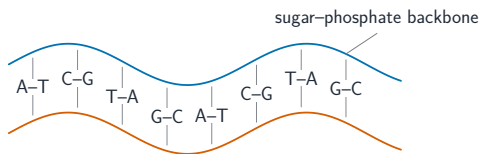
starch iodine → blue-black	reducing sugar Benedict's → brick-red	protein biuret → purple
fat emulsion → cloudy	vitamin C DCPIP → colourless	

2 DNA

The structure of DNA

DNA 脱氧核糖核酸 is a **double helix** 双螺旋 – a twisted ladder of two **strands** 链.

The **bases** 碱基 always pair: **A-T** and **C-G**. So one strand sets the other.



two strands form a double helix; bases pair A-T and C-G

3 Recap

Worked example – reading food tests

A food gives a brick-red Benedict's result and a purple biuret result, but iodine stays orange-brown. What is in it?

- Benedict's brick-red ⇒ **reducing sugar** present, and a lot of it.
- Biuret purple ⇒ **protein** present.
- Iodine *stays* orange-brown ⇒ **no** starch (blue-black would mean starch).
- So: **reducing sugar + protein, no starch.**

Learn the colour **change**, not just the final colour: Benedict's blue → brick-red (heat needed), iodine orange-brown → blue-black, biuret blue → purple.

Topic 4 – key takeaways

1 Elements

carbs & fats C,H,O; proteins add N

2 Big molecules

chains of glucose / amino acids / fatty acids

3 Food tests

iodine, Benedict's (heat), biuret, DCPIP

4 DNA

double helix; A-T & C-G

Check yourself

- 1 Which element do proteins have that fats do not?
- 2 What are proteins built from?
- 3 Which food test needs heating?
- 4 Which base pairs with C in DNA?



Answers 1. nitrogen 2. amino acids 3. Benedict's (reducing sugars) 4. G