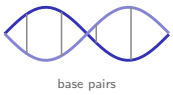
Biological Molecules

IGCSE Biology ▪ Topic 4

IGCSE Biology

What we will cover

1. Elements in food
2. Building large molecules
3. Food tests
4. Test colours
5. The structure of DNA



the structure of DNA

1 Molecules

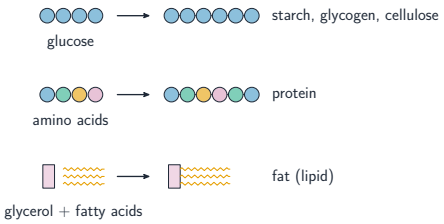
Elements in food

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.)

Building large molecules



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 **cellulose** 纤维素	many **glucose** 葡萄糖 units
proteins	**amino acids** 氨基酸
fats and oils	**fatty acids** 脂肪酸...

Food tests

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

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

Only **Benedict'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

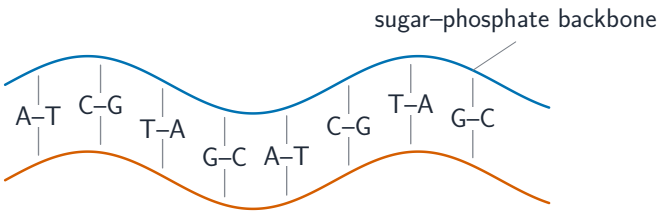
vitamin C
DCPIP → colourless

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.

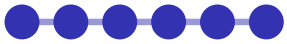
Learn the colour change, not just the final colour: Benedict's blue → brick-red (heat needed), iodine orange-brown → blue-black, biuret blue → purple.

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