

2 Biological molecules – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
carbohydrates	碳水化合物	_____	_____	_____
lipids	脂质	_____	_____	_____
proteins	蛋白质	_____	_____	_____
molecule	分子	_____	_____	_____
reducing sugar	还原糖	_____	_____	_____
starch	淀粉	_____	_____	_____
biuret	双缩脲	_____	_____	_____
emulsion	乳浊液	_____	_____	_____
monomer	单体	_____	_____	_____
polymer	聚合物	_____	_____	_____
monosaccharide	单糖	_____	_____	_____
glucose	葡萄糖	_____	_____	_____
disaccharide	二糖	_____	_____	_____
maltose	麦芽糖	_____	_____	_____
polysaccharide	多糖	_____	_____	_____

English	中文	Write it 3 times (English)		
glycosidic bond	糖苷键			
condensation	缩合			
hydrolysis	水解			
amylose	直链淀粉			
amylopectin	支链淀粉			
glycogen	糖原			
cellulose	纤维素			
cell wall	细胞壁			
insoluble	不溶			

Recall

You met these ideas at IGCSE. Bring them with you:

- Living things contain **carbohydrates** 碳水化合物, **lipids** 脂质, **proteins** 蛋白质 and water.
- You used food tests before — the iodine test for starch, and Benedict’s test for sugar.
- “Big molecules are built from small ones” — that simple idea runs through this whole sheet.

Nothing here is harder than IGCSE. It just lines up the chemistry the AS course starts with.

New ideas

Read these first. Each has a short worked example. Then do the Practice below.

■ 1 Four food tests

A **molecule** 分子 is a group of atoms joined together. Simple tests show which kinds are present in a sample.

Test	Finds	Positive result
Benedict's test	reducing sugar 还原糖	blue → green → orange → brick-red
iodine test	starch 淀粉	orange-brown → blue-black
biuret 双缩脲 test	protein	blue → purple
emulsion test	lipid	white cloudy emulsion 乳浊液

Worked example. You add Benedict's solution to a juice and heat it. It turns brick-red. So the juice contains a reducing sugar.

■ 2 Monomers and polymers

- a **monomer** 单体 is a small single unit.
- a **polymer** 聚合物 is a long molecule made of many monomers joined up.

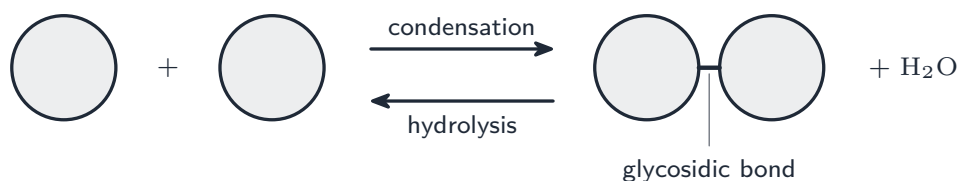
Sugars come in three sizes:

- a **monosaccharide** 单糖 is one sugar unit, such as **glucose** 葡萄糖.
- a **disaccharide** 二糖 is two units joined, such as **maltose** 麦芽糖.
- a **polysaccharide** 多糖 is many units joined into a polymer.

■ 3 Joining and breaking (condensation and hydrolysis)

When two monomers join, a strong **glycosidic bond** 糖苷键 forms and **one water molecule is removed**. This is **condensation** 缩合.

The reverse adds water to break the bond. This is **hydrolysis** 水解.



Worked example. Sucrose + water → glucose + fructose. Adding water breaks one bond, so this is hydrolysis.

■ 4 Storage and structure polysaccharides

All three are polymers of glucose, but their **shape fits their job**:

- **starch** is the store in plants — made of a coiled chain (**amylose** 直链淀粉) and a branched chain (**amylopectin** 支链淀粉).
- **glycogen** 糖原 is the store in animals — like amylopectin but **more branched**, so it breaks down fast.
- **cellulose** 纤维素 is made of straight chains held side by side; they pack into strong fibres that build the plant **cell wall** 细胞壁.

Stores like starch and glycogen are useful because they are compact and **insoluble** 不溶 (so they stay in the cell).



amylose (coiled)



glycogen (branched)



cellulose (straight)

Watch out: condensation *removes* water (joining monomers); hydrolysis *adds* water (breaking them apart). Starch, glycogen and cellulose are *all* glucose polymers — it is their different *shapes* that suit their different jobs.

Practice

Try these in order. The methods are all above.

2.1 Name the test for (a) starch, (b) protein, (c) a reducing sugar. [3]

2.2 A sample turns Benedict's solution brick-red. What does this tell you? [1]

2.3 Define (a) a monomer, (b) a polymer. [2]

2.4 Two monosaccharides join to form a disaccharide. (a) Name the bond formed. (b) Name this type of reaction. (c) What small molecule is removed? [3]

2.5 Glycogen and cellulose are both polymers of glucose, but do different jobs. State one use of each. [2]

2.6 Explain why starch is a good storage molecule in a cell.

[2]

2.7 Challenge. Cellulose and starch are both made only of glucose, yet cellulose builds strong cell walls while starch is a store. Explain how their different structures suit these different jobs.

[2]