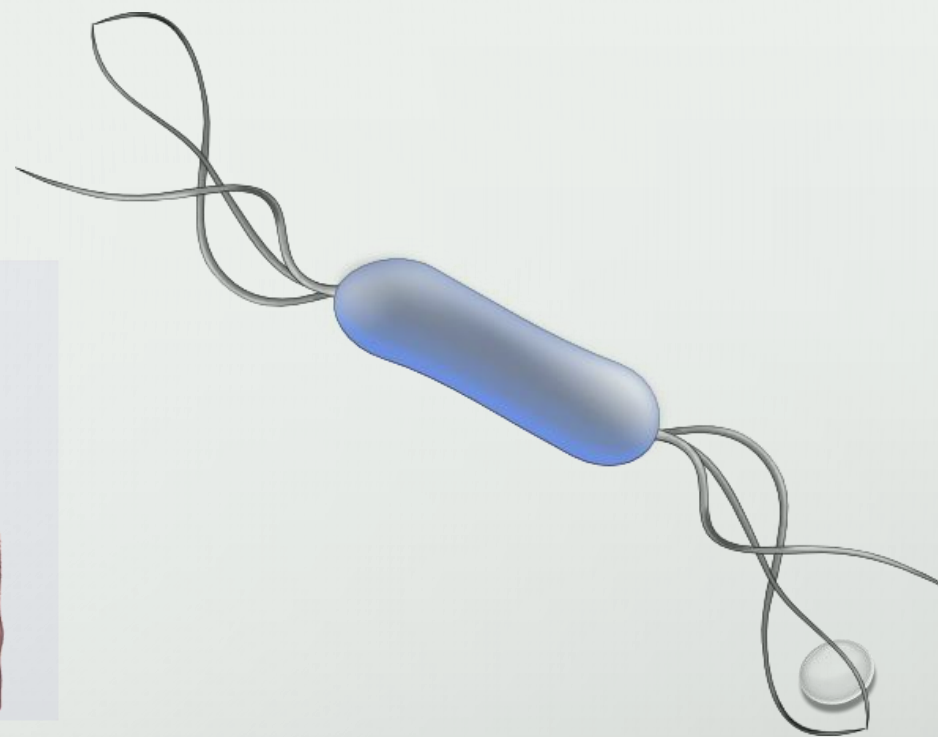
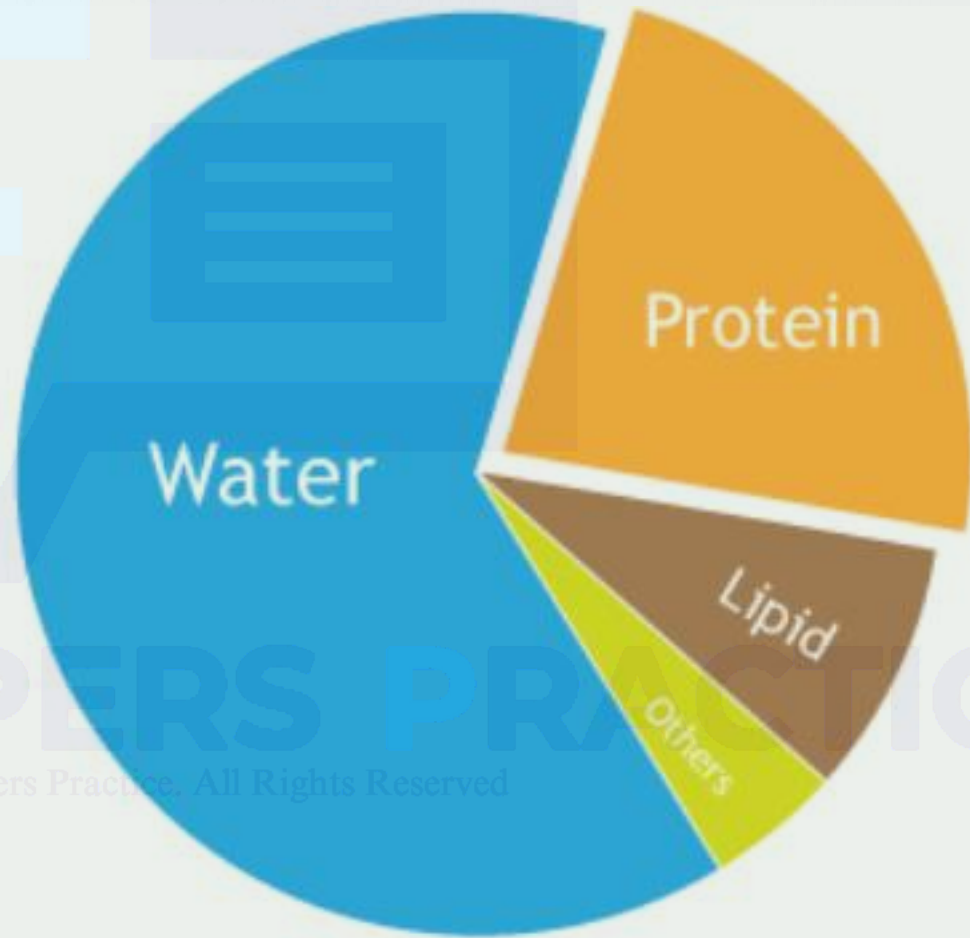


The chemicals of life



**What are you
made of ?**

The chemicals of life



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Biochemical Composition of Human Body

protein 蛋白质
lipid 脂质
fat 脂肪
carbohydrate 碳水化合物
vitamin 维他命

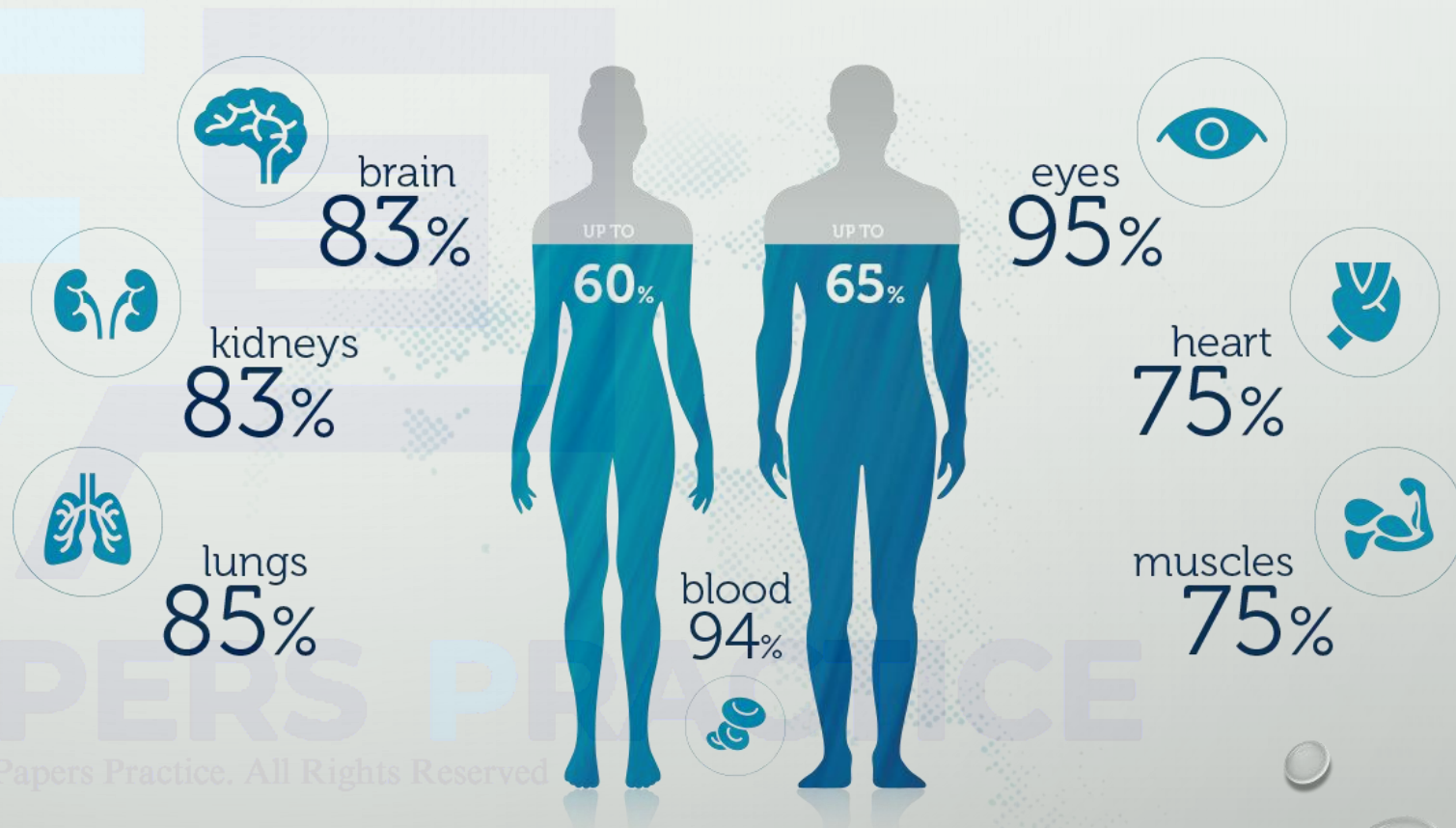
The chemicals of life

water

◆ solvent

Metabolic reactions can only take place if the chemicals which are reacting are dissolved in water.

◆ **transportation**(dissolved substance)
nutrients
waste products



metabolic reactions 代谢反应

◆ starch + sugars

◆ C H O



The chemicals of life

carbohydrates—

sugars

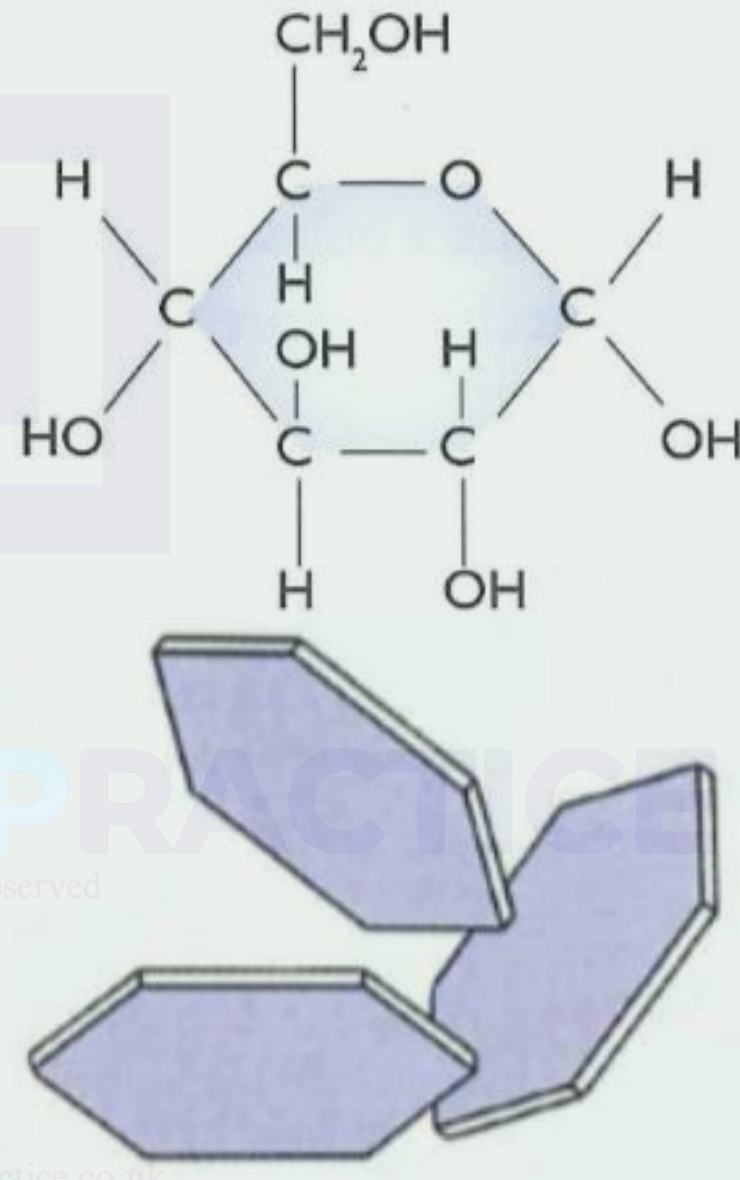
Sugars

monosaccharides (simple sugar)

- ♦ **glucose** $C_6H_{12}O_6$
soluble in water

normally used in respiration (release energy)

monosaccharide 单糖



The chemicals of life

carbohydrates— sugars

Sugars

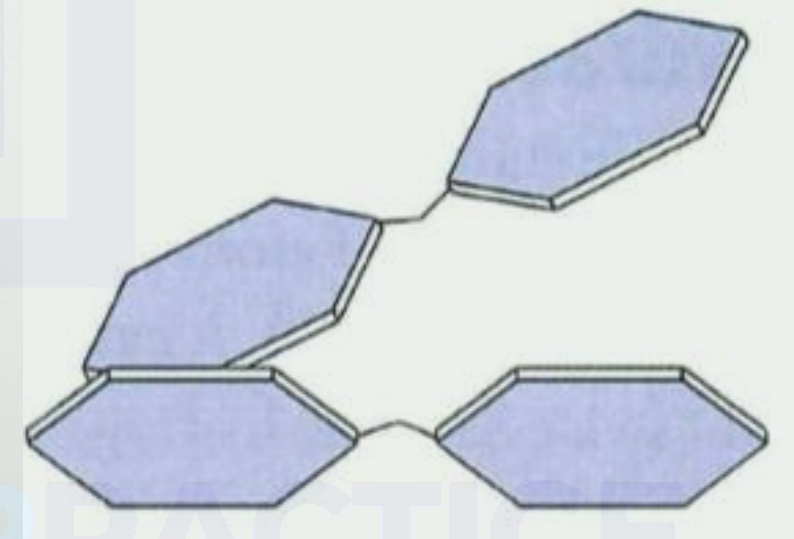
monosaccharides (simple sugar)

disaccharide

◆ sucrose (in plant)

Plant transport glucose

◆ maltose (malt sugar/ in plant)



soluble in water

disaccharide 二糖

sucrose 蔗糖

maltose 麦芽糖

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The chemicals of life

carbohydrates— sugars

Sugars

monosaccharides (simple sugar)

disaccharide

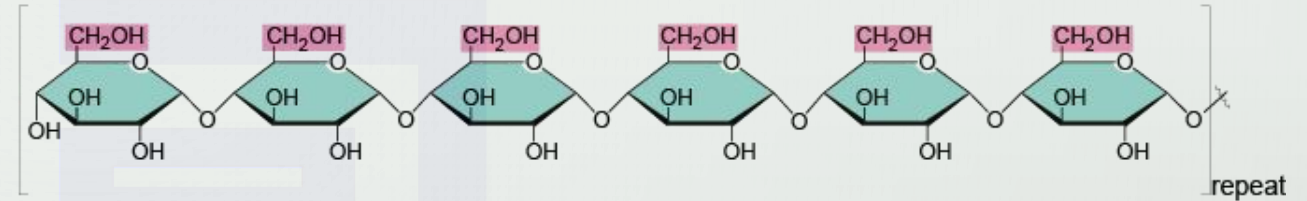
polysaccharide

- ◆ cellulose (cell wall)
 - ◆ starch (plant store carbohydrates)
 - ◆ glycogen (animals/ in liver and muscles)
- insoluble in water

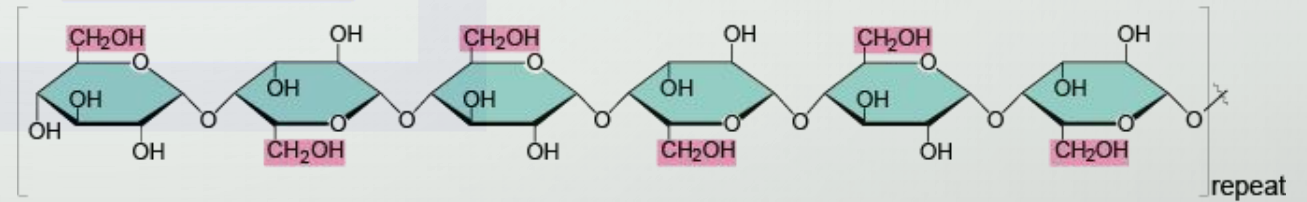
polysaccharide 多糖

glycogen 糖原

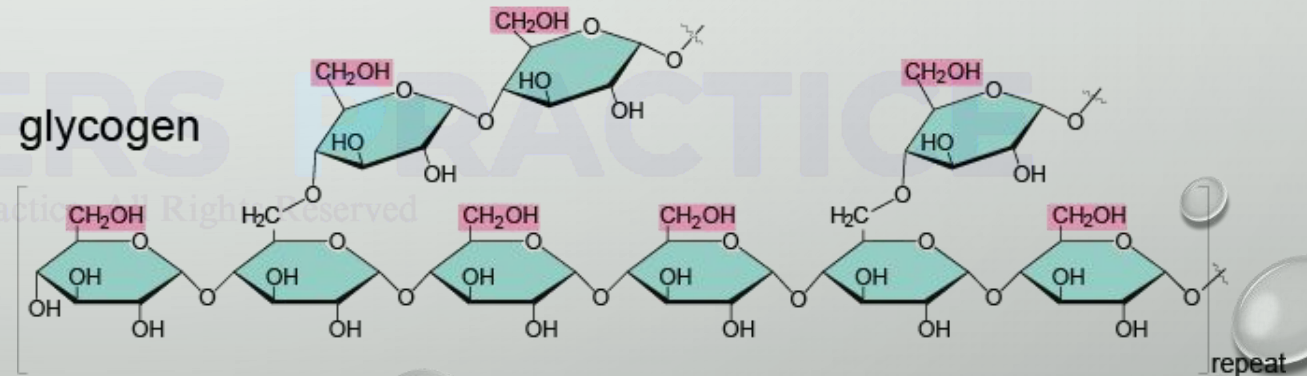
starch



cellulose



glycogen



Testing for carbohydrates

Test sugars (reducing sugar)

e.g. all monosaccharides, maltose

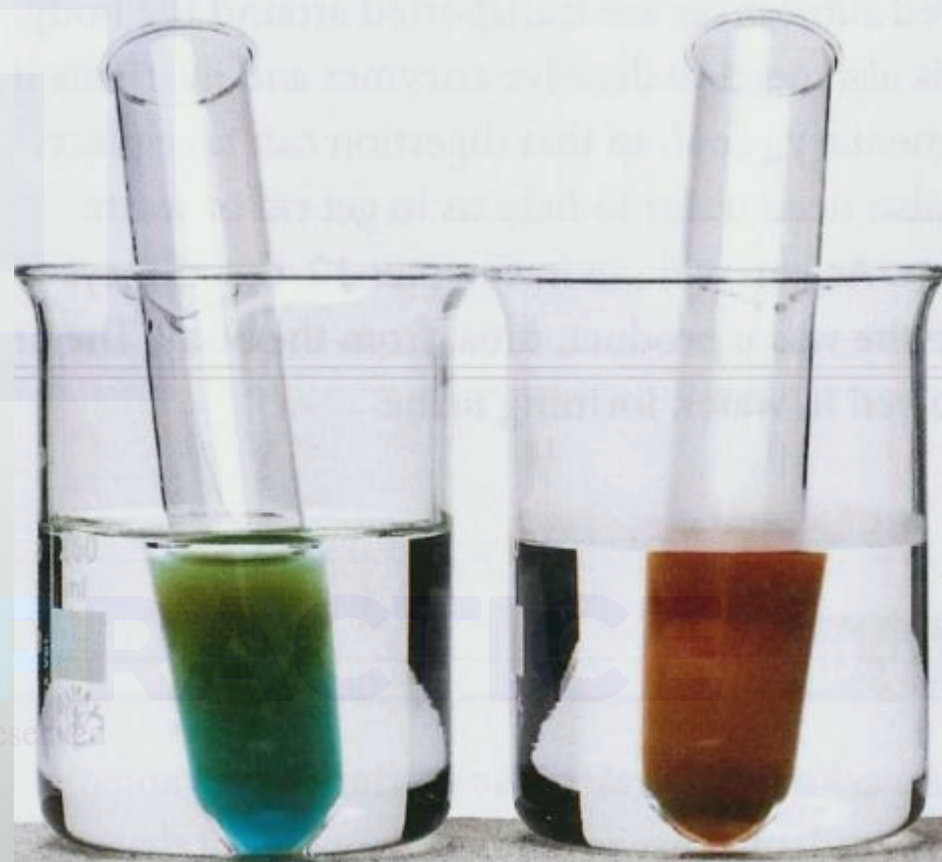
◆ benedict' s solution

◆ experiment steps

↓ mix sugar solution with benedict' s solution

↓ heat with water bath 80°C

Blue → brick red
benedict's solution
water bath 水浴
brick red 砖红色



The chemicals of life

carbohydrates—— sugars

Testing for carbohydrates

Test sugars (starch)

◆ iodine solution

Orange-brown → blue black

Iodine solution 碘液
orange-brown 黄棕色



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Why do organisms die if they do not have enough water?

What three elements are contains in all carbohydrates?

The molecular formula for glucose is , what does this tell you about a glucose molecule?

To which group of carbohydrates does each of these substances belong: **a** glucose; **b** starch ; **c** glycogen

EXAM PAPERS PRACTICE

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NUTRITION BY *Mia*



FATTY
FISH



EDAMAME



NUTS



PEANUT
BUTTER

FATS

@nutritionbymia



SEEDS



OLIVES



AVOCADO



OLIVE
OIL

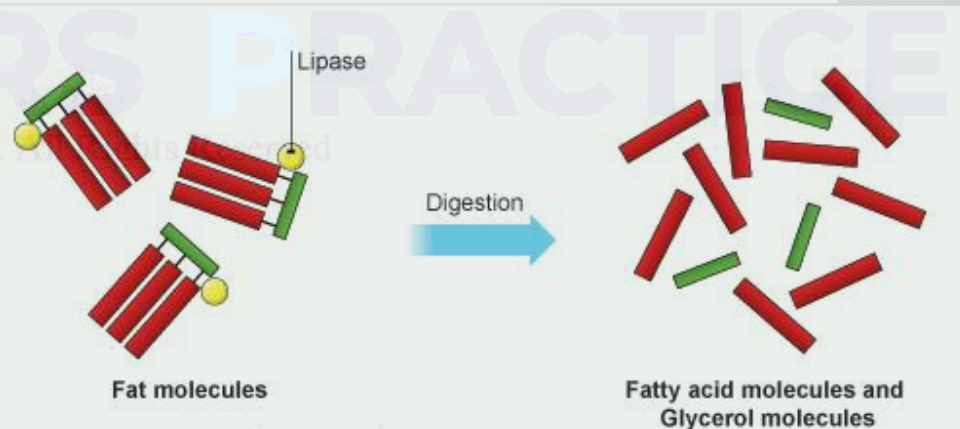
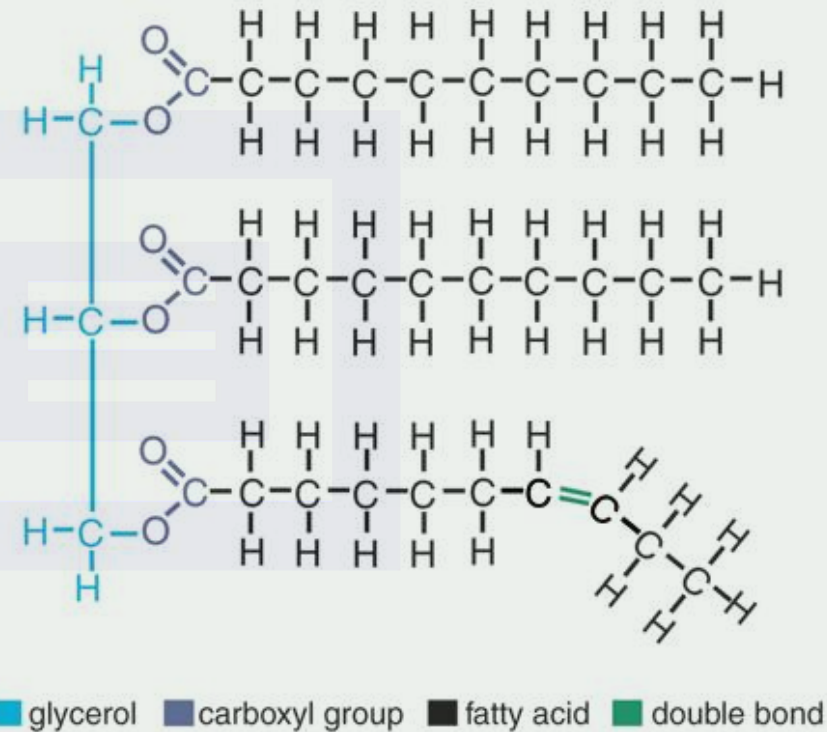
EXAM PAPERS PRACTICE

The chemicals of life

Fat

- ◆ lipids (fats)
- ◆ insoluble in water
- ◆ carbon, hydrogen, oxygen
- ◆ 3 fatty acids + 1 glycerol

lipid 脂质
fatty acid 脂肪酸
glycerol 甘油

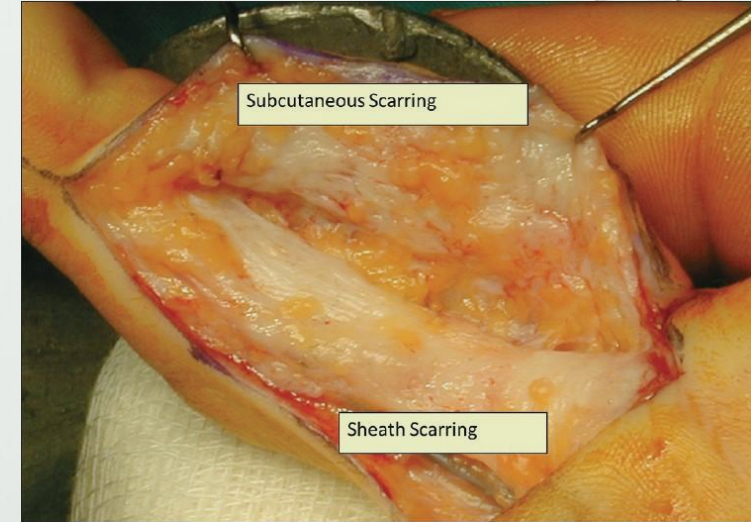


The chemicals of life

Fat

functions

- ◆ provide energy
cells use carbohydrates first to obtain energy then fats
- ◆ store energy (adipose tissue)
fat > sugar
- ◆ keep heat (insulation)



adipose tissue 脂肪组织
walrus 海象
insulation 绝缘

Testing for fats and oils — ethanol emulsion test

1) mix food with ethanol
(fat can dissolve in ethanol)

2) Pour mixture into water
if there was any fat in the food, then the fat-ethanol mixture breaks up into millions of tiny droplets. This mixture is called an emulsion (white and opaque)



emulsion 乳状
ethanol 酒精
droplet 微滴
opaque 不透明的
transparent 透明的

protein



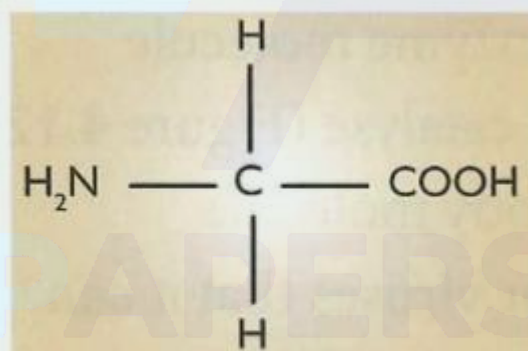
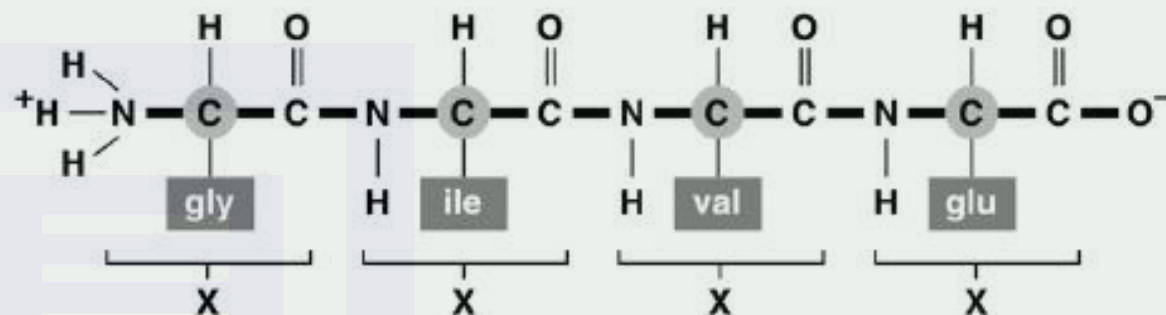
The chemicals of life

Protein

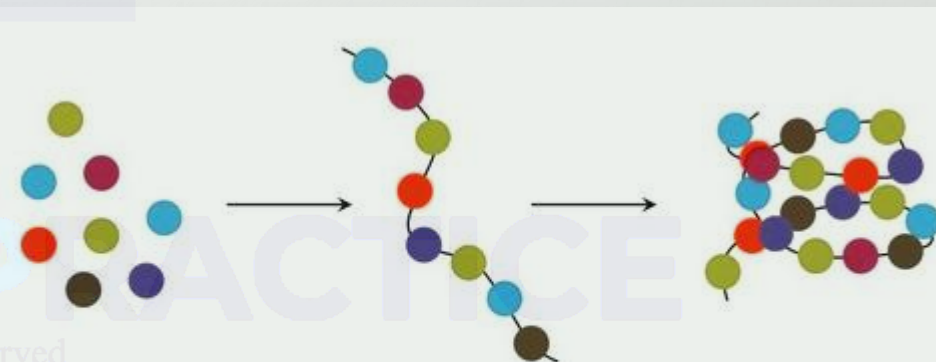
Protein

- ♦ Carbon, hydrogen, oxygen, nitrogen
- ♦ small amounts of sulfur
- ♦ amino acid
- 20 different kinds

amino acid 氨基酸



one kind of amino acid molecule



AMINO ACIDS

PEPTIDE

PROTEIN

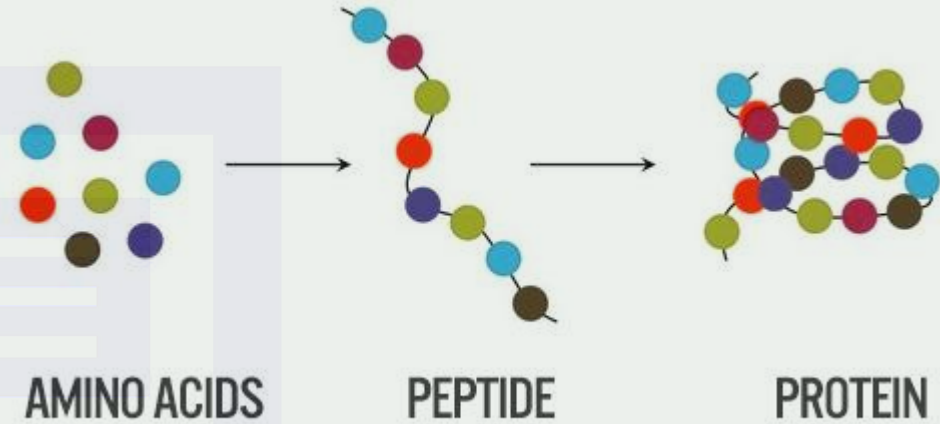
Protein

- ◆ Carbon, hydrogen, oxygen, nitrogen
- ◆ small amounts of sulfur amino acid
- 20 different kinds

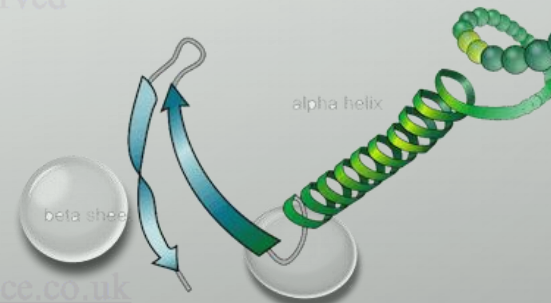
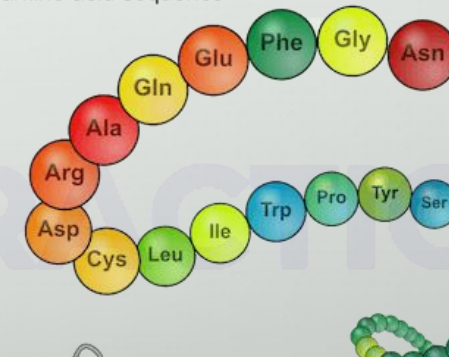
Each protein is made of molecules with amino acids in a **precise order**

Even a small difference in the order of amino acids make a difference protein

Different **sequences** of amino acids result in different **shapes** of protein.



Primary structure
amino acid sequence

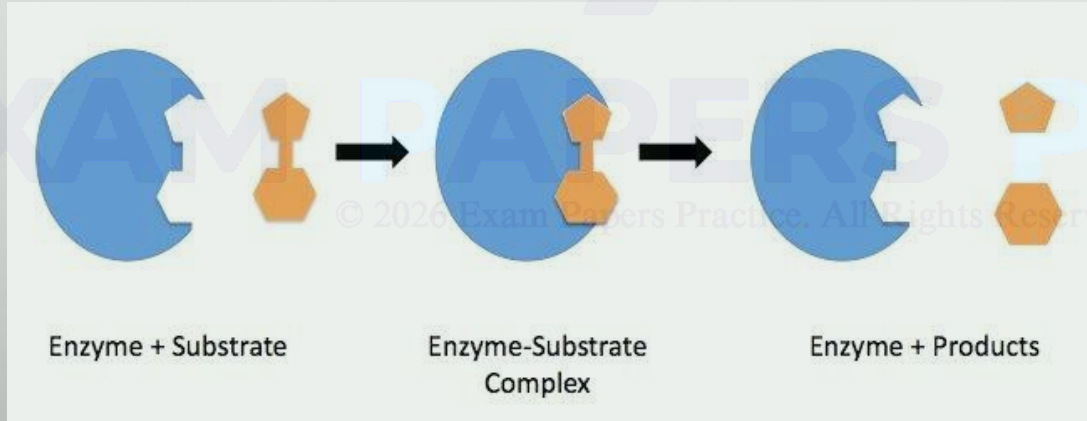


The chemicals of life

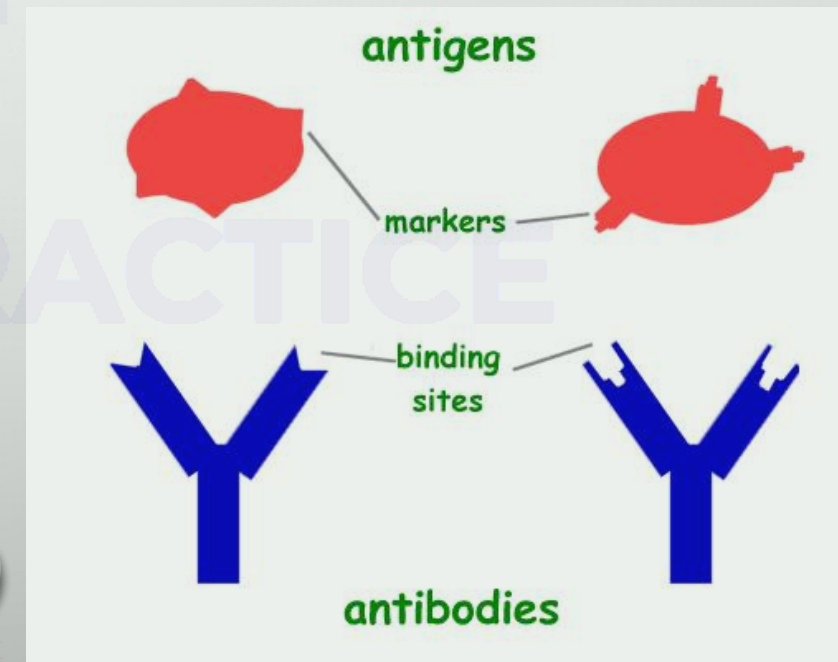
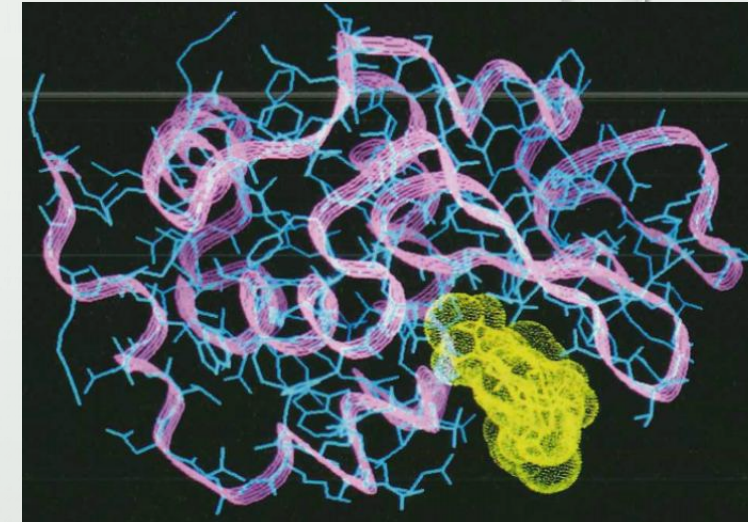
Protein

functions

- ◆ making new cells
e.g. repairing damaged parts, cell membrane and cytoplasm
- ◆ antibodies
- ◆ enzymes (biological catalyst)



antibody 抗体
enzyme 酶
catalyst 催化剂

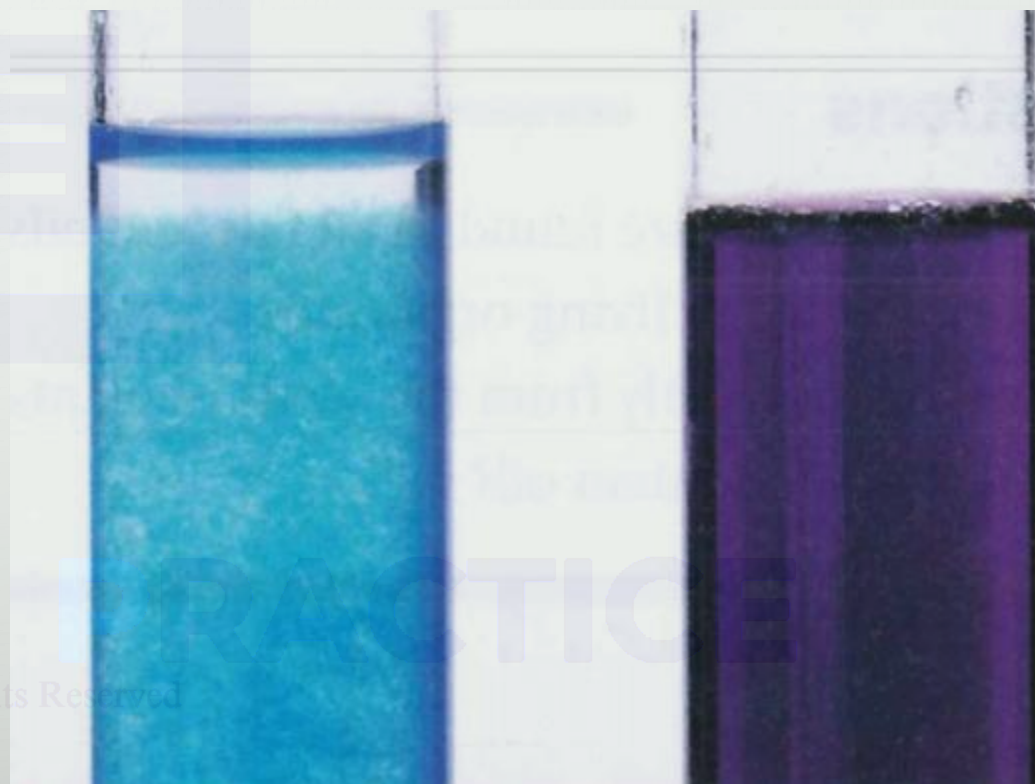


Testing for protein — biuret test

biuret test uses potassium hydroxide solution and copper sulfate solution. You can use a ready-mixed reagent called biuret reagent, which contains these two substances already mixed together.

- 1) mix food in water
- 2) Adding dilute copper sulfate solution
- 3) Adding dilute potassium hydroxide solutions

purple



biuret test 双缩脲检测

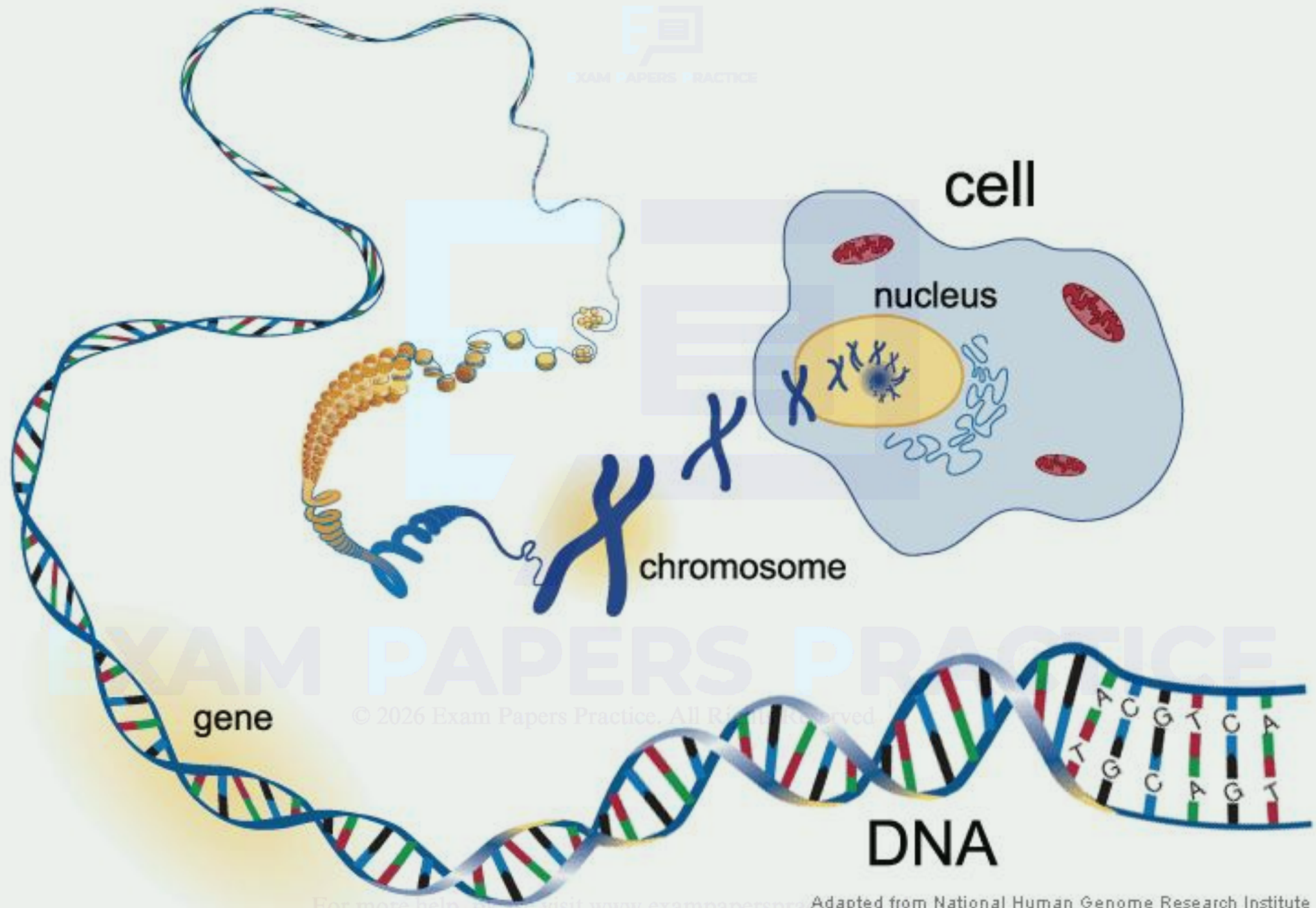
potassium hydroxide solution 氢氧化钾

copper sulfate solution 硫酸铜溶液

reagent 试剂

The chemicals of life

	Carbohydrates	Fats	Proteins
Elements they contain			
Smaller molecules of which they are made			
Solubility in water			
Why organisms need them			



The chemicals of life

DNA

DNA—— deoxyribonucleic acid

- ◆ genetic material
- ◆ two long strands (double helix)
 - base (A, G, C, T)
- ◆ The sequence of the bases in our DNA

↓
kinds of proteins

↓
characteristics

base 碱基
bond 键

