

Biology

Notes

For Study Guide

By Class 1 Grade 10
Liam 李浩民

Unit 1 Biochemistry.

1. Water

ribose 核糖

ribosome 核糖体

2. Nucleic Acids.
 DNA - Deoxyribo nucleic acids
 RNA - Ribo nucleic acids

polymer 聚合物

monomer 单分子 → nucleotide 核苷酸

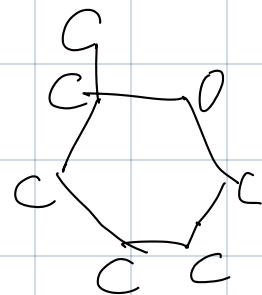
3. Proteins. Antibody 抗体 telomerase 端粒酶 polymer

$H_2N-C-COOH$ amino acids ← monomer

官能团 ← any groups R

4. Lipids 脂肪 (monomer)
 fats
 oil
 sterical 类固醇 (激素等)

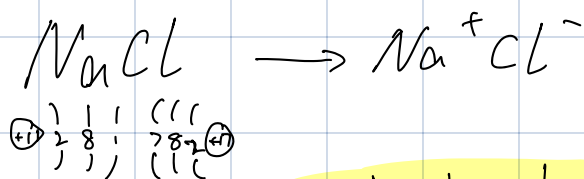
5. carbohydrates. → glucose (monomer)
 (CH₂O)_n
 ↓
 starch (polymer)



*: polymer \Rightarrow macro molecules.

	Nucleic Acid	Protein	Carbohydrates	Lipids 脂肪
monomer	nucleotide	amino acid	monosaccharide	脂
bond	sugar-phosphate covalent bond	peptide bond	glycosidic bond	ester bond
elements	C O H P N	C H O N S	C, H, O	C H O
functions	<ul style="list-style-type: none"> * store genetic information * transport phospholipid 	<ul style="list-style-type: none"> * enzyme * immune * transport * structure * 	<ul style="list-style-type: none"> * provide energy * store energy * raw materials * structure 	<ul style="list-style-type: none"> * energy storage * cushion organs * insulates body * Fat * phospholipids * steroid

1 Water



ionic bond 离子键

covalent bond 共价键

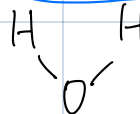
非极性

nonpolar

polar

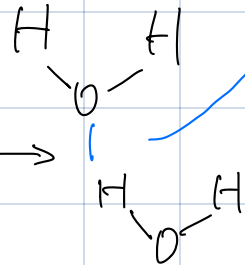
极性

eg:



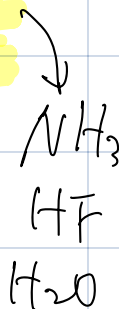
(H 显正电性
O 显负电性)

电子分布
不均匀



Hydrogen bond

氢键



相似相溶

Elixir of Life

灵丹妙药

Special properties of water

1. cohesion & adhesion 内聚力 附着力

surface tension, capillary action

2. good solvent

many molecules dissolve in H_2O

hydrophilic vs. hydrophobic

3. lower density as a solid

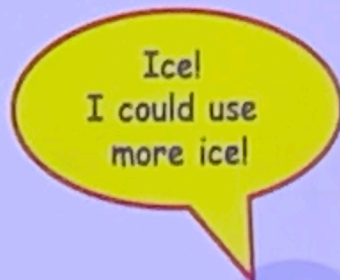
ice floats!

4. high specific heat 比热容

water stores heat

5. high heat of vaporization

heats & cools slowly



传屏码: D9R

1. cohesion & adhesion

eg: Transpiration 蒸騰作用

xylem 导管 — 水
phloem 筛管 — 营养物质

2. solvent 溶剂

solvent 溶质 solution 溶液

Ionization of water & pH

Water ionizes

- ♦ H^+ splits off from H_2O , leaving OH^-
- if $[H^+] = [OH^-]$, water is neutral
- if $[H^+] > [OH^-]$, water is acidic
- if $[H^+] < [OH^-]$, water is basic

pH scale

- ♦ how acid or basic solution is

♦ $1 \rightarrow 7 \rightarrow 14$

pH = 1
 $H^+ 10^{-1}$

pH = 3

$H^+ 10^{-3}$

pH = 14

$H^+ 10^{-14}$

$OH^- 10^{-13}$

\Rightarrow

$OH^- 10^{-11}$

\Rightarrow

$OH^- 10^0 = 1$

2. Nucleic Acids

Function: 1. stores information (DNA)
2. transfers information (mRNA, tRNA)

RNA

DNA

Nucleotides

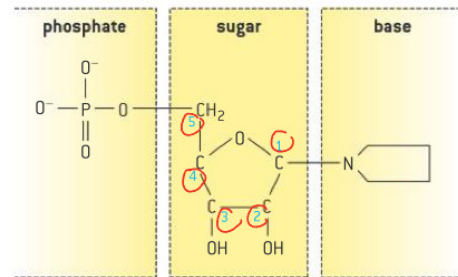


Figure 1 The parts of a nucleotide

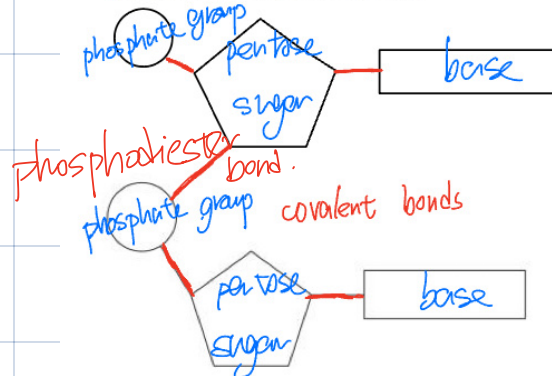
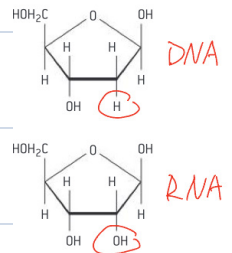
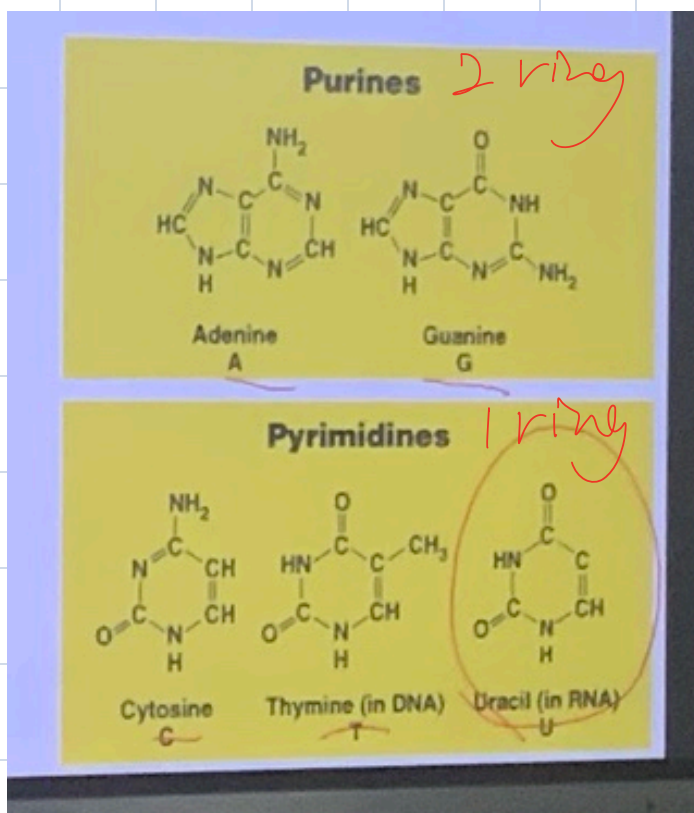


Figure 2 A simpler representation of a nucleotide

nitrogen base → A, G, C, T, U
pentose sugar → deoxyribose in DNA
phosphate group → ribose in RNA





purine = pyrimidine

A :: T

G :: C



H bond

3. Proteins.

The function of proteins

- Most structurally & functionally diverse group
- Function: involved in almost everything
 - enzymes (pepsin, DNA polymerase)
 - structure (keratin, collagen)
 - carriers & transport (hemoglobin, aquaporin)
 - cell communication
 - signals (insulin & other hormones)
 - receptors
 - defense (antibodies)
 - movement (actin & myosin)
 - storage (bean seed proteins)

胃蛋白酶

角蛋白

胶原蛋白

聚合酶

血红蛋白

水通道蛋白

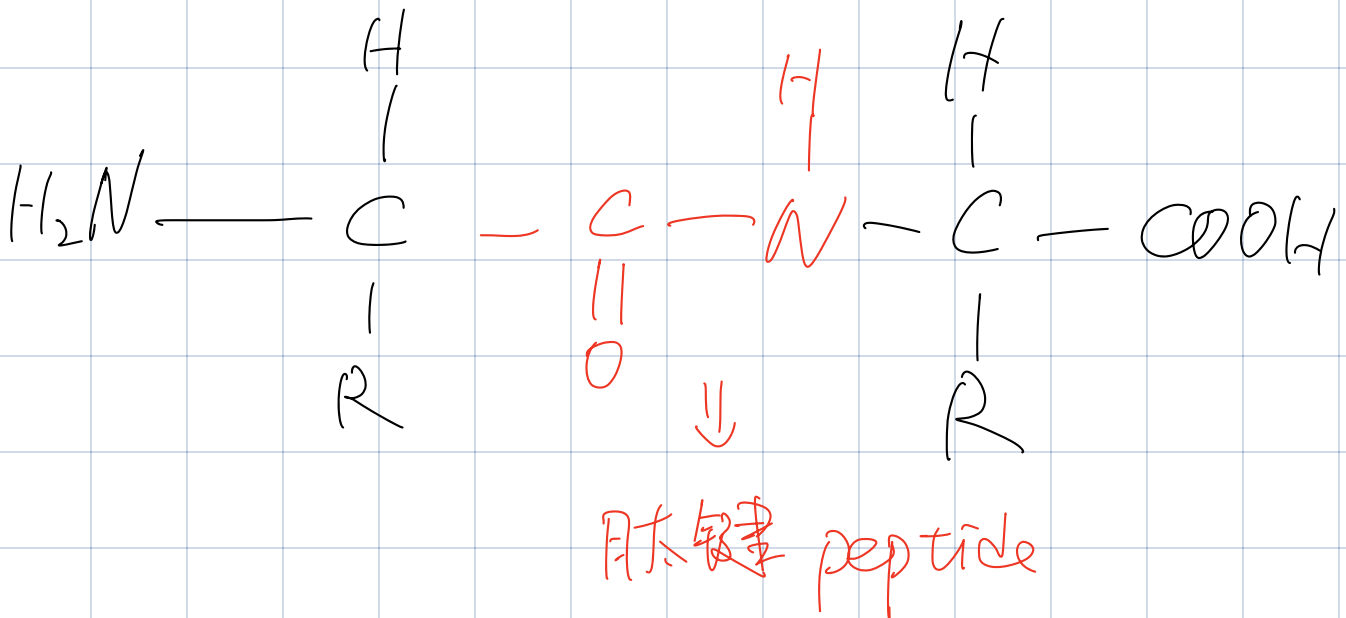
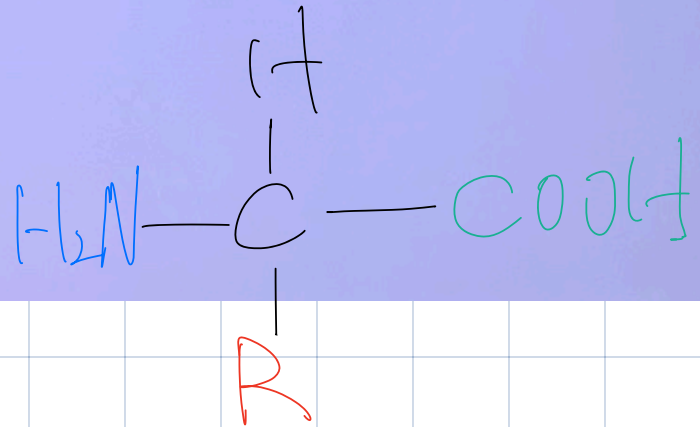
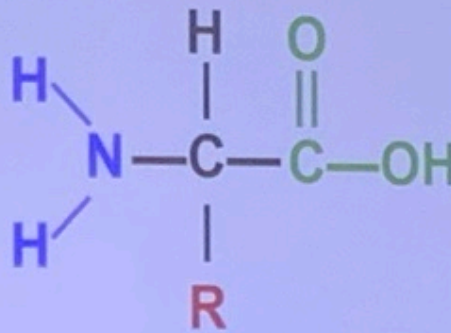
catalyst 催化剂

proteins \rightarrow amino acids (20 kinds)
(poly peptide 多肽)
polymer \rightarrow monomer

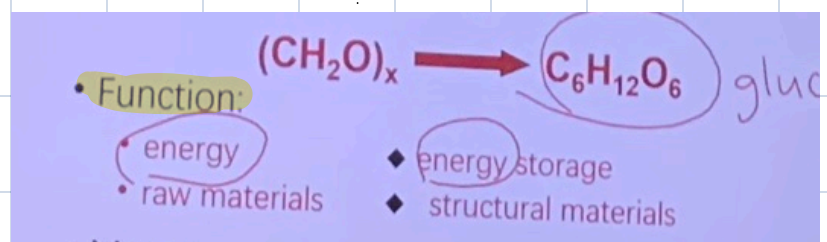
Amino acids

- Structure

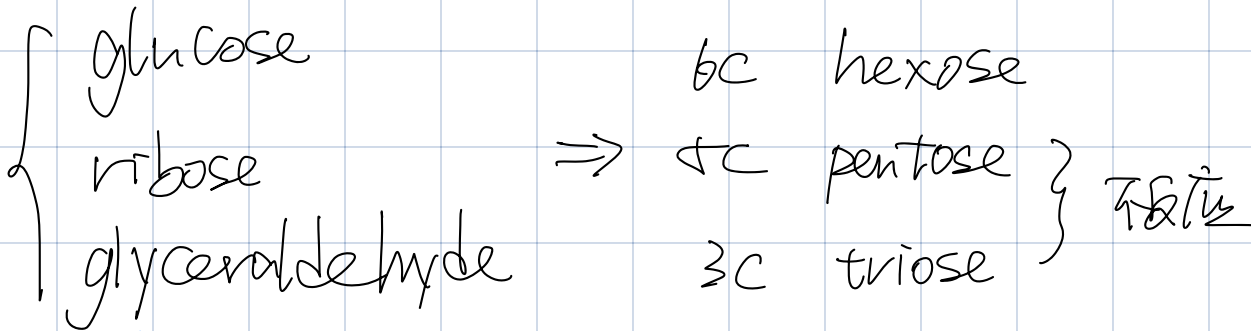
- central carbon
- amino group
- carboxyl group (acid)
- R group (side chain)
 - variable group



4. Carbohydrates $(CH_2O)_x$

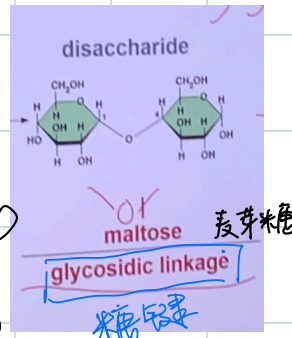
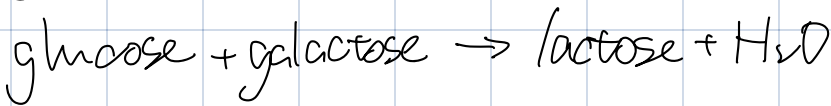
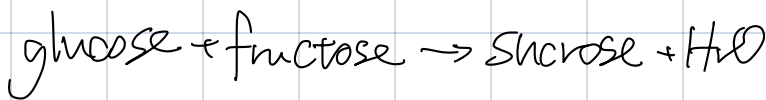
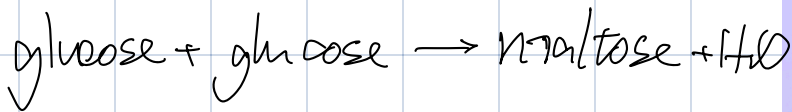


Monosaccharides



↓ dehydration synthesis

Disaccharides






Polysaccharides

glycosidic bond

Polysaccharides

- Polymers of sugars
 - costs little energy to build
 - easily reversible = release energy
- Function:
 - energy storage
 - starch (plants)
 - glycogen (animals)
 - in liver & muscles
 - structure
 - cellulose (plants)
 - chitin (arthropods & fungi)
几丁质 \rightarrow 节肢动物



5. Lipid, 脂类

composed of C, H, O

fat 脂肪

phospholipids 磷脂

steroids 类固醇

⇒ big monomer
x polymer.

Fats: Triglycerides

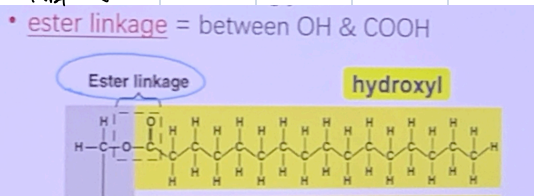
↓
glycerol + fatty acid

(甘油, 丙三醇)

脂肪酸

dehydration synthesis

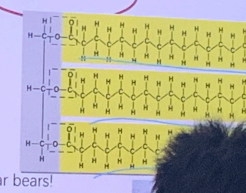
long tail
carboxyl group (COOH) 羧基.



Fats store energy

- Long HC chain
- polar or non-polar?
- hydrophilic or hydrophobic?
- Function:
 - energy storage
 - concentrated
 - all H-C/
 - cushion organs
 - insulates body
 - Whale blubber & polar bears!

non-polar
hydrophobic



Saturated Fats

solid at room temperature, from animal.

Unsaturated Fats

liquid at room temperature, from plant / fish

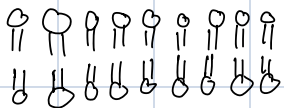
Phospholipids

phospholipids

glycerol + 2 fatty acids + PO_4

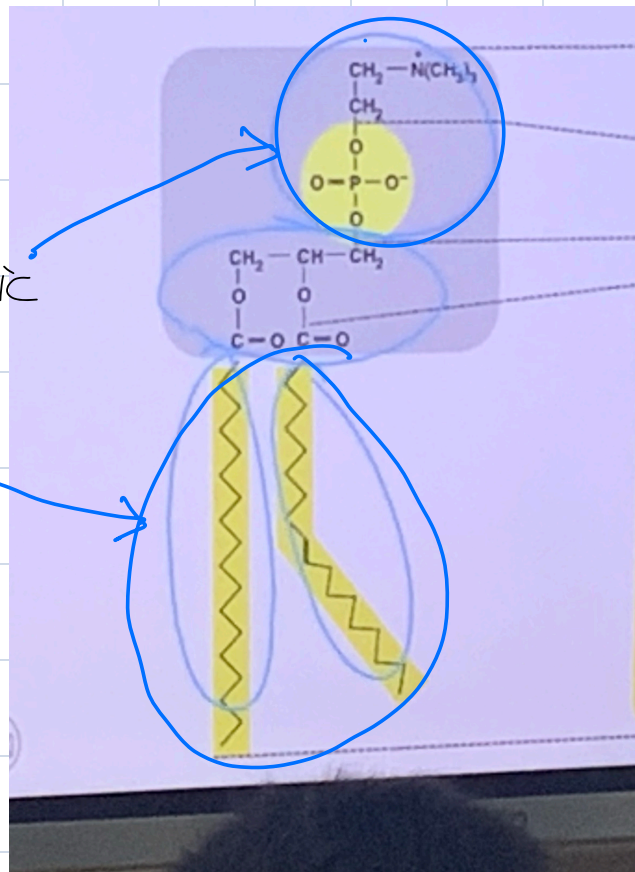
↓ hydrophobic ↓ hydrophilic

外液



细胞膜

细胞质 (内液)



Steroids

Steroids

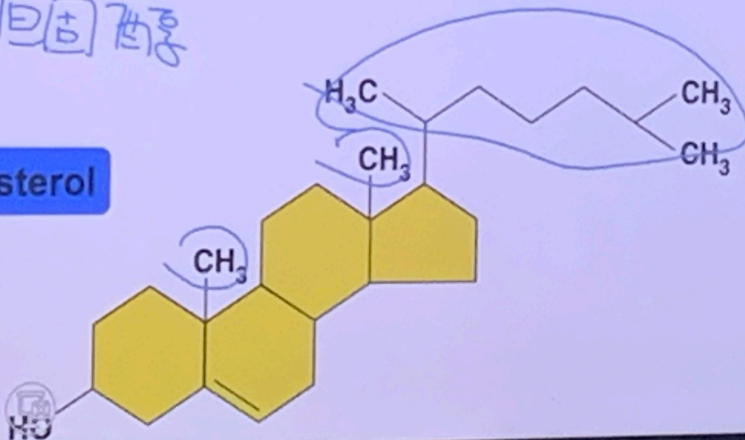
Structure:

- 4 fused C rings + ??
- different steroids created by attaching different functional groups to rings
- different structure creates different function
- examples: cholesterol, sex hormones

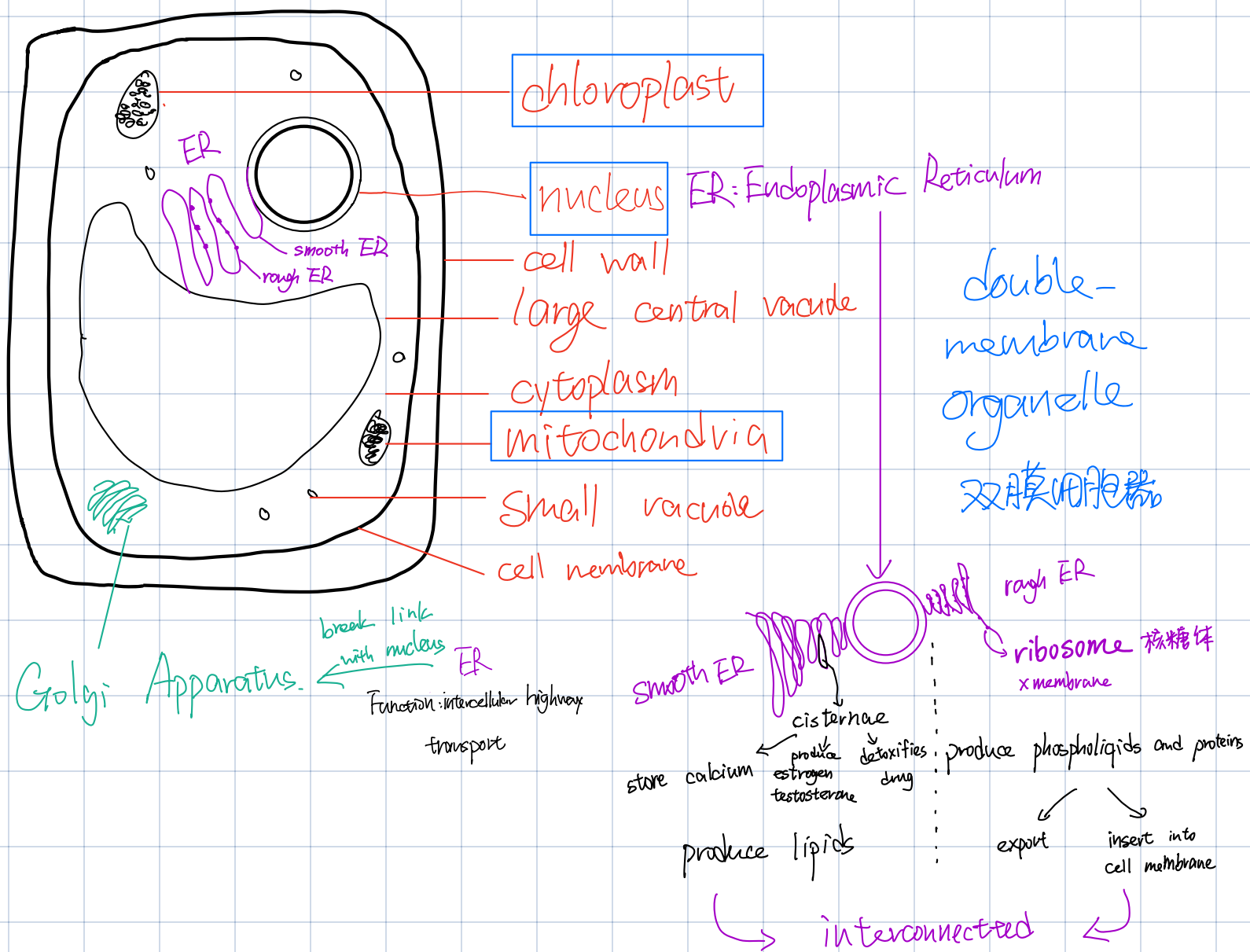


胆固醇

cholesterol



Unit 2 Cell



Prokaryotes 原核生物 → prokaryotic cell

nucleoid 核区



DNA



nuclear membrane



nucleus

Eukaryotes 真核生物 → eukaryotic cell

Nucleus

controls most functions in eukaryotic cells
stores the genetic information

