

1.2 Cells as the basic units of living organisms

Name: _____ Class: _____ Date: _____

Total: 22 marks

Objective

Build the skills to answer exam questions on **cells as the basic units of living organisms** —identifying **organelles** 细胞器, comparing plant, animal and **prokaryotic** 原核 cells, and describing viruses.

You must be able to:

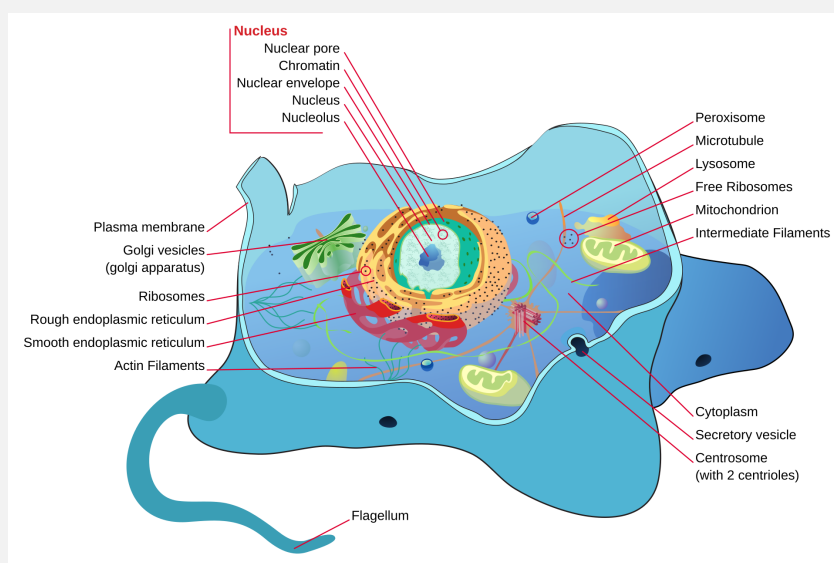
- name organelles from their structure and give their function
- compare a typical plant cell with a typical animal cell
- compare a **prokaryotic cell** with a **eukaryotic cell** 真核细胞
- state that a virus is non-cellular, with a nucleic acid core and a protein **capsid** 衣壳

1 Worked examples

Study these first. Each shows the **method** 方法 for a question type used later.

■ Identifying an organelle from its features

Match the clues —shape, membranes, contents—to one organelle, then give its job. Learn to recognise each organelle in the diagram below.



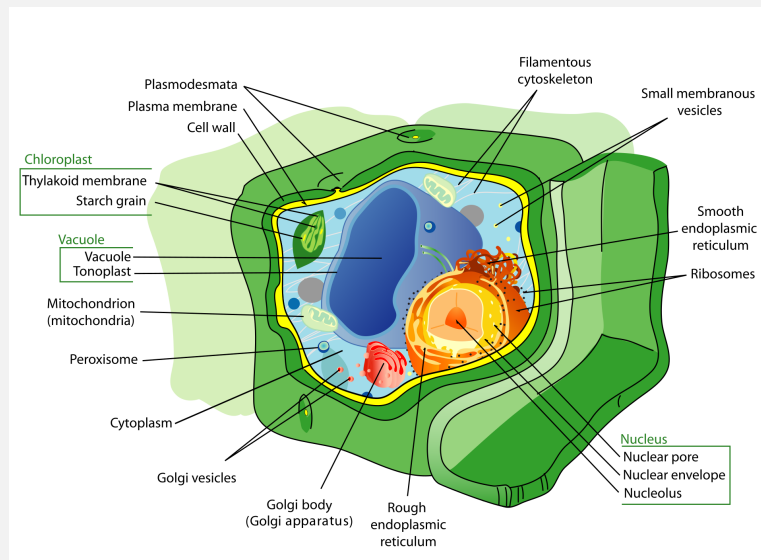
A generalised animal cell —recognise each organelle by its shape and position

Image: source

Example. "This organelle is oval, has a folded inner membrane, and contains small circular DNA and 70S ribosomes." → It is a **mitochondrion** 线粒体. Its function is **aerobic respiration** 有氧呼吸—releasing energy as ATP. (The folded inner membrane and own circular DNA are the give-away clues.)

■ Answering a "compare" question

"Compare" means give points that mention **both** sides, and include at least one **similarity**.



A plant cell —note the features an animal cell does not have

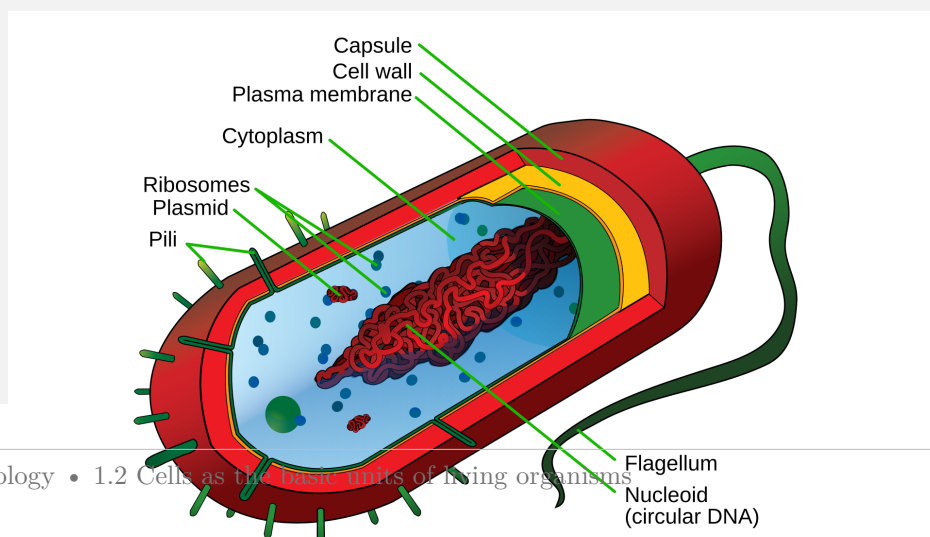
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Example —plant vs animal cell. Write paired statements:

- a plant cell has a **cellulose** 纤维素 cell wall; an animal cell has none.
- a plant cell has **chloroplasts** 叶绿体; an animal cell has none.
- a plant cell has one large permanent **vacuole** 液泡; an animal cell has only small, temporary ones.
- **both** have a cell surface membrane, cytoplasm, a nucleus and mitochondria.

■ Comparing prokaryotic and eukaryotic cells

A **prokaryotic cell** (a bacterium) has no nucleus and no membrane-bound organelles.



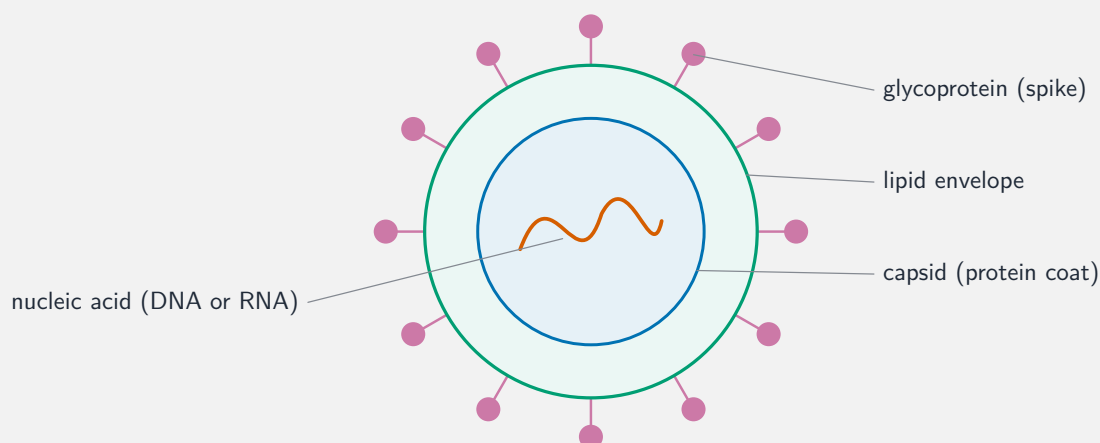
The key differences examiners reward:

feature	prokaryotic cell	eukaryotic cell
nucleus	none (DNA free in cytoplasm)	true nucleus with envelope
DNA	circular, no histones 组蛋白	linear, wound on histones
ribosomes	70S	80S (in the cytoplasm)
membrane-bound organelles	absent	present (mitochondria, ER, Golgi)
size	1–5 μm	10–100 μm

Both have a cell surface membrane, cytoplasm, ribosomes and DNA. (A prokaryote also has a wall, but of **peptidoglycan** 肽聚糖, not cellulose.)

■ Viruses are non-cellular

A virus is **not** a cell. It has only a **nucleic acid** 核酸 core (DNA *or* RNA) inside a protein **capsid**; some also have an outer phospholipid **envelope** 包膜.



A generalised virus: nucleic acid core, protein capsid, and (in some) a lipid envelope

It has no cytoplasm, no organelles and no ribosomes, so it cannot release energy or make proteins on its own.

2 Practice

2.1 Name the organelle that carries out each function.

[4]

function	organelle
makes and transports proteins (has ribosomes on it)	
packs and modifies proteins into vesicles	
site of photosynthesis	
breaks down old organelles and waste	

2.2 State **three** structures found in a plant cell that are **not** found in a typical animal cell.

[3]

2.3 Give the size (S value) of the ribosomes found in (a) the cytoplasm of a eukaryotic cell, and (b) a prokaryotic cell. [2]

3 Exam-style questions

3.1 Which structures are found in **both** a prokaryotic cell and a eukaryotic cell? [1]

- **A** cell surface membrane, cytoplasm, ribosomes
 - **B** mitochondria, nucleus, ribosomes
 - **C** chloroplasts, cell wall, vacuole
 - **D** nuclear envelope, Golgi body, lysosomes
-

3.2 An organelle has a **double membrane** and contains small **circular DNA**. Which organelle could it be? [1]

- **A** lysosome
 - **B** mitochondrion
 - **C** ribosome
 - **D** smooth endoplasmic reticulum
-

3.3 Which feature is present in a prokaryotic cell but **not** in a eukaryotic cell? [1]

- **A** 70S ribosomes only
 - **B** a cell surface membrane
 - **C** a Golgi body
 - **D** linear DNA wound on histones
-

3.4 A student views an electron micrograph of an animal cell.

(a) One organelle is described as *"a stack of flat membrane sacs near the nucleus"*. Name this organelle and state its function. [2]

(b) Another organelle has "*sheets of membrane covered with ribosomes*". Name it and state what it makes. [2]

3.5 The diagram of the prokaryotic cell above shows several features. Compare the structure of a prokaryotic cell with that of a eukaryotic cell. Give **two** differences and **one** similarity. [3]

3.6 Describe the structure of a virus. [3]

4 Go further

You are now ready for the real exam questions on this subtopic. Open the **1.2 Cells as the basic units of living organisms** past-paper sheet in the Library, or try these in **Practice mode**:

- 9700/11 N25 —Q3 (organelle structure and function)
- 9700/13 N25 —Q2 (prokaryotic and eukaryotic cells)
- 9700/14 N25 —Q4 (plant and animal cell comparison)
- 9700/22 N25 —Q1 (cell structure, structured question)

Solutions

2.1 rough endoplasmic reticulum; Golgi body (Golgi apparatus); chloroplast; lysosome.

2.2 Any three of: cellulose cell wall; chloroplasts; large permanent vacuole (tonoplast); plasmodesmata.

2.3 (a) 80S; (b) 70S.

3.1 A. A cell surface membrane, cytoplasm and ribosomes occur in all cells; the others are eukaryote-only.

3.2 B. Mitochondria (and chloroplasts) have a double membrane and their own circular DNA.

3.3 A. Prokaryotes have only 70S ribosomes; the cell surface membrane is in both, and a Golgi body and histone-wound linear DNA are eukaryote features.

3.4 (a) Golgi body / Golgi apparatus; modifies and packages proteins/lipids into vesicles for secretion.

(b) rough endoplasmic reticulum; makes (and transports) proteins.

3.5 Two differences, e.g. prokaryote has no nucleus while eukaryote has a true nucleus; prokaryote has 70S ribosomes while eukaryote has 80S; prokaryote has no membrane-bound organelles while eukaryote does. One similarity, e.g. both have a cell surface membrane / cytoplasm / ribosomes / DNA.

3.6 A nucleic acid core, either DNA or RNA; surrounded by a protein coat called a capsid; some have an outer phospholipid envelope / it is non-cellular with no organelles.