1.2 Cells as the basic units of living organisms

Name: _____ Class: _____ Date: _____ **Total: 34 marks**

KEY WORDS organelle • cell wall • prokaryotic • prokaryotic cell • cell surface membrane

Objective

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

You must be able to:

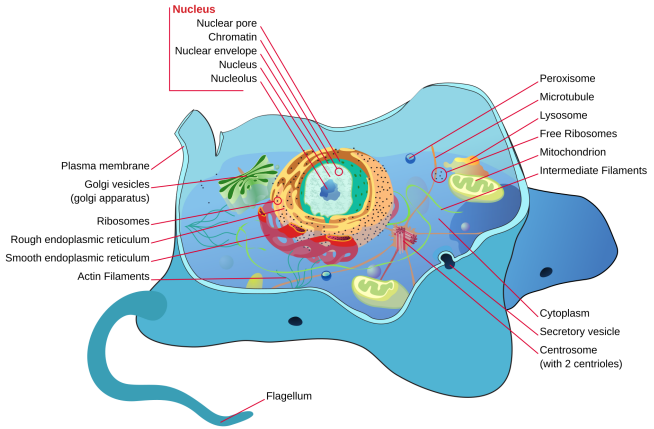
- name organelles from their structure and give their function
- compare a typical plant cell with a typical animal cell
- compare a **prokaryotic cell** with a **eukaryotic cell**
- state that a virus is non-cellular, with a nucleic acid core and a protein **capsid**

1 Key knowledge and worked examples

Study these first. Each shows the **method** 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.

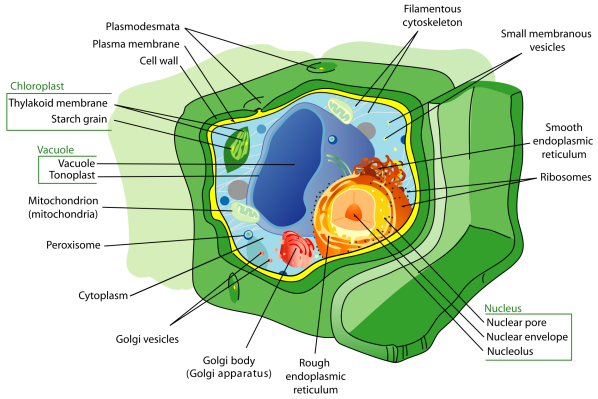


A generalised animal cell – recognise each organelle by its shape and position

Example. *"This organelle is oval, has a folded inner membrane, and contains small circular DNA and 70S ribosomes."* → It is a **mitochondrion** . Its function is **aerobic respiration** – 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

Example – plant vs animal cell. Write paired statements:

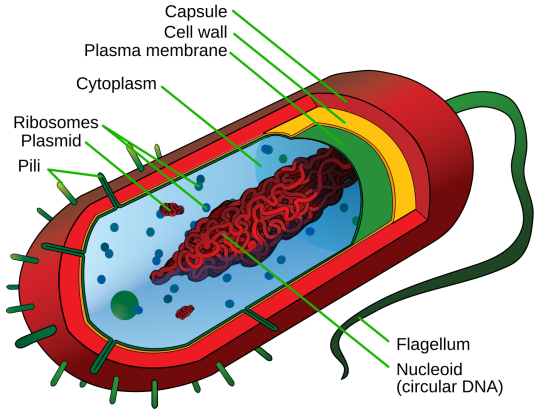
- a plant cell has a **cellulose** cell wall; an animal cell has none.
- a plant cell has **chloroplasts** ; an animal cell has none.
- a plant cell has one large permanent **vacuole** ; an animal cell has only small,

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.



A prokaryotic cell: circular DNA lies free in the cytoplasm; 70S ribosomes; no nucleus

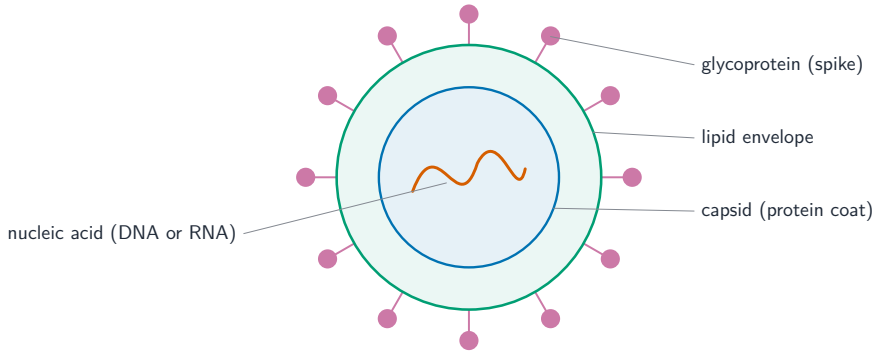
The key differences examiners reward:

feature	prokaryotic cell	eukaryotic cell
nucleus	none (DNA free in cytoplasm)	true nucleus with envelope
DNA	circular, no **histones**	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** , not cellulose.)

■ Viruses are non-cellular

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



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]

3.7 An electron micrograph shows a cell containing many mitochondria, an extensive network of rough endoplasmic reticulum, a large Golgi body, numerous vesicles at the cell surface, and no cell wall.

(a) State, with **three** pieces of evidence from the description, whether this is a prokaryotic or a eukaryotic cell. [3]

(b) Suggest the function of this cell, and justify your suggestion using **two** of the organelles named. [3]

(c) Describe the route taken by a protein from the gene that codes for it to the outside of the cell, naming each organelle involved. [4]

(d) State **two** reasons why the mitochondria could not have been seen in this detail with a light microscope. [2]