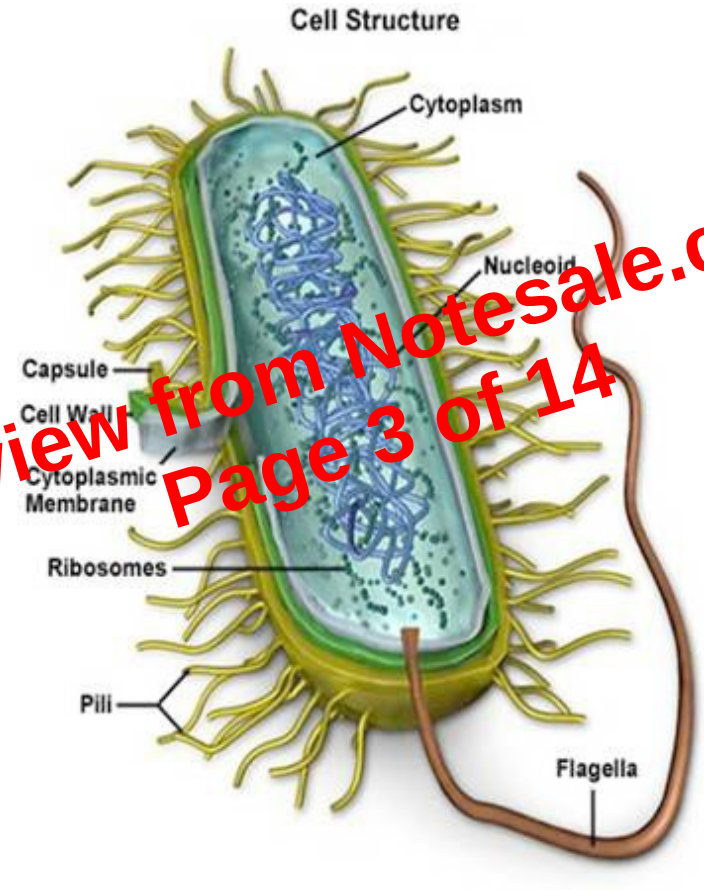
Prokaryotic and Eukaryotic Cells

- All cells can be classified as either **prokaryotic** or **eukaryotic**.
- Prokaryotic cells do not have a nucleus. Instead they have a loop of naked DNA (nucleoid).
- Eukaryotic cells' DNA is contained within a membrane, forming a nucleus. Eukaryotic chromosomes are linear, not loops.
- Both prokaryotic and eukaryotic cells are organized into discrete structures called organelles, which have specific functions within the cell. Eukaryotic cells have more, and they are more complex – membrane bound organelles.

Note: Any eukaryotic cell is more similar to any other eukaryotic cell than any prokaryotic cell.

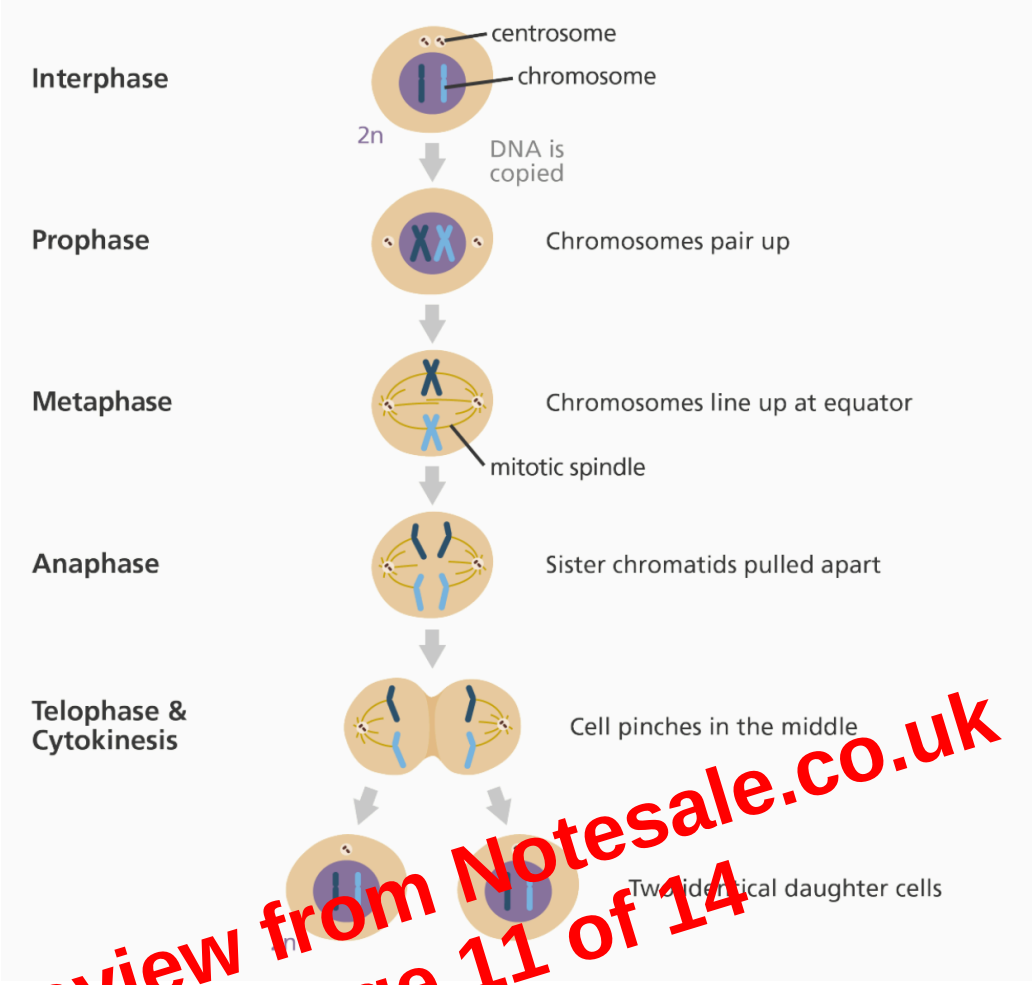
Prokaryotic Cells

These cells do not have a membrane-bound nucleus, just a simple loop of DNA. They also have very few organelles.



Functions of Prokaryotic Cell Structures:

- Cell wall: protective outer layer that prevents damage from outside and bursting if internal pressure is too high
- Plasma membrane: controls exchange of substances (nutrients and waste)
- Cytoplasm: contains enzymes that catalyze the chemical reactions of metabolism and DNA
- Ribosomes: synthesize proteins by translating messenger RNA; stay in the cell or secreted
- Naked DNA: stores the genetic information that controls the cell - is passed onto the daughter cells
- Pili: hair-like structures that enable attachment to surfaces and to other bacteria Prokaryotes (bacteria) may be classified according to their metabolism:



Mitosis is used in eukaryotes whenever it is necessary to produce identical cells:

- Growth of multicellular organisms (e.g. bone cells, muscle cells)
- Embryonic development
- Repair of damaged tissues (e.g. new skin cells to repair a wound)
- Asexual reproduction

How Mitosis ensures that Identical Cells are produced:

- During interphase (S), an exact copy of each chromosome is made by DNA replication, forming two identical sister chromatids.
- The sister chromatids remain attached to each other by their centromeres during metaphase, when each gets attached to a spindle fibre.
- In anaphase, the centromeres split and one chromatid from each pair moves towards opposite poles of the cell.
- The chromosomes at the poles become the nuclei of the daughter cells, each with identical sets of chromosomes.
- Cytokinesis splits the parent cell in between the two new nuclei, forming two cells with exact copies of the original nucleus.