TOPIC 1: CELL & CELL EVOLUTION

- Define the fundamental unit of life, a cell – cell theory

A cell is small, membrane bound compartment in which most biological reactions occur. They contain a wide range of ions and molecules. They can be single cell organisms or multicellular, where cells communicate and co-operate with each other in tissues.

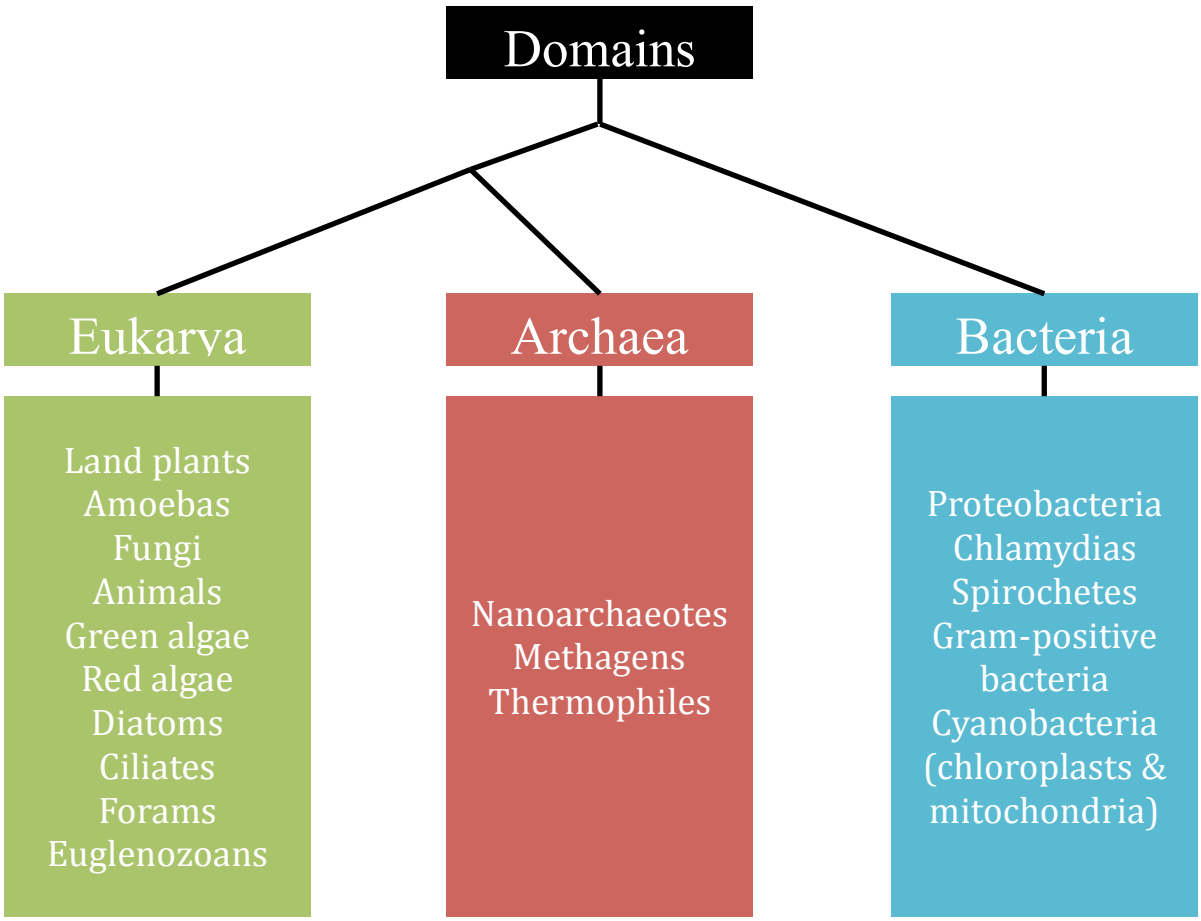
Cell Theory states that
- all organisms are made of cells and the products of cells
- all cells come from pre-existing cells
- the cell is the smallest and simplest organization unit

Cells were first viewed by Antoni van Leeuwenhoek.
They are approximately 0.2-100μm in size.

Every cell
- needs proteins
- has ribosomes to make proteins
- has DNA to encode ribosomes

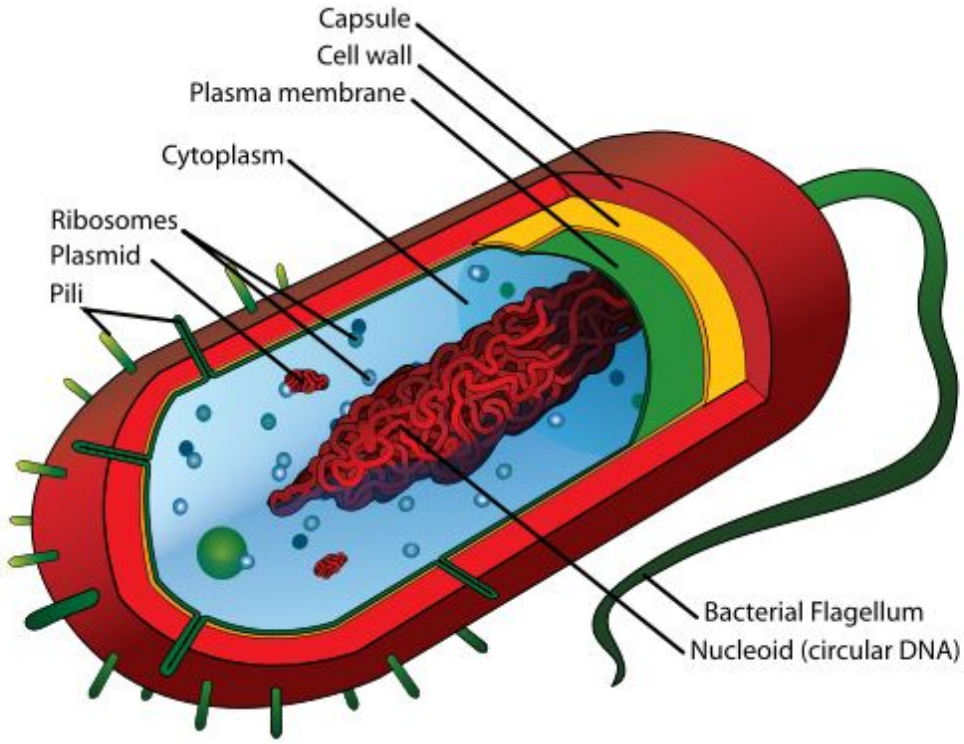
- Describe features that distinguish the 3 domains (Bacteria, archaea, Eukarya)

Domain structure based on ribosomal RNA



A **prokaryotic cell** has no nucleus and DNA is held in the nucleoid in chromosomes.

Bacteria are the most common cells and are still being discovered as they are important in the life of the Earth. They contain no organised nucleus or plastids. They have a single circular chromosome in the nucleoid region. Their size is about 1-5μm and they contain plasmids which are small circular DNA fragments.
They are single celled and can be spherical (cooci), rod-shaped (bacilli) or spirals (spirilla).



EG: photosynthetic cyanobacteria, anabaena (a cyanobecteria fertilizer in rice paddies),

However bacteria can be large. *Epulopiscium fishelsoni* is 0.2-0.7 millimetres. *Thiomargarita namibiensis* can be 0.7mm.

Bacterial cell walls contain peptidoglycan and is important for protection. Gram staining bacteria helps determine if bacteria is Gram-positive or Gram-negative depending on the thickness of the peptidoglycan. Gram positive bacteria appear purple as they retain the dye due to the thick layer of peptidoglycan however gram negative bacteria appear pink as the thin layer of peptidoglycan allows the dye to wash out.

An **archaean** organism is a type of prokaryote that lives in extreme climates. They produce methane, or live in high salt or high temperature climates.

- Explain how eukaryotic cells are thought to have evolved – endosymbiosis

Endosymbiosis: is a theory that states that an early ancestor of eukaryotic cells engulfed an oxygen-using non-photosynthetic prokaryotic cell and then some engulfed a photosynthetic prokaryote and gave us animal and plant eukaryotic cells with chloroplasts and mitochondria

- Describe common features of eukaryotic cells

A **eukaryotic cell** has a membrane bound nucleus which contains DNA and also has organelles which are special compartments of the cell with specialised function.

Types of Eukaryotes

- Excavata: diverse, often groove on bodies, often modified mitochondria, parasitic EG: *Euglena sp., Trypanosoma sp., Giardia intestinalis*
- SAR
  - Stramenopila: with extremely diverse lineage, diatoms, brown algae, EG: *Oomyceta, Phytophthora infestans, Saprolegnia sp.*
  - Alveolata: membrane-lined sacs regulate diffusion across plasma membrane, red tides (carotenoids), bioluminescence, malaria EG: *Paramecium caudatum, Dunaliella salina, Noctiluca sp., Plasmodium sp.*
  - Rhizaria: amoebas with hard shells EG: *Foraminifera, Baculogypsina sphaerulata*
- Unikonta:
  - slime moulds, *Dictyostelium discoideum,*
  - Fungi: multicellular, *Basidiomycetes, Chytrids, Zygomycetes, Glomeromycetes, Ascomycetes, Mycorrhiza,* unicellular, *Saccharomyces cerevisiae, Candida albicans*
  - Animalia
- Archaeplastida
  - Rhodophyta: nori
  - Chlorophyta: *Volvox sp., Spirogyra varians*
  - Plantae: include non-vascular, seed-forming and vascular