CLASSIFICATION

- ☑ 5 kingdoms
- ☑ Viruses
- ☑ Classification system (using DNA base sequences in classification)
- ☑ Species & binomial system

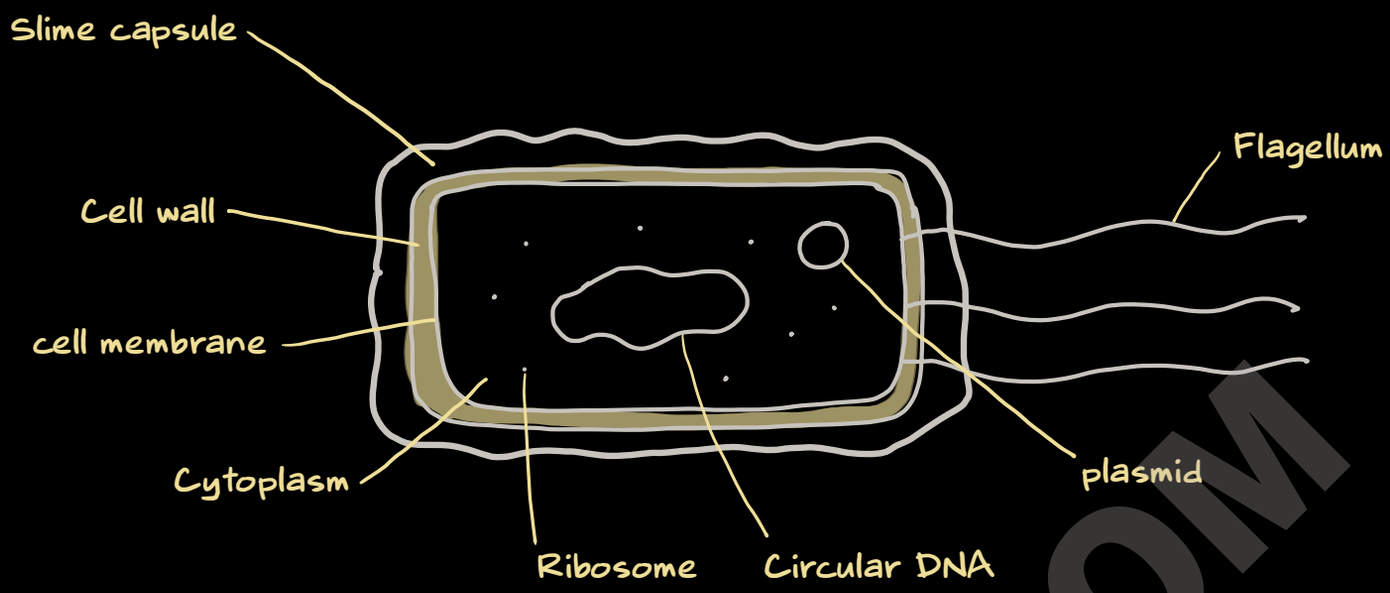
5 kingdoms

- 5 kingdoms:
  - Bacteria
  - Protoctists
  - Fungi
  - Animals
  - Plants

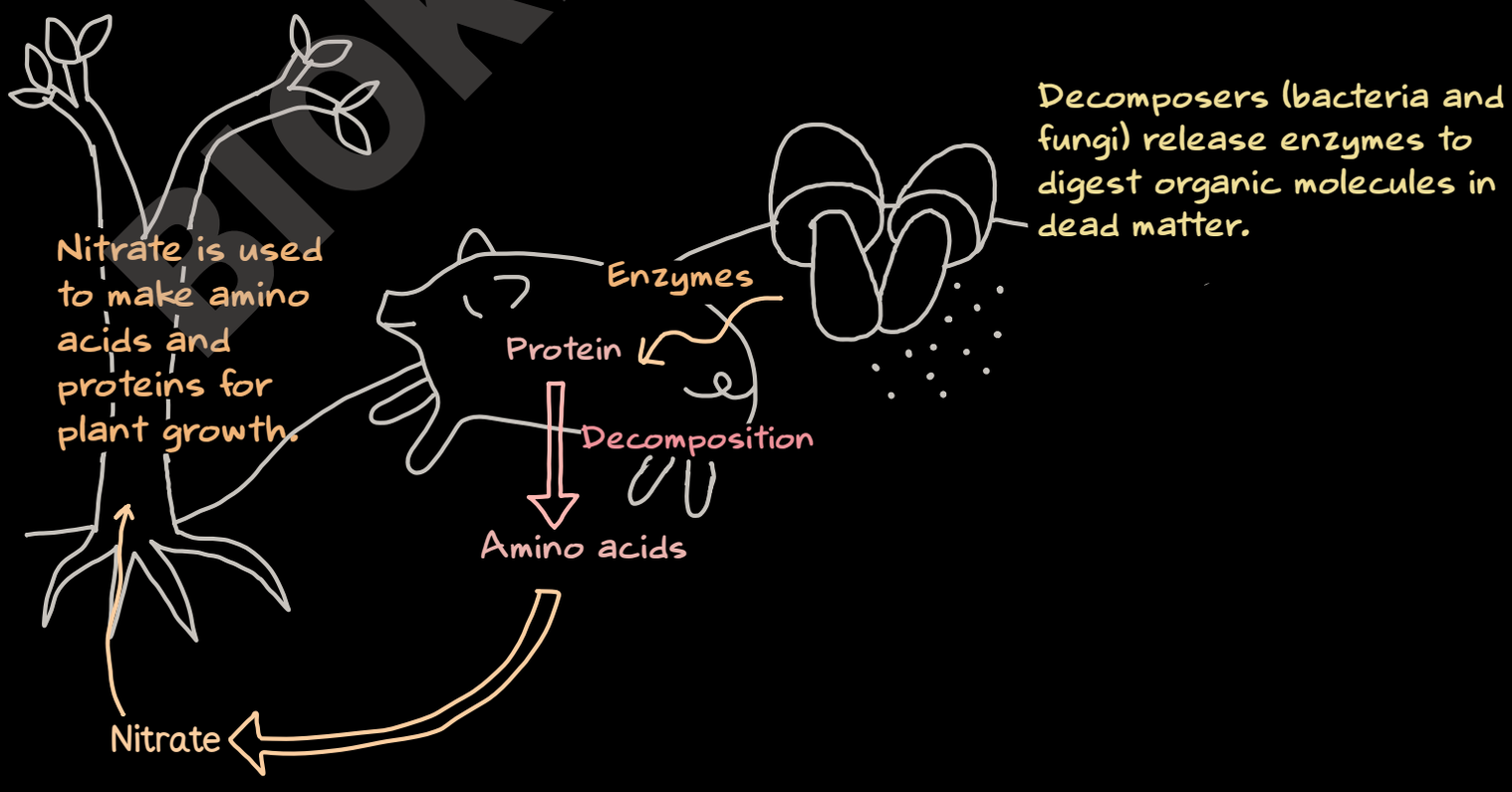
Bacteria

- Bacteria are prokaryotes.
  - This means they do not have a nucleus and other membrane-bound organelles such as mitochondria, RER, vesicles, and vacuoles.
    - Genetic materials of bacteria are circular DNA and plasmids, which float freely in the cytoplasm.
  - Pro means before or ancient, and kryon means nucleus.
    - Prokaryotic cells then have the properties of cells that exist in ancient times with no nucleus.
- Bacteria are unicellular.
- Size of bacteria is around 1 micrometer.
- Bacteria are present in many types and shapes.
  - Coccus = spherical shape
  - Bacillus = rod shape

Structure of a bacterial cell

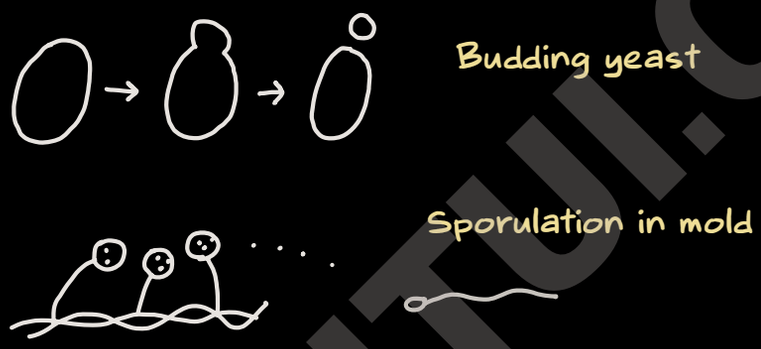


- Bacteria are decomposers or saprotrophs.
  - This means they obtain organic nutrients from dead matter and organic waste by releasing extracellular enzymes out of their bodies to break down complex molecules into simpler ones that can be absorbed into their bodies for usage.
  - Decomposers are essential to the ecosystem as they help recycle nutrients back to producers and prevent the accumulation of dead matter.



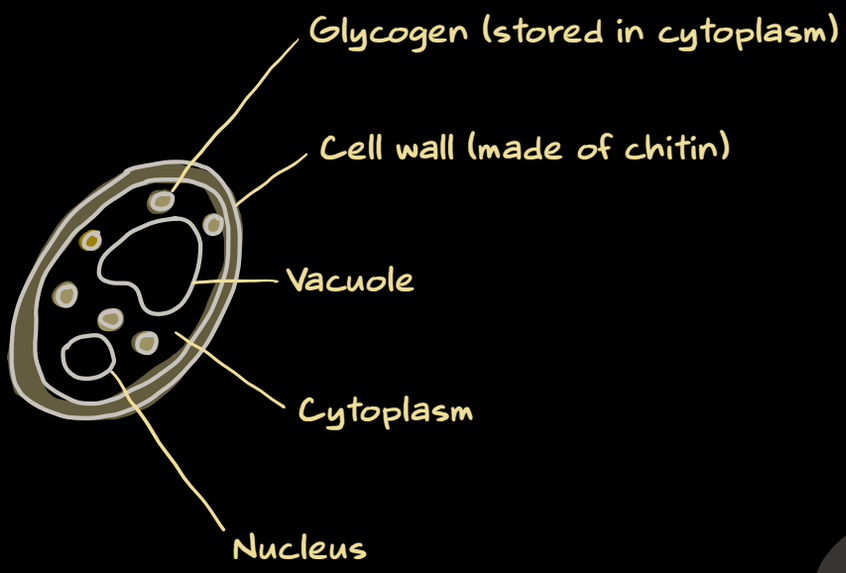
Fungi

- Examples of fungi are yeast and mold.
    - Yeast is unicellular, but mold is multicellular.
- Cell walls of fungi are made of chitin.
- Fungi are decomposers or saprotrophs. They obtain organic nutrients from dead matter through decomposition.
- Yeast and mold reproduce asexually.
    - Yeast reproduces by budding.
    - Mold reproduces by sporulation.

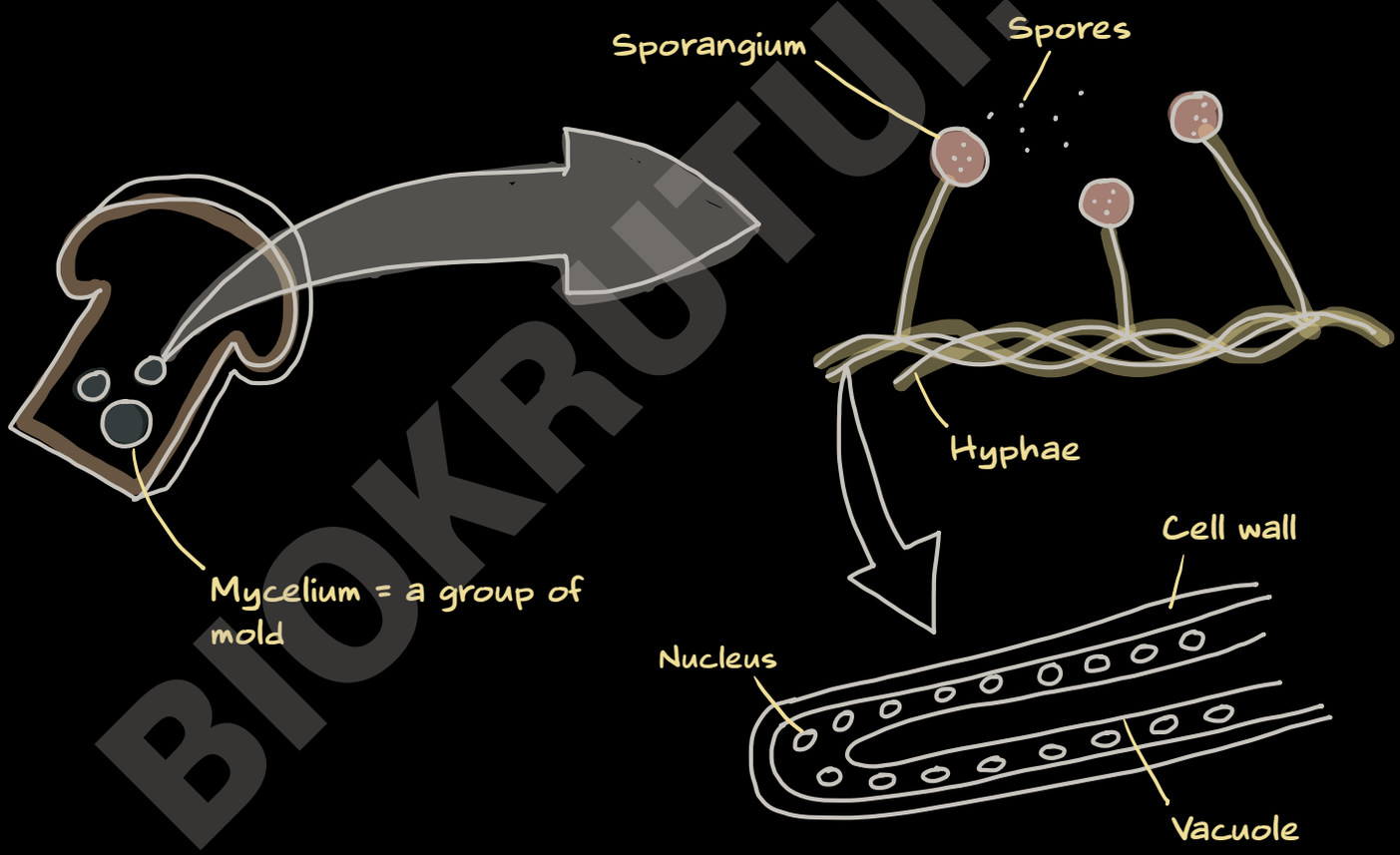


- Importance of fungi
    - Yeast is involved in bread-making.
        - Yeast is added to bread dough to make it rise.
            - Yeast respires sugar in the dough anaerobically and produce carbon dioxide that forms bubbles in the bread dough.
    - Yeast is involved in the production of biofuels.
        - Starch from plants is treated with amylase to break down into glucose.
        - Yeast is added to do anaerobic respiration with glucose, converting it into carbon dioxide and ethanol that can be used as biofuels.
    - Mold, such as penicillium, produces a substance that can kill bacteria.
        - Substances produced from penicillium can be later extracted to make an antibiotic called penicillin.

Structure of a yeast cell

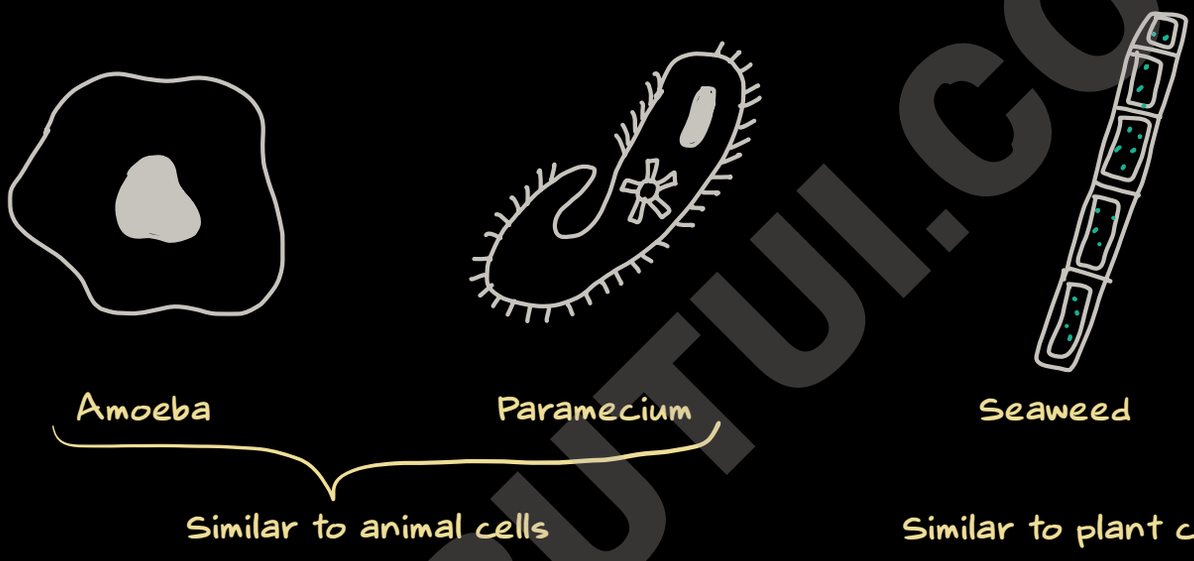


Structure of mold



Protoctists

- All Protoctists are eukaryotes.
- All Protoctists are unicellular. Some protoctist cells are grouped in the form of colonies but do not function together as tissue. An example of this is seaweed or algae.
- Some protoctists are like animal cells. Some are like plant cells with the presence of cell walls and chloroplasts.
    - Animal-like protoctists are amoeba and paramecium.
    - Plant-like protoctists are euglena and seaweeds.

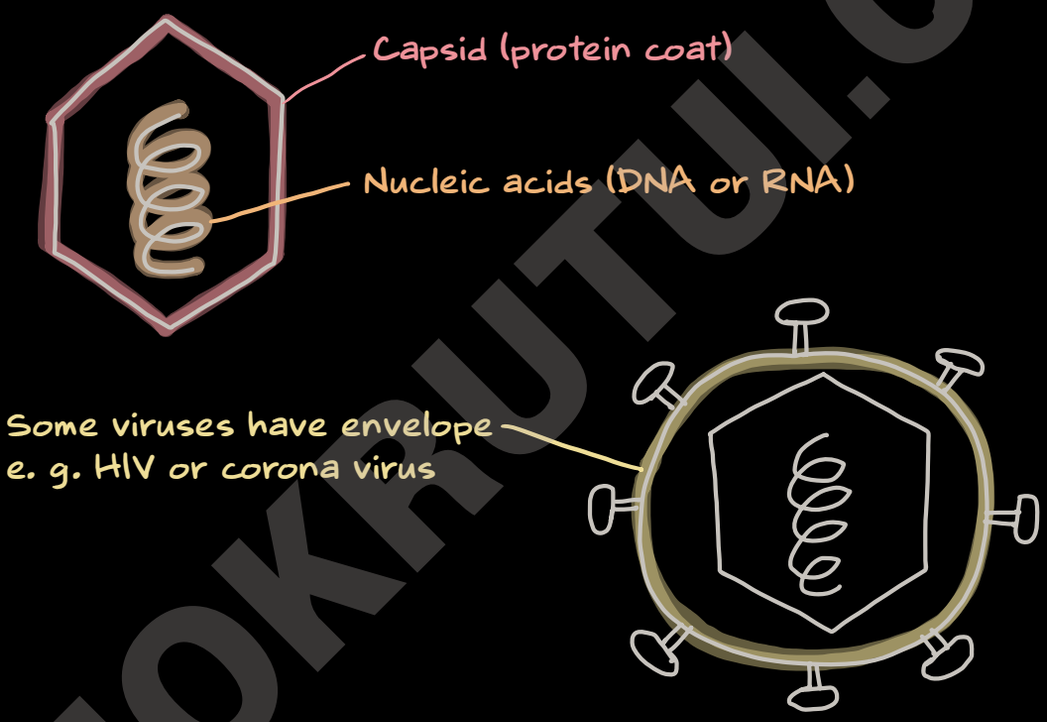


Prokaryotes	Eukaryotes	
	Unicellular	Multicellular
Unicellular (No nucleus)		
Bacteria	Protoctists (amoeba) Protoctists (algae) Fungi (yeast)	Plants Animals Fungi (mold & mushrooms)

Viruses

- Viruses are non-living because of the following reasons:
  - They are not composed of cells (acellular).
  - They do not carry out life processes such as respiration, excretion, or nutrition, although they can reproduce, but this has to be done in host cells.
- 2 main components of viruses:
  - Capsid or protein coat
  - Genetic material, which could be DNA or RNA
- Some viruses, such as HIV, have an envelope made of host cell membrane.

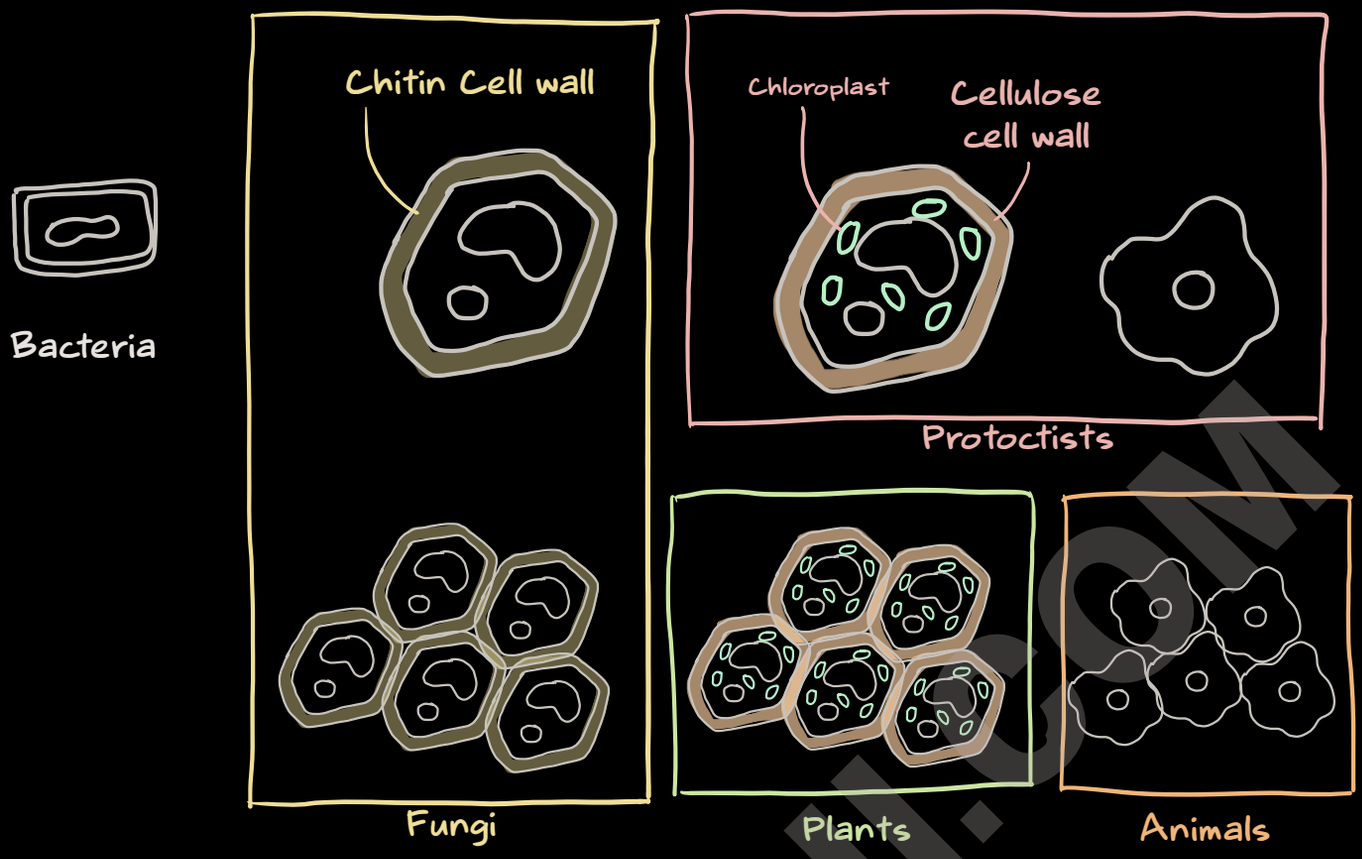
Structure of viruses



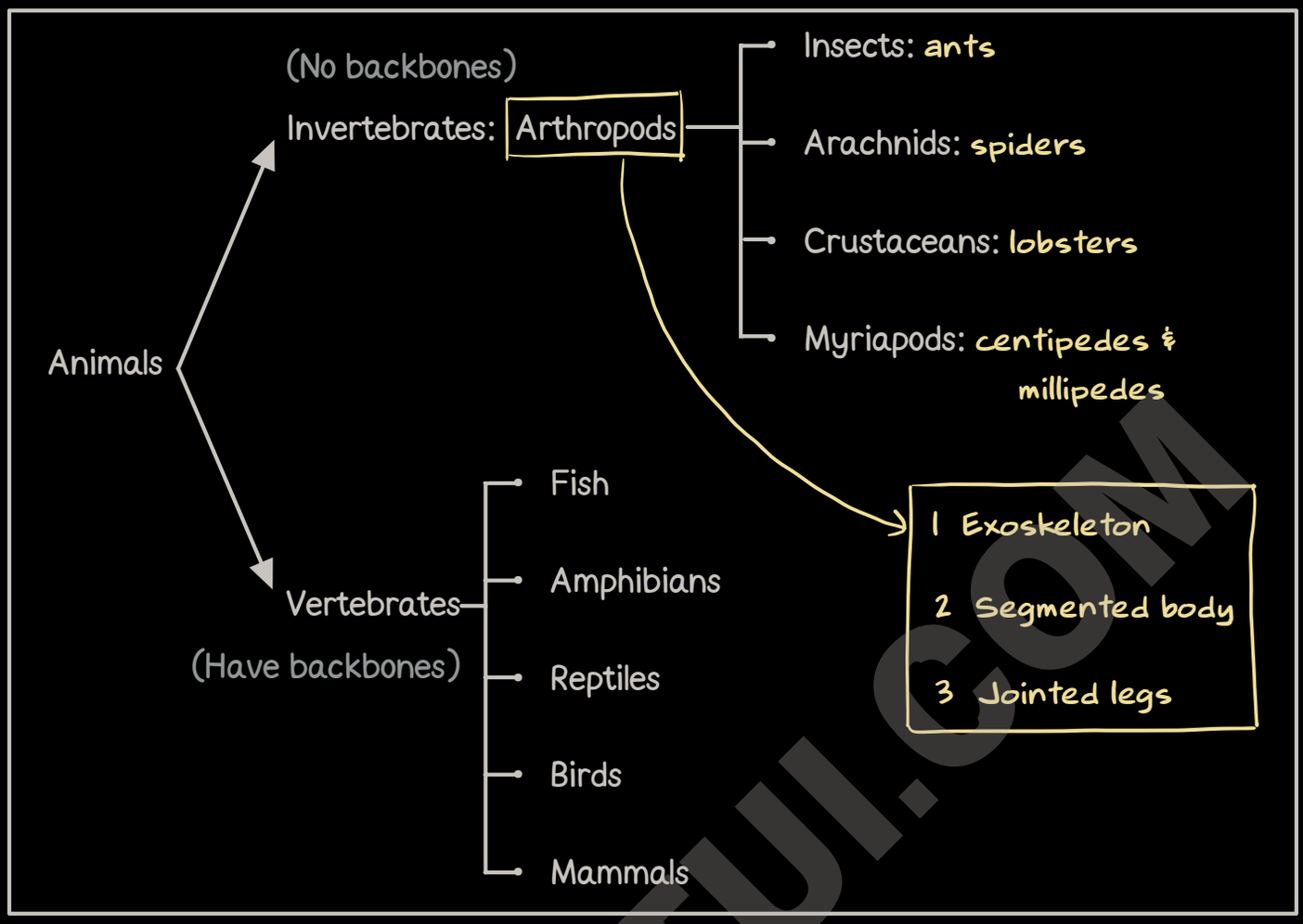
Recap questions & answers

- State the type of organisms which has the following features.
  - Unicellular + cell wall made of chitin: Yeast
  - Prokaryotes: Bacteria
  - Multicellular no cell wall: Animals
  - Unicellular + cellulose cell wall: Protoctists

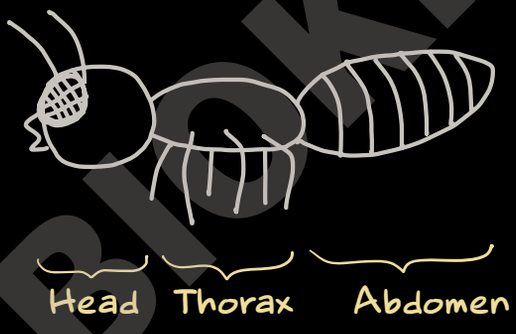
Summary



Animals



Insects



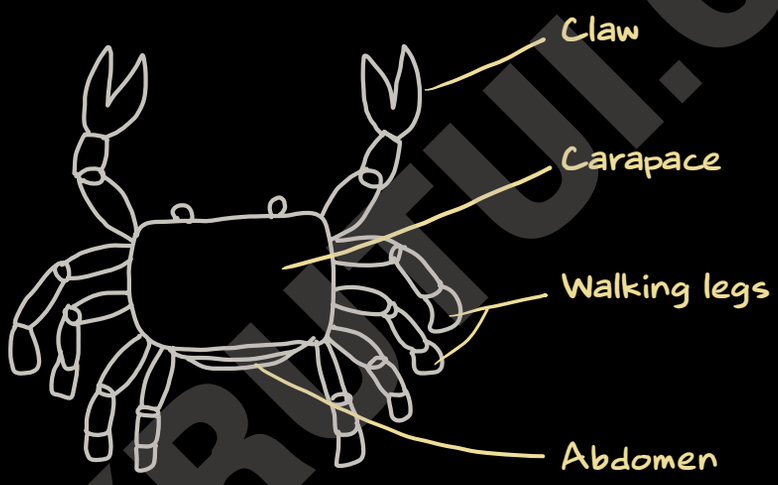
- 3 body parts: head, thorax and abdomen
- 3 pairs of legs
- 1 pair of antenna
- Compound eyes

Arachnids

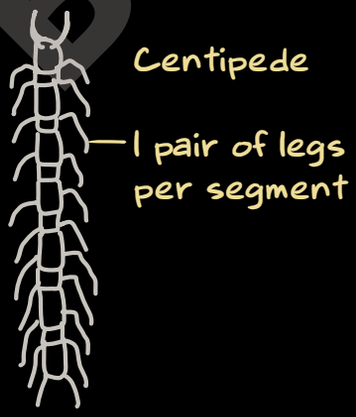
- 2 body parts: cephalothorax & abdomen
- 4 pairs of legs
- Simple eyes

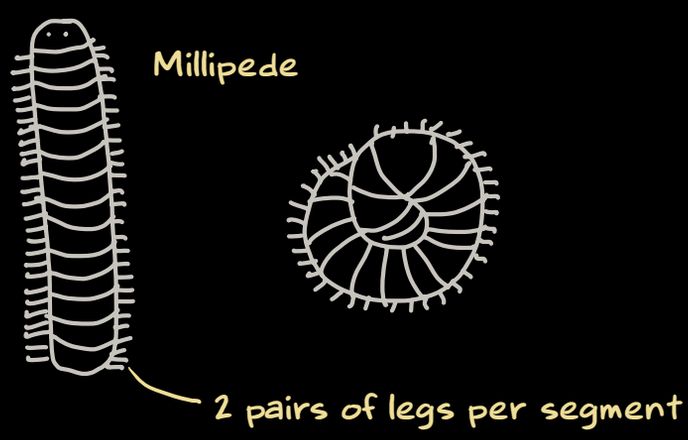
Crustaceans

- E.g. crabs, prawns, shrimps, and lobster
- Have more than 4 pairs of legs



Myriapods

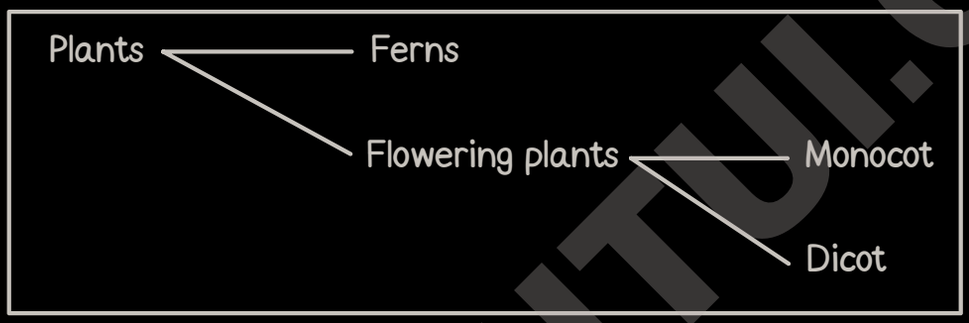




Vertebrates

- Vertebrates can be classified into 5 groups: fish, amphibians, reptiles and mammals.
- Each group has different types of skin and additional features, as follow:
  - Fish - scaly skin, gills, and fins
  - Amphibians - moist skin and webbed feet
  - Reptiles - dry scaly skin
  - Birds - feather, beak, and scales on feet
  - Mammals - fur or hair, mammary glands, external ears, whiskers, diaphragm, and sweat glands

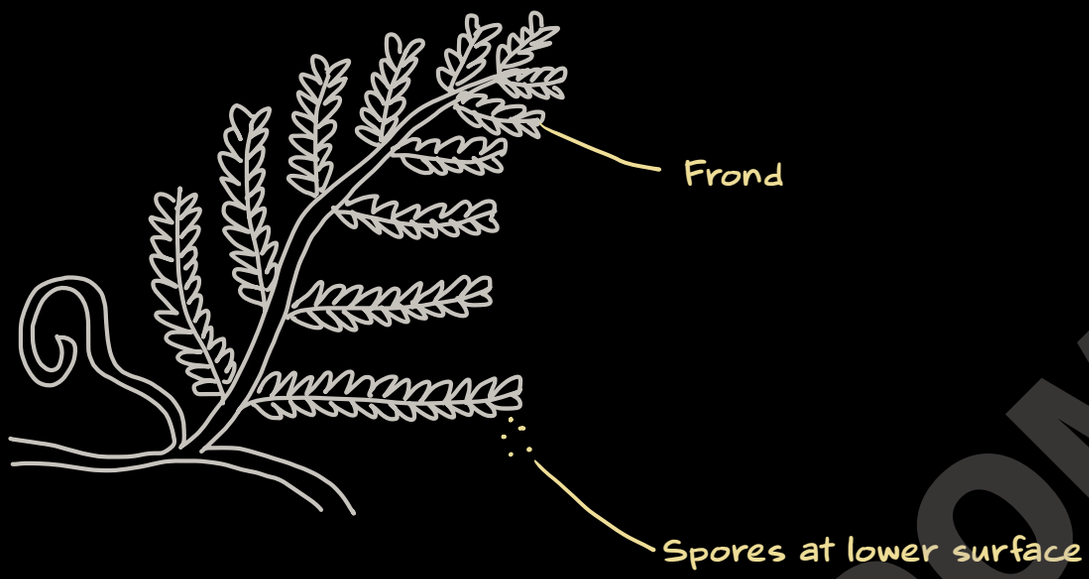
Plants



Ferns

- Ferns have vascular bundles: xylem & phloem, which is the way they are adapted to live on land.
- Ferns are restricted to the damp areas because
  ① Water is a medium for the transfer of male gametes.
  ② Ferns have thin cuticle, so there is less prevention for water loss.

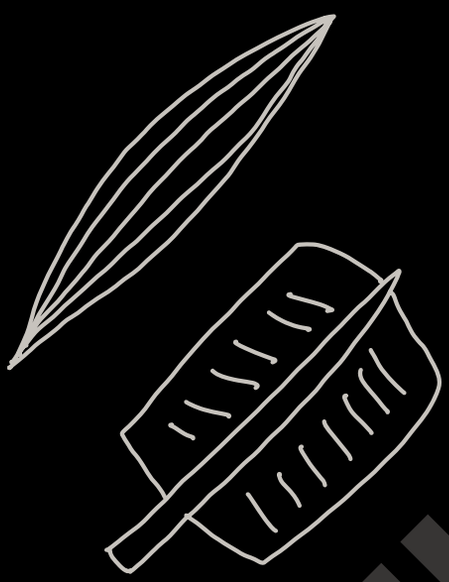
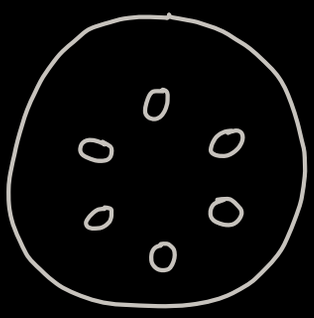
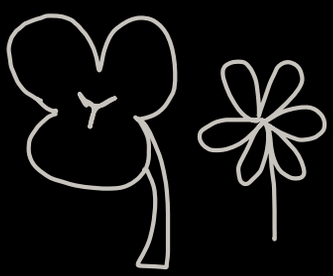
Structure of a fern



Flowering plants

- Flowering plants comprise monocotyledons and dicotyledons.
  - Monocotyledons have one cotyledon in their seeds.
    - Examples of monocotyledonous plants: corns, grasses, and sugar canes.
  - Dicotyledons have two cotyledons in their seeds.
    - Examples of dicotyledonous plants: apple trees, roses, and oak trees.

Monocotyledons Vs. Dicot plants

	Monocot	Dicot
No. of cotyledon	1	2
Leaf shape & leaf vein	 Narrow leaves Parallel leaf veins	 Broad leaves Branched veins
Arrangement of vascular bundle in the stem	 Scatter	 Ring form
No. of petal	 Multiple of 3	 Multiple of 4 or 5

Concept of classification & classification system

- Species = a group of organisms that can reproduce to produce fertile offspring

Horse X Donkey

Mule

Infertile

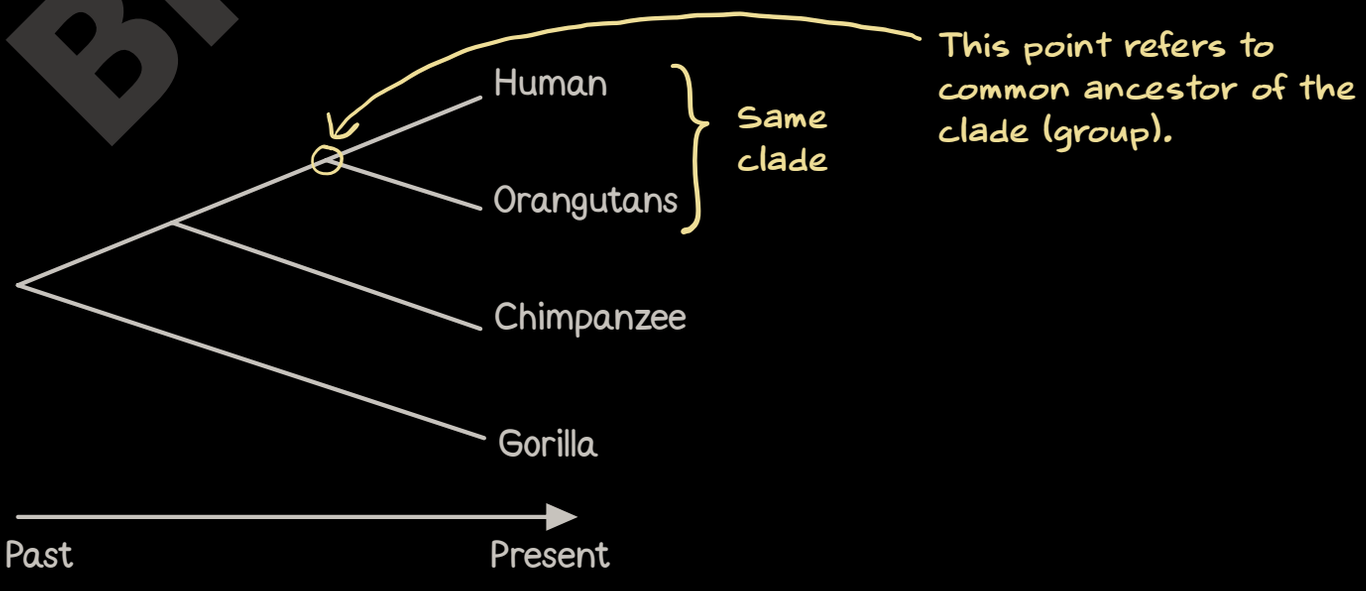
This shows that horses and donkeys are of different species.

Same species:

① similar morphology
② Same set of genes
③ Same no. of chromosomes
④ Similar base sequence.

- Purposes of classifying organisms:
  1. To group organisms into different classes so it is easier to identify unknown organisms.
  2. Once unknown organisms are identified, it is easier to conserve them.

- New method of classification is based on the base sequence of DNA.
  - Organisms are arranged into different clades in the form of a cladogram.



- Humans are more closely related to a chimpanzee than orangutans because of this reason.
    - In the cladogram, the branching points for humans and orangutans are shorter.
        - This shows that they have more recent common ancestor.
        - This also shows that the base sequence of humans are more similar to that of a chimpanzee than to orangutans

Binomial nomenclature

- Binomial nomenclature = a naming system that consists of 2 parts: genus and species
    - Example: *Panthera leo*
        - The first part, *Panthera,* is the genus that has to start with a capital letter.
        - The second part, Leo, is the species that has to start with a lower-case letter.
        - The scientific name has to be written in italic.