



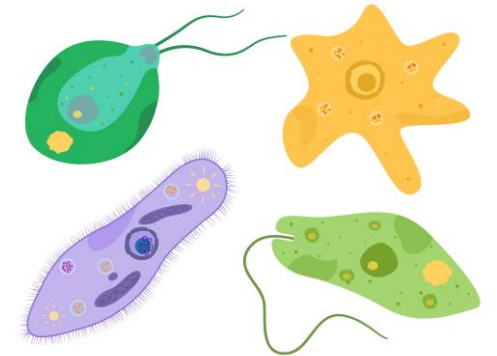
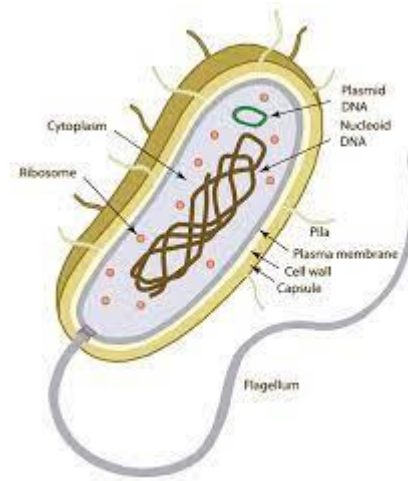
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Prokaryotes , Fungi and Protista



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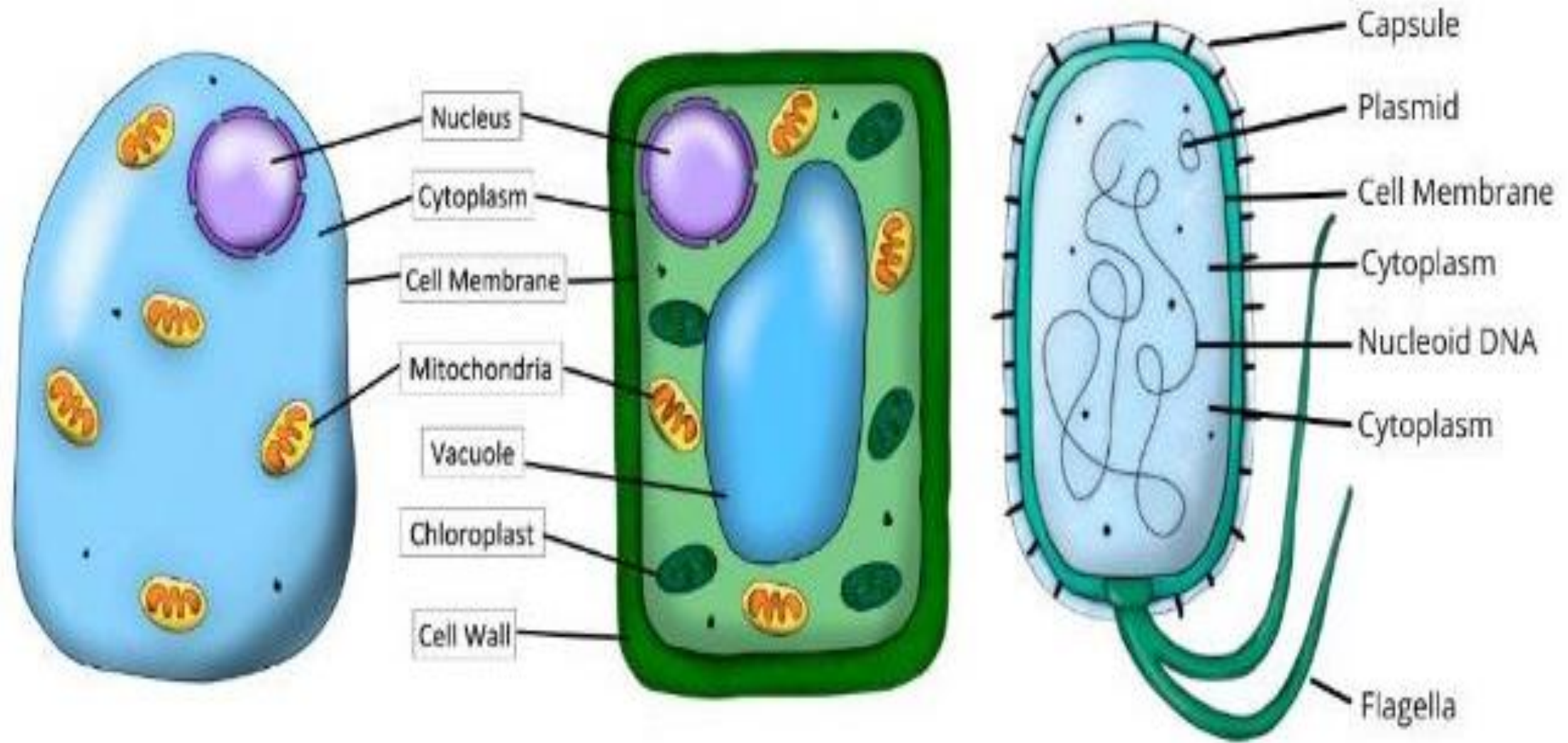


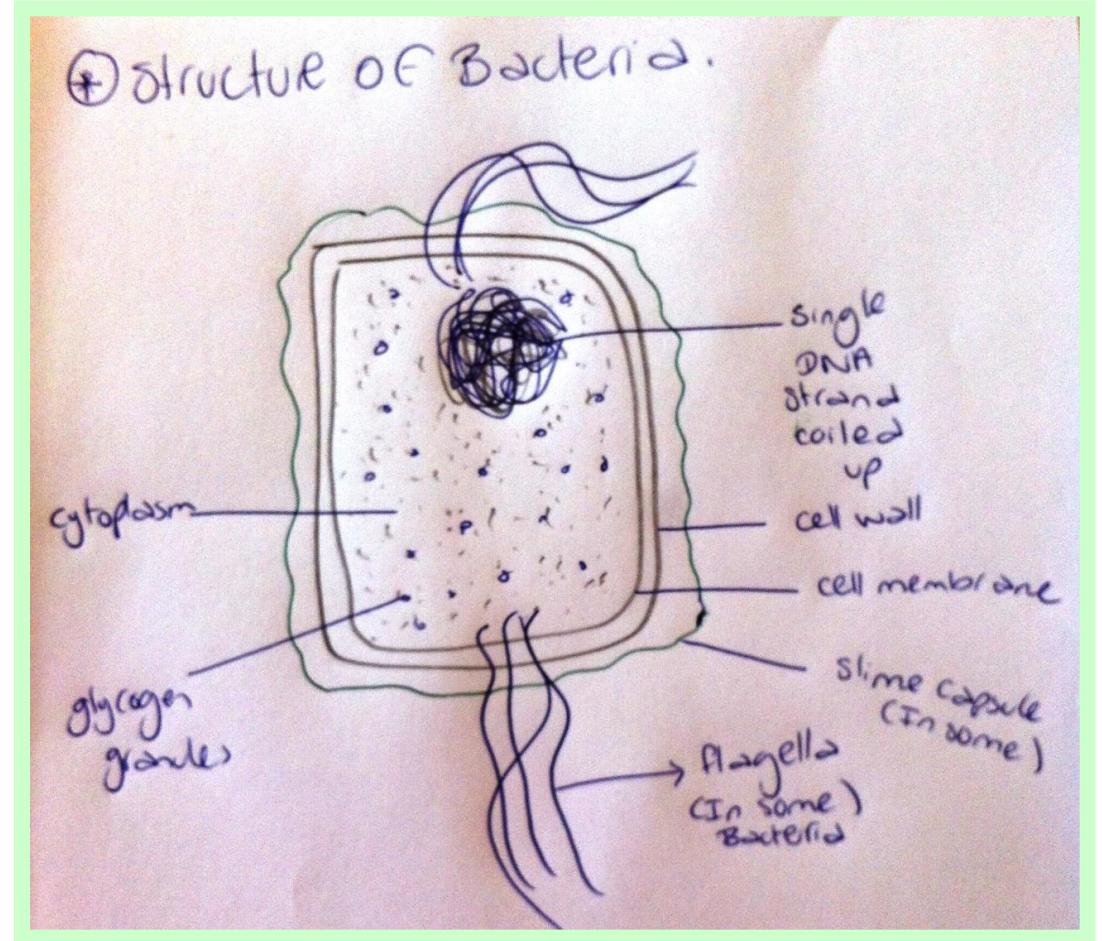
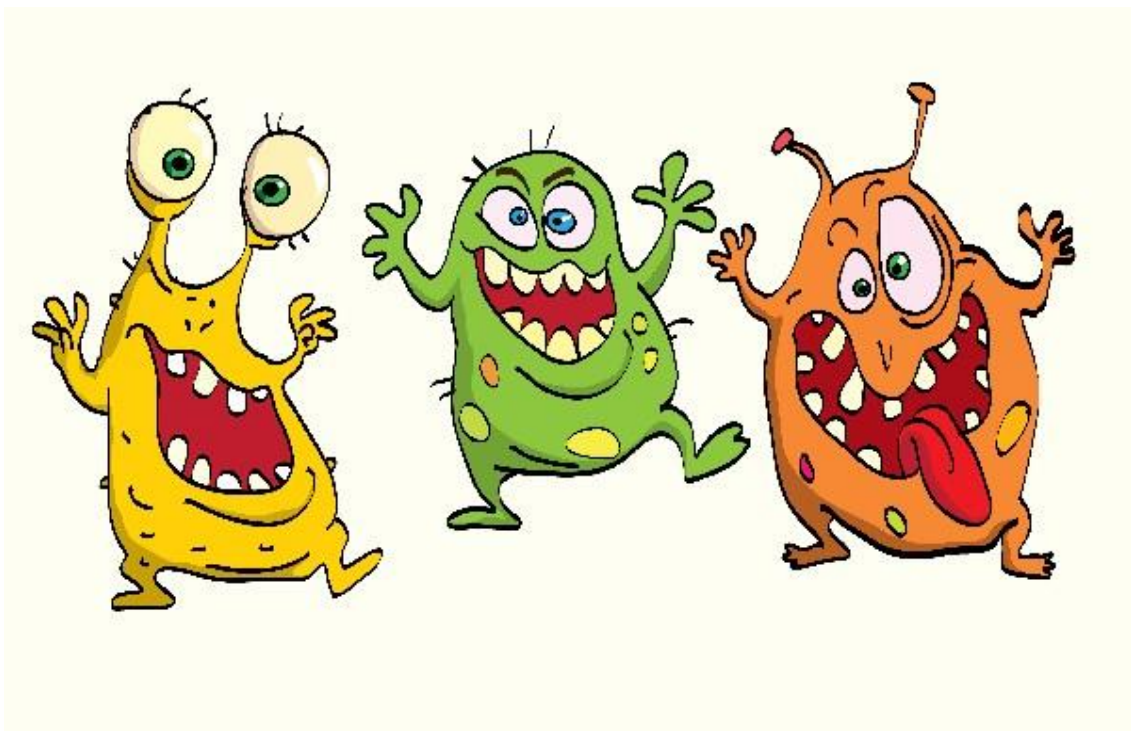
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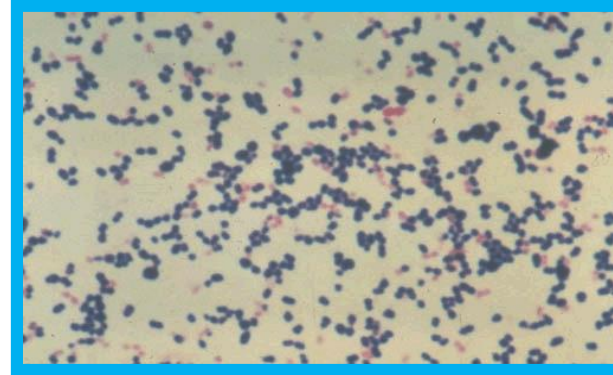


Bacteria (singular bacterium)

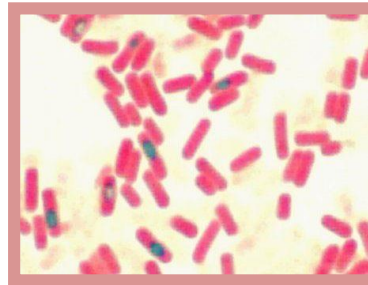
- ✓ Are very small organisms consisting of a single cell (unicellular)
- ✓ Rarely more than 0.01 mm in length.
- ✓ Cannot be seen by naked eye i.e. we need to use a microscope in order to see bacterial cells, they are much smaller than animal and plant cells

Bacteria have several shapes:

Spherical (cocci) singular coccus



Rod-shaped (bacilli) singular bacillus



Spiral shaped (spirilli) singular spirillum



Common Features:

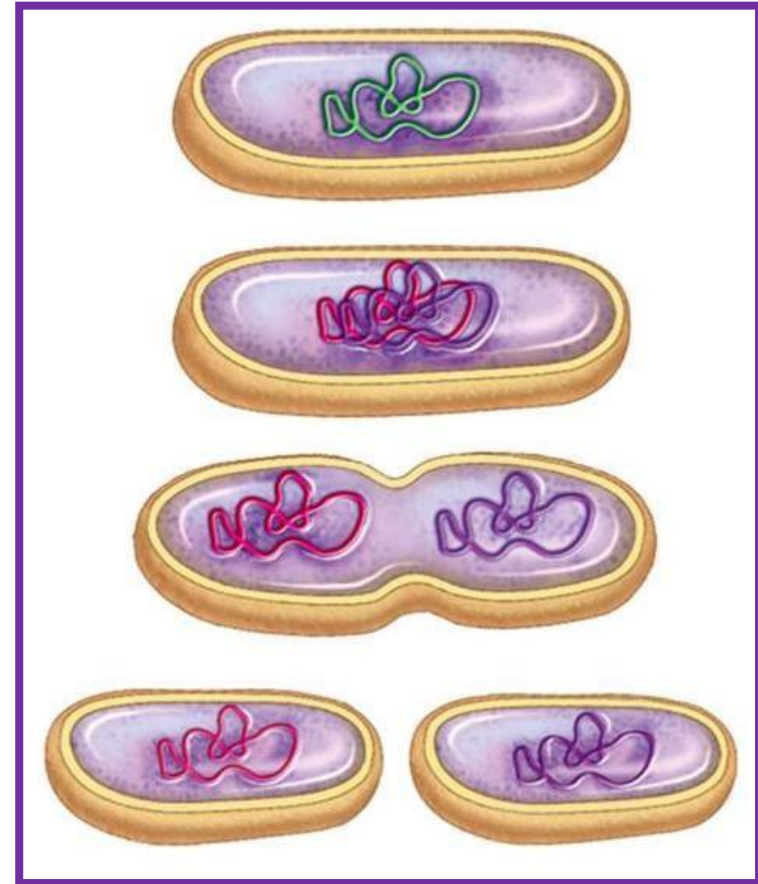
1. They have a cell membrane (similar to that of an animal and of a plant cell).
2. They have a cytoplasm which contain granules of glycogen (similar to animal cell cytoplasm) lipids & other food reserves.
3. They don't have a nucleus (unlike animal and plant cells); instead they have a single strand of DNA coiled up free in the cytoplasm, with no nuclear envelope.
 - That's why they are referred to as prokaryotes
 - Other structures present in the cytoplasm include the plasmids; these are small circular rings of DNA, carrying some of the bacterial genes (not all bacteria have plasmids).
4. They have a cell wall (differs in composition from plant cell wall) made up of sugars, proteins & lipids
5. Some species have flagella for locomotion.
6. Some species of bacteria have an outermost layer called capsule which protects it from phagocytes (white blood cells).

Reproduction of bacteria

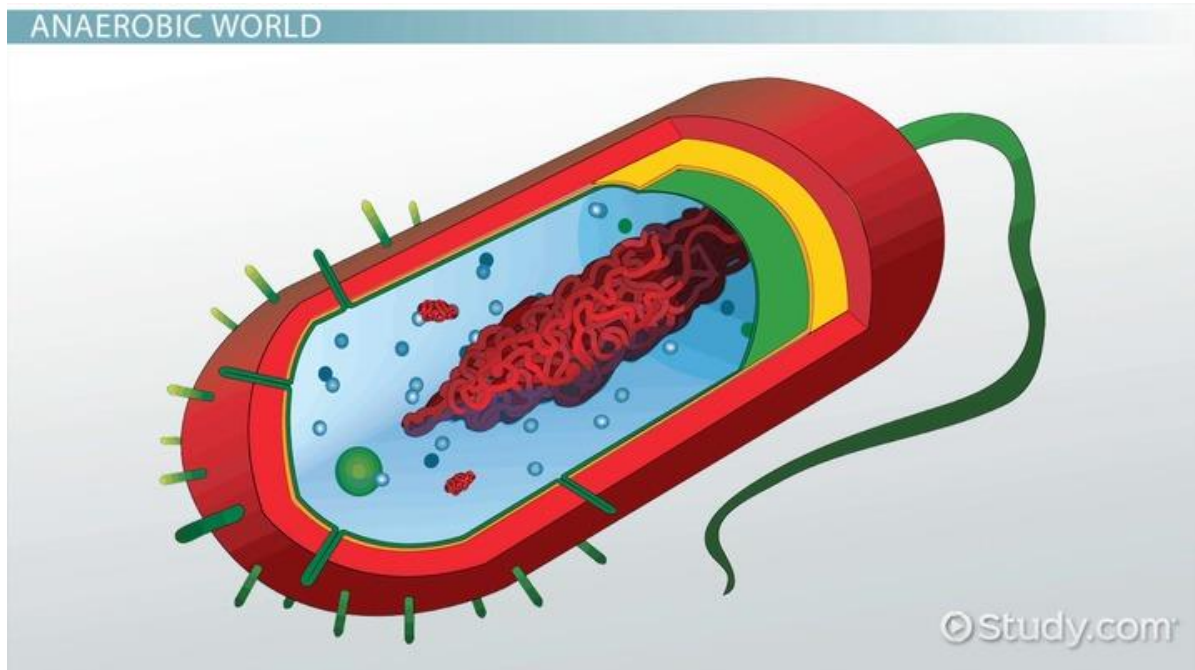
<https://www.youtube.com/watch?v=XICA-cdvSvU>

They reproduce **asexually** by a process called **binary fission**. In this process bacterial cell divides into two and each cell becomes an independent bacterium.

In some cases, binary fission can take place every 20 minutes, so that in a very short time a large colony of thousands & thousands of cells (these are derived from the continuous division of the original bacterial cell) is produced. This is one reason why a small number of bacteria can seriously contaminate our food.



Respiration of bacteria :
Bacteria which need oxygen for their respiration are called (aerobic bacteria).
Those which do not need oxygen for respiration are called (anaerobic bacteria).



Nutrition of bacteria:

Bacteria can be:

Parasites: causing a variety of animal and plant diseases

Decomposers: (Saprobies) they release enzymes which digest the food outside the cell. The products of digestion are then absorbed back into the bacteria cell.

Autotrophs: has chlorophyll pigment e.g. blue – green bacteria.

Fig. 2.1 is an electron micrograph showing the bacteria, *Vibrio cholerae*.



Fig. 2.1

(ii) The bacteria shown in Fig. 2.1 each have a flagellum.

Suggest the function of the flagellum in bacteria.

For movement

[1]

(a) (i) Bacteria are prokaryotes.

State **two** distinguishing features of all prokaryotes.

- 1 1. They don't have mitochondria .
- 2 2. They don't have a nucleus

Figure 1 shows a list of sub-cellular structures and different cell types. Ribosomes are found in all three cell types.

Sub-cellular structure	Bacterial cell	Plant cell	Animal cell
Ribosomes	✓	✓	✓
Cell Membrane			
Permanent vacuole			
Cellulose cell wall			
Mitochondria			

Figure 1 shows a list of sub-cellular structures and different cell types. Ribosomes are found in all three cell types.

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Permanent vacuole		✓	
Cellulose cell wall		✓	
Mitochondria		✓	✓

Viruses <https://www.youtube.com/watch?v=8FqITslU22s>

<https://www.youtube.com/watch?v=rWkNvIUthBI> new

These are non-cellular organisms that are usually considered as particles because of their extremely small size.

Viruses are **not included in the 5 kingdom scheme because they are non-cellular** and lack many characteristics of living things.

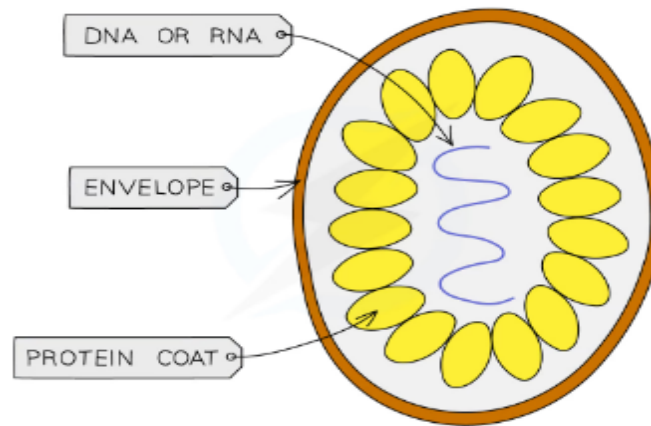
Viruses are about thousand times smaller than bacteria, and bacteria are much smaller than most animal cells. Viruses are so small that cannot be seen with a light microscope, but can be observed with an electron microscope.

Viruses can infect vertebrates, insects, fungi and bacteria.

Viruses that infect bacterial cells are called Bacteriophages.

Features of Viruses

- Viruses are not part of any classification system as they are **not considered living things**
- They **do not carry out the seven life processes** for themselves, instead they **take over a host cell's metabolic pathways** in order to make multiple copies of themselves
- Virus structure is simply **genetic material** (RNA or DNA) inside a protein coat



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Structure of a typical virus

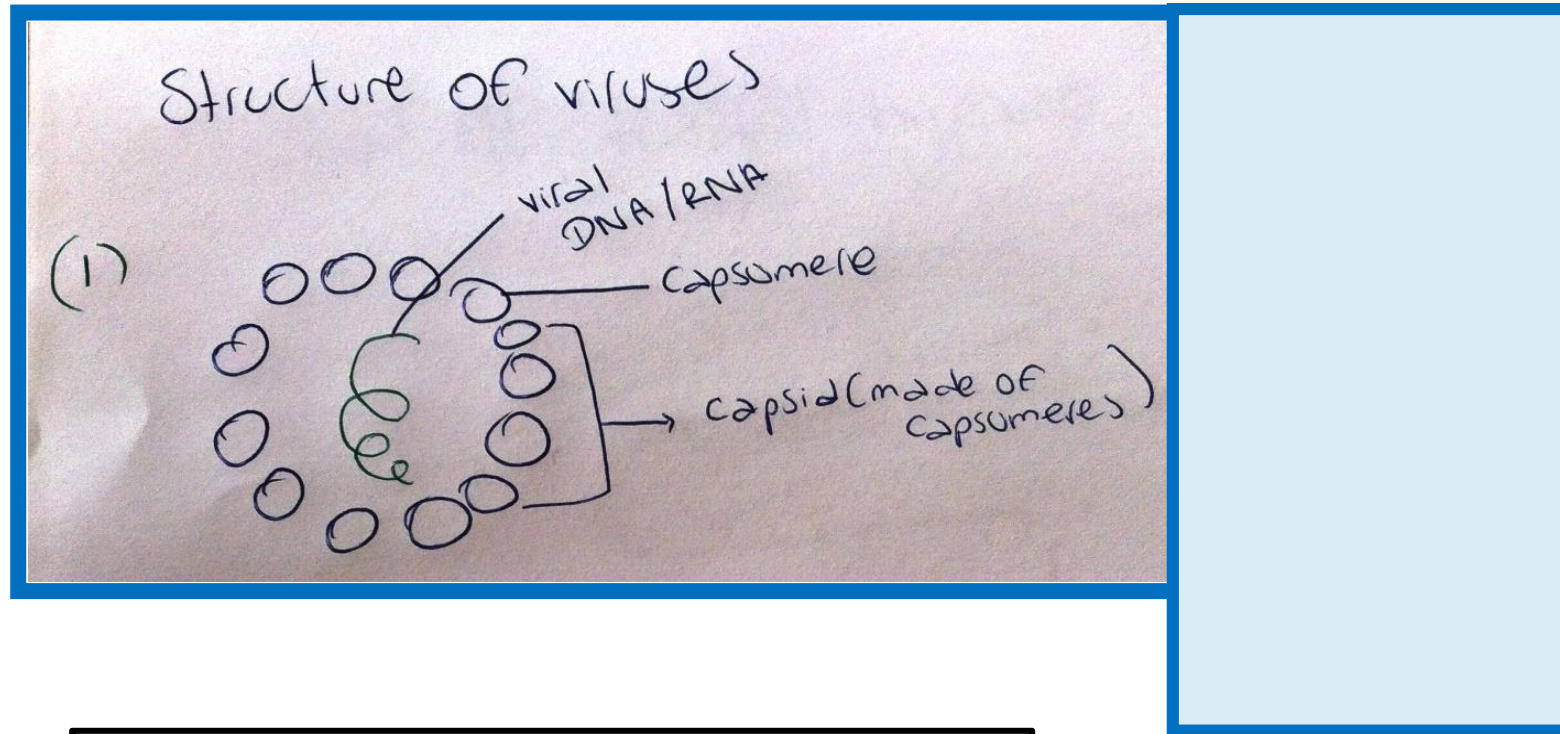
Viruses are not classified as living organisms.

Suggest two characteristics of living organisms that viruses do **not** carry out.

(b) Viruses do not carry out...

Any **two** of the following:

- Respiration; [1 mark]
- Growth
- Excretion
- Nutrition; [1 mark]



Length: 0.1 (micrometer) 10^{-6} m
Width: 20-30 nm (nanometer) 10^{-9} m

General Features of viruses:

- All viruses are parasites that kill host cells as they reproduce inside them using the cell's energy & materials.
- They have a single strand of DNA or RNA coiled up.
- They have no nucleus, no cytoplasm, no cell membrane → Viruses are too small to contain organelles.
- Viruses are not active outside the host cell. They cannot reproduce, respire, move or excrete outside the host cell even if they were cultured in a lab with all the nutrients provided.

Multiplication of viruses:

Viruses are found everywhere around us. They get into our bodies through mouth, nose, or even a cut in the skin. Once inside the body, a virus can recognize the proper host cell through special proteins found on the surface of the virus.

That's why an influenza virus infects the cells of the respiratory tract while an HIV (the causative agent of AIDS) recognizes the cells of your immune system.

When a virus infects a cell, it usually has two goals:

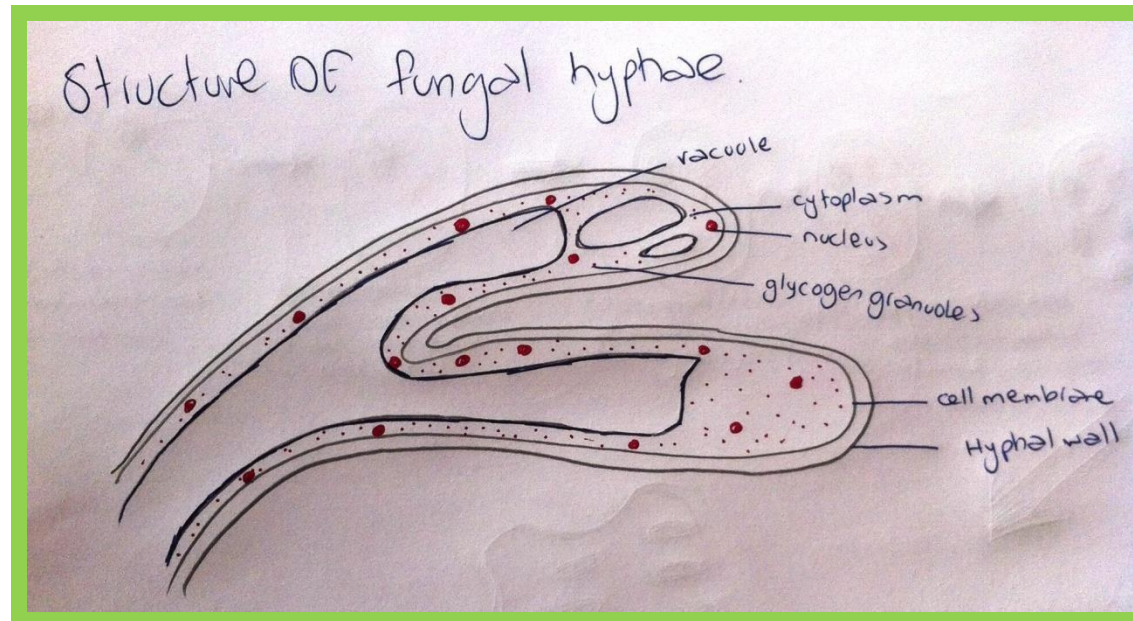
- a. Replication of genetic material (DNA /RNA)
- b. Production of capsid proteins and eventually forming new viral units.

The Kingdom of Fungi

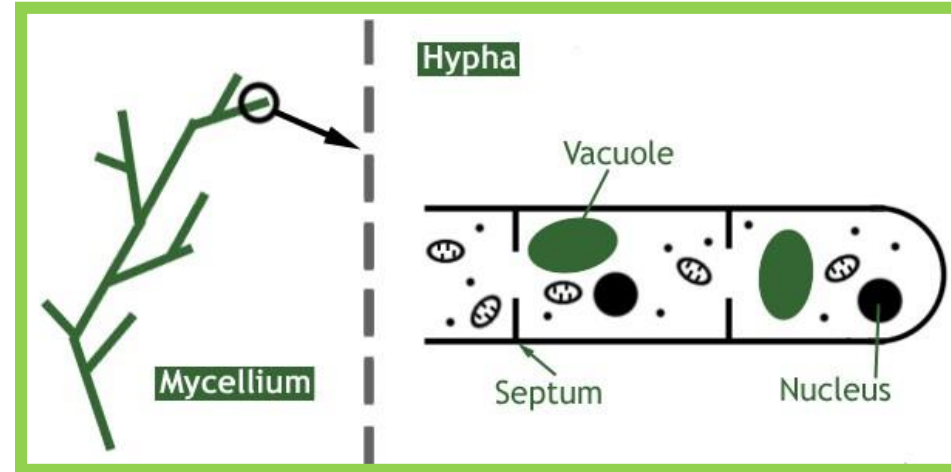
https://www.youtube.com/watch?v=dM_g_p4h6CM

<https://www.youtube.com/watch?v=UCgKHOo0nU4> introduction

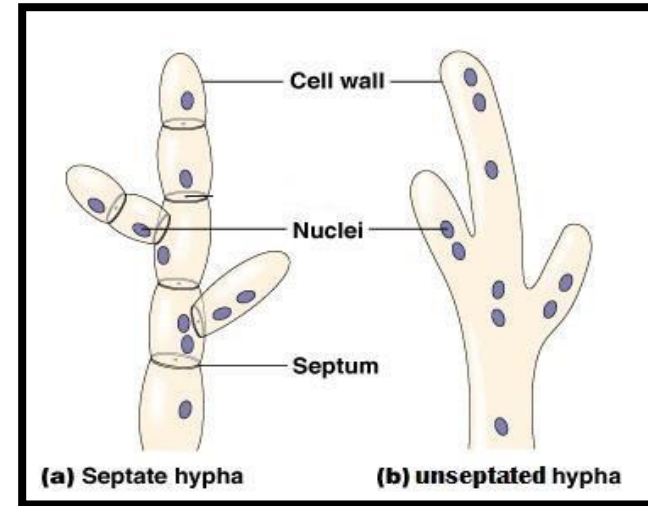
Fungi are **multicellular** organisms except for yeast, which is **unicellular** (made up of a single cell). Fungi consist of multicellular filaments (threads) called **hyphae**.



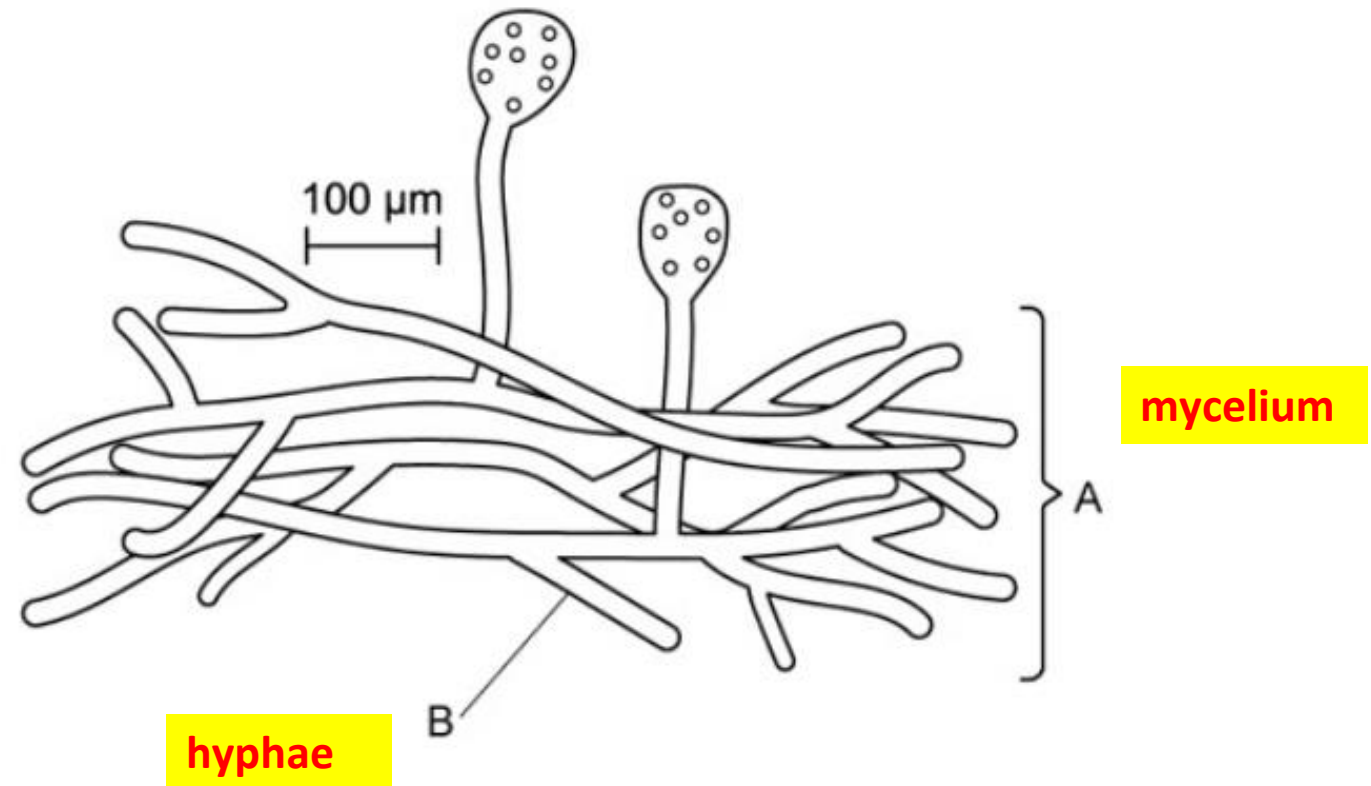
A network of Hyphae is called mycelium.



Some species have partitions called septa (singular: septum) that divide the hyphae (singular hypha) into cell-like segments



The diagram below shows a species of multicellular fungi.



Name the structures labelled **A** and **B** on the diagram.

- **Similar to animal cells in having glycogens granules as energy stores.**
- **Similar to plant cells in having large vacuoles.**

Features:

- ❖ They have a hyphal **wall** which is made up primarily of **chitin**.
- ❖ They have a **cytoplasm** that contains organelles, lipids & glycogen granules (la feature of animal cells). **Fungi have no chloroplasts.**
- ❖ They have **large vacuoles** (a feature of plant cells).

Nutrition of Fungi:

They don't have chloroplasts so they cannot carry out photosynthesis

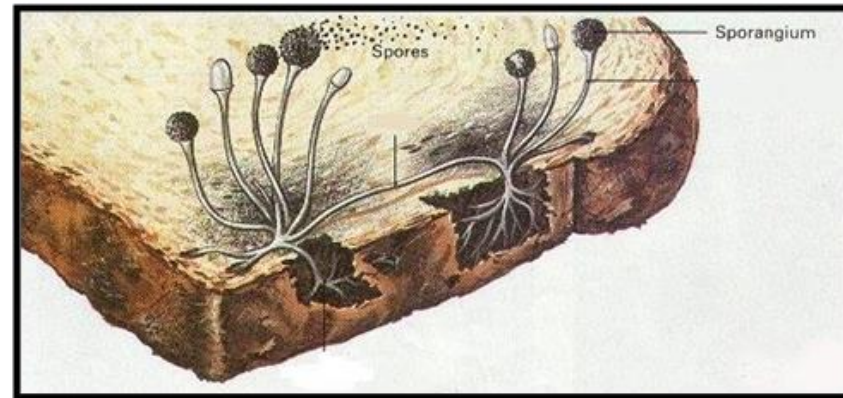
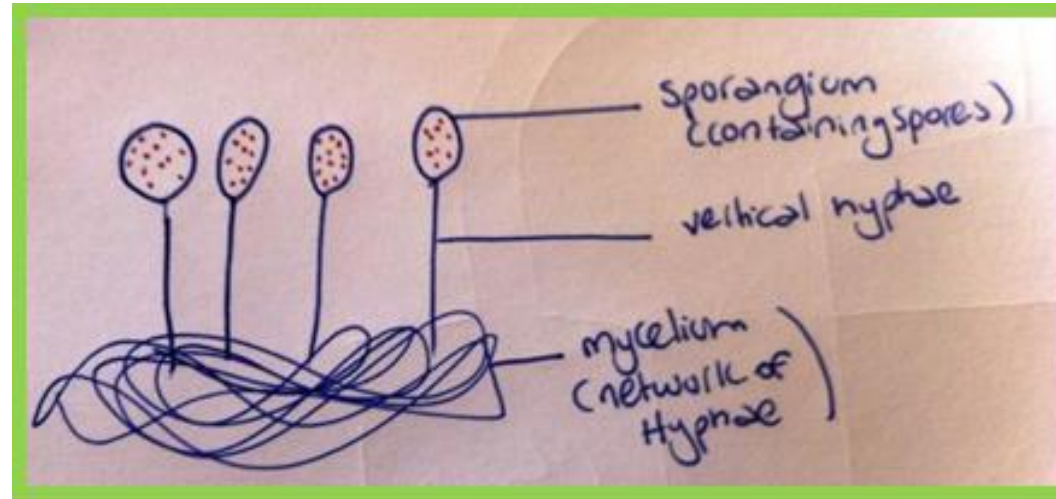
1. Some are parasites of animals and plants

2. Mainly they are saprobes (decomposers)

Decomposers produce enzymes outside the feeding hyphae that digest organic matter (proteins, carbohydrate) then the digested molecules (amino acids, glucose) are absorbed into the fungus.

3. They reproduce asexually by formation of sexual spores. On the other hand, some fungi are capable of reproducing sexually by forming asexual spores that are kept within a structure called sporangium (plural: sporangia).

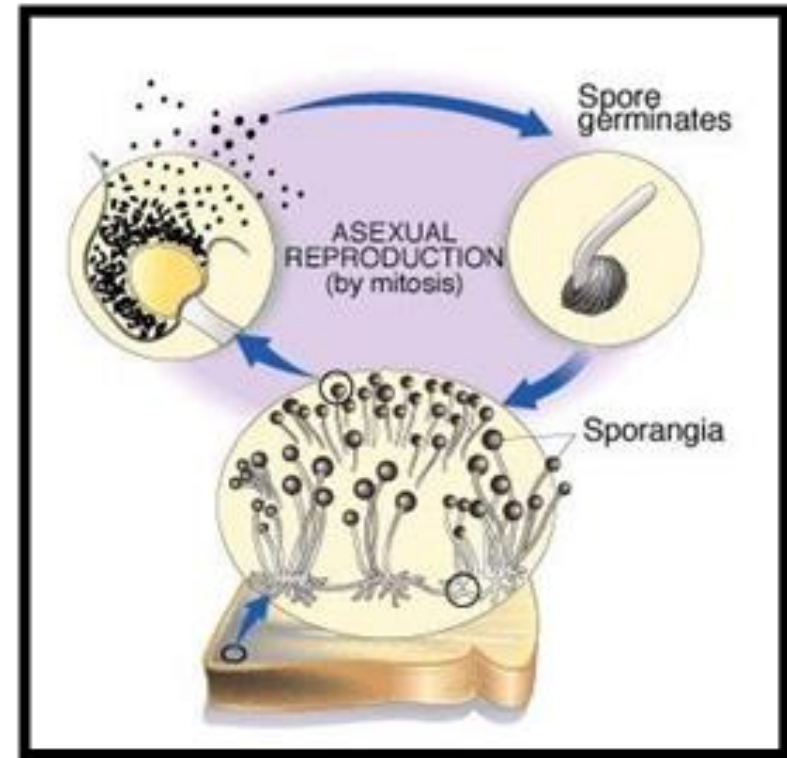
How Fungus spreads to new food sources. e.g. Bread Mold



Sporangium contains asexual spores.

When the sporangium bursts open, the spores are released & are dispersed in air. When a spore lands on suitable organic matter it germinates to produce a mycelium.

That's why it is always recommended to remove the infected loaf of bread away from the uninfected ones because the fungus can spread and infect them all easily.

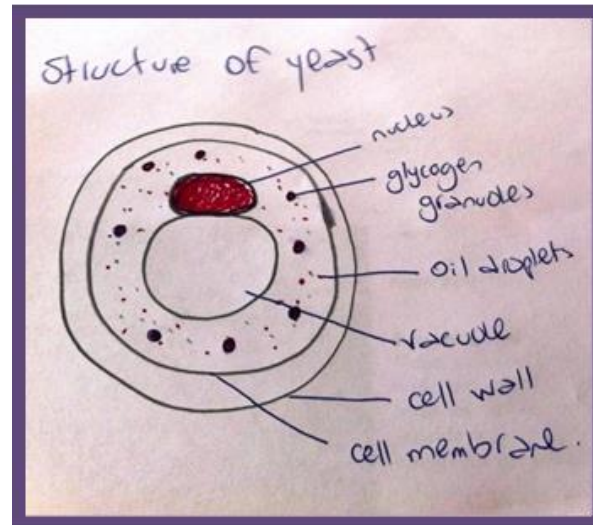


Yeast: The Unicellular Fungus

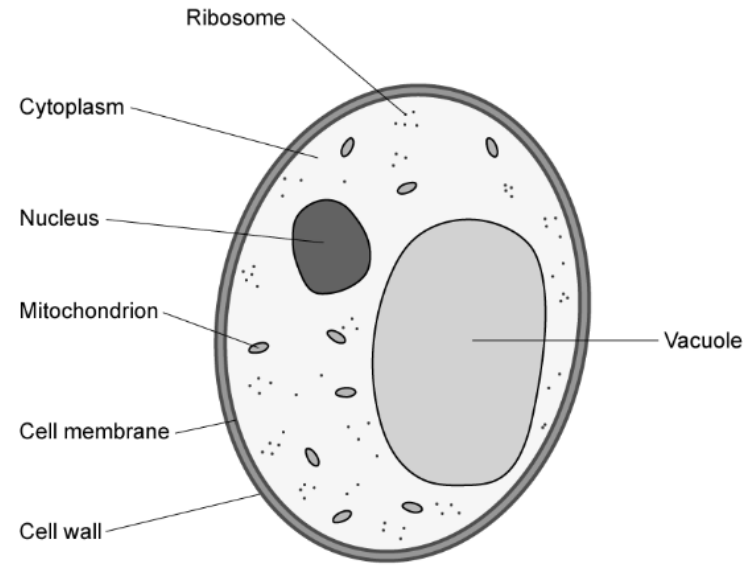
They consist of spherical, separate cells that can only be seen with the aid of the microscope.

Structure:

They have a cytoplasm that contains a nucleus, vacuole and granules of glycogen and other food reserves, enclosed by a cell membrane and a thin cell wall.



The diagram shows a yeast cell.



(i) Which substance makes up the composition of the yeast cell wall?

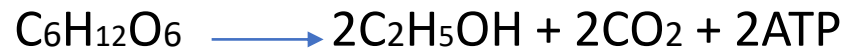
- A Cellulose
- B Chitin
- C Glycogen
- D Starch

(1)

Respiration: <https://www.youtube.com/shorts/XcTekSyhLLI>

Yeast respire aerobically in the presence of oxygen and anaerobically in the absence of O₂.

Anaerobic respiration:



Glucose \longrightarrow Ethanol + Carbon dioxide + Energy

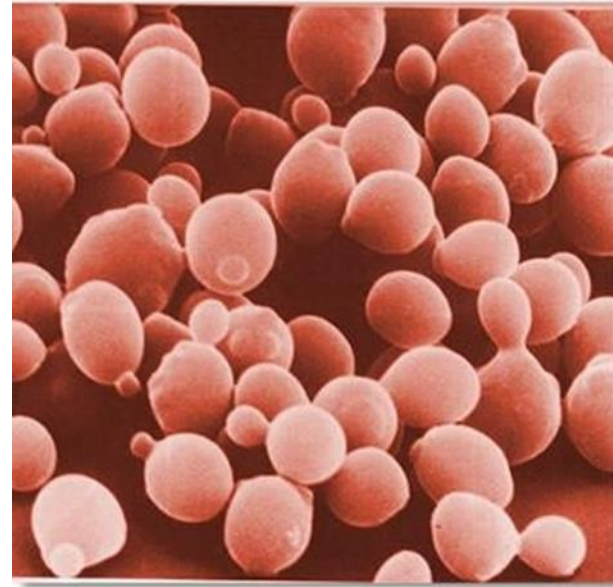
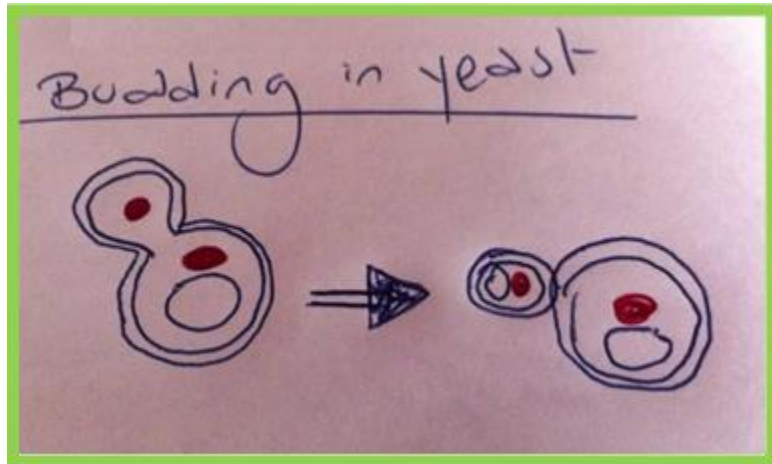
This reaction takes place when wheat flour, sugar & yeast are mixed with water to form dough. In the dough, the yeast respire anaerobically and the CO₂ produced causes the dough to rise (the bubbles within bread) while the alcohol produced evaporates.

And that is the recipe for making bread



Reproduction:

Yeast reproduces by **budding**, which is a form of **asexual reproduction**. An outgrowth from the cell enlarges & is finally cut off as an independent cell.



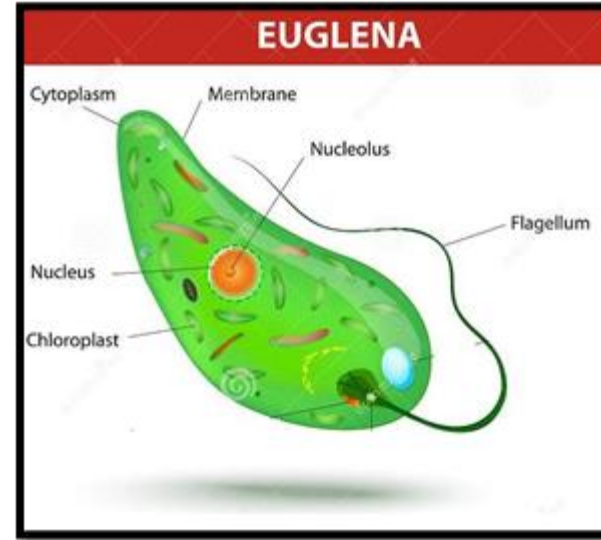
Comparison between Fungi, bacteria and viruses

Feature	Fungi	Bacteria	Virus
Nucleus	Present	Absent	Absent
Cell membrane	Present	Present	Absent (Protein Coat)
Cell Wall	Present(Made up of Chitin)	Present (made up of proteinsugar & Lipids)	Absent

Kingdom of Protista <https://www.youtube.com/watch?v=DaehcP7GkHI>

General Features:

- These are **single-celled (unicellular)** microorganisms
- Their genetic material is enclosed in a nuclear membrane to form a nucleus as eukaryotic cells
- Some have contractile vacuoles involved in maintaining the amount of water in the cell by removing excess water
- They reproduce **asexually**



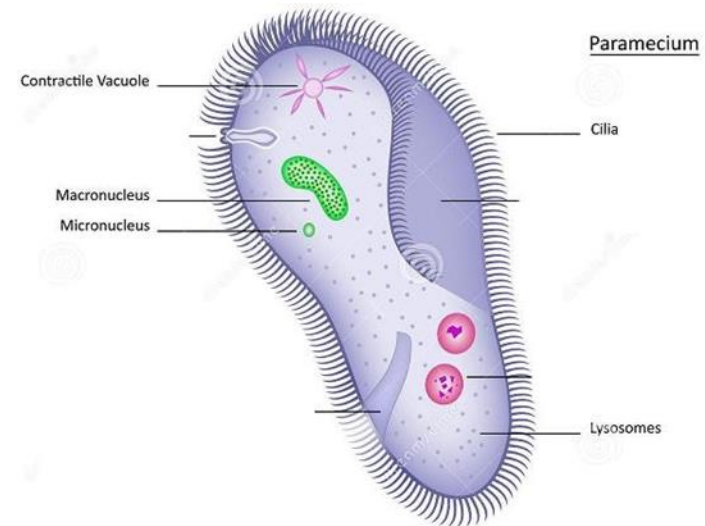
Feeding:

Some of them have chloroplasts and can make their food by the process of photosynthesis e.g. *Euglena* (These are called unicellular plants or **protophyta**)

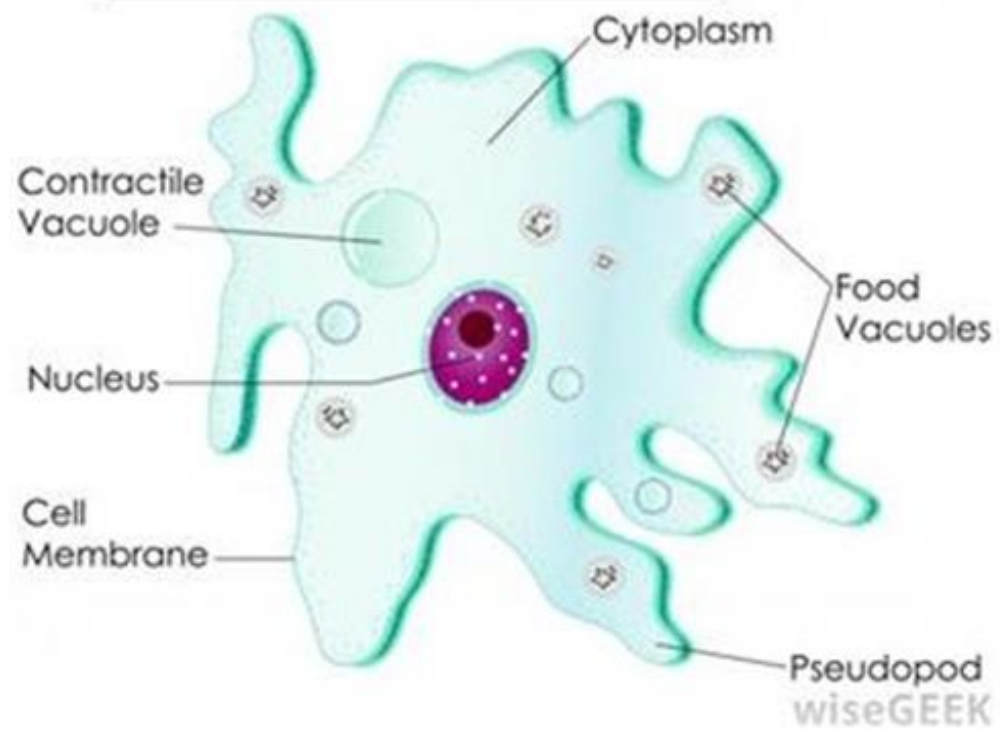
Some can take in and digest food by engulfing like amoeba.

Movement:

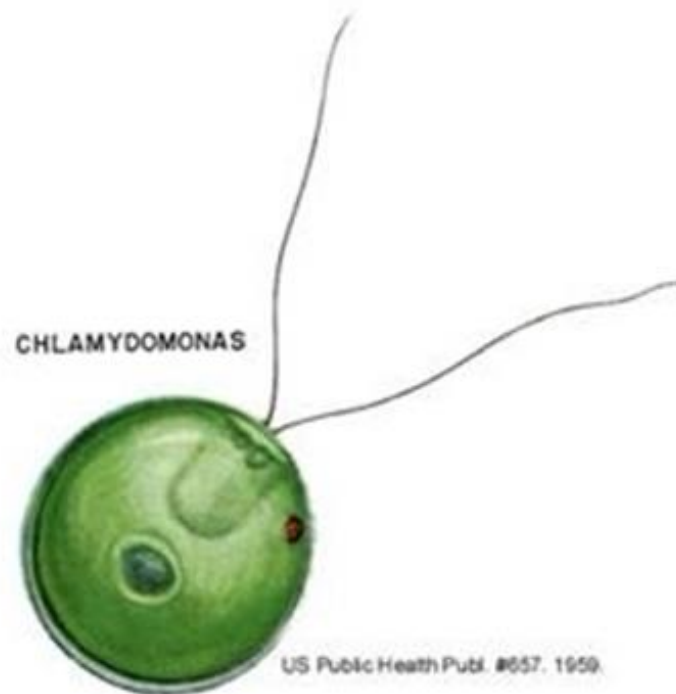
- 1) By pseudopodia → flowing movement of the cytoplasm, like amoeba.
- 2) By cilia → like paramecium
- 3) By flagella → like euglena and chlamydomonas



Amoeba



Chlamydomonas



The table shows some of the main characteristics of all of the five kingdoms.

Animal kingdom	Plant kingdom	Fungus kingdom	Protoctist kingdom	Prokaryote kingdom
<ul style="list-style-type: none">• cells with no cell walls• multicellular• feed on organic substances made by other organisms	<ul style="list-style-type: none">• cells with cell walls made of cellulose• multicellular• make their own organic substances from inorganic ones, by photosynthesis	<ul style="list-style-type: none">• cells with cell walls not made of cellulose• multicellular or single-celled• feed on dead or decaying organic material	<ul style="list-style-type: none">• single-celled organisms with a nucleus• some have cell walls and chloroplasts, and some do not	<ul style="list-style-type: none">• single-celled organisms, with no nucleus, mitochondria or endoplasmic reticulum• have a cell wall, but are not made of cellulose

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Thank you