Lab 2

(Cytology) Cell Biology

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The Cell

The cell :- Is the functional and structural unit of all living organism .

Organism are either single –celled ,such as most bacteria and protists or multicelled, such as plants ,animals and most fungi.

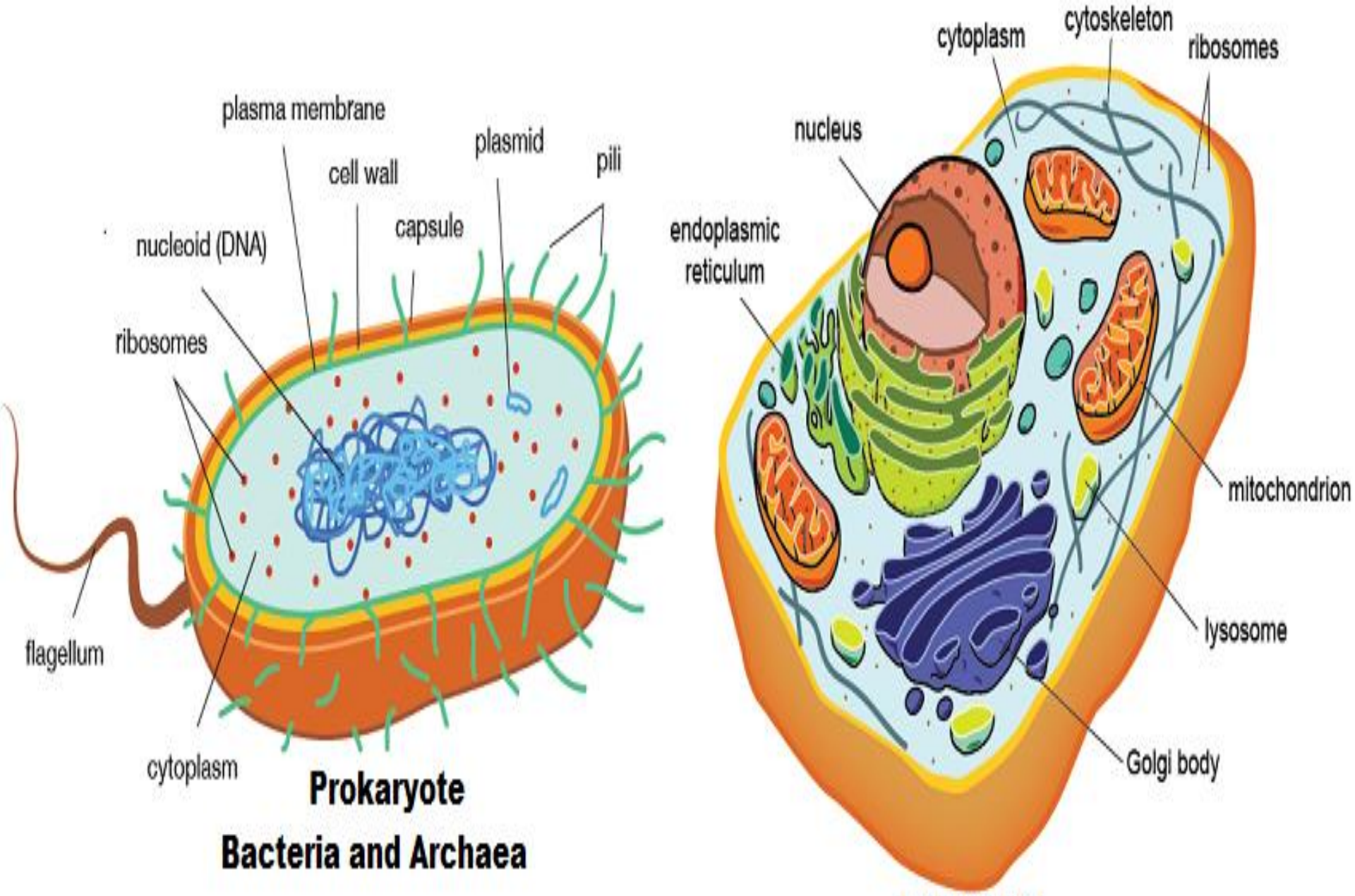
The countless cells that exist on earth fall into two basic categories :- prokaryotic cells and eukaryotic cells, Bacteria and archaea consist of prokaryotic cells and so are called prokaryotes, All other organisms –protists, plants, fungi and animals, including humans – are composed of eukaryotic cells and are called eukaryotes.

Prokaryotic Cells

1. Prokaryotic cells have no nucleus. Instead, some prokaryotes such as bacteria have a region within the cell where the genetic material is freely suspended. This region is called the nucleoid.
2. They all are single-celled microorganisms. Examples include archaea, bacteria, and cyanobacteria.
3. The cell size ranges from 0.1 to 1.5 μm in diameter.
4. The hereditary material can either be DNA or RNA.
5. Prokaryotes generally reproduce by binary fission, a form of asexual reproduction. They are also known to use conjugation – which is often seen as the prokaryotic equivalent to sexual reproduction (however, it is NOT sexual reproduction).

Eukaryotic Cells

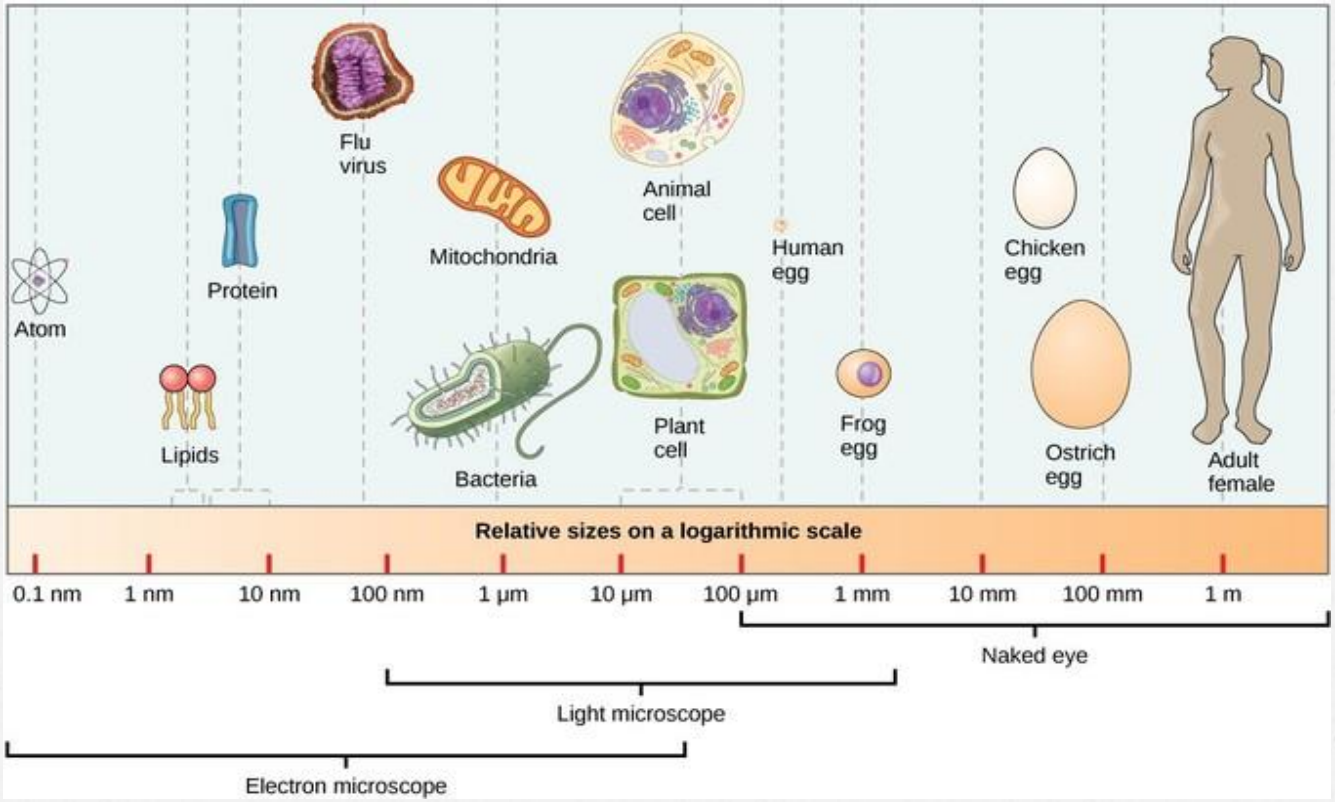
1. Eukaryotic cells are characterised by a true nucleus.
2. The size of the cells ranges between 10–100 µm in diameter.
3. This broad category involves plants, fungi, protozoans, and animals.
4. The plasma membrane is responsible for monitoring the transport of nutrients and electrolytes in and out of the cells. It is also responsible for cell to cell communication.
5. They reproduce sexually as well as asexually.
6. There are some contrasting features between plant and animal cells. For eg., the plant cell contains chloroplast, central vacuoles, and other plastids, whereas the animal cells do not.


plasma membrane
plasmid
pili
cell wall
capsule
nucleoid (DNA)
ribosomes
flagellum
cytoplasm
Prokaryote
Bacteria and Archaea
cytoplasm
cytoskeleton
ribosomes
nucleus
endoplasmic reticulum
mitochondrion
lysosome
Golgi body
Eukaryote
Plants, Animals, Fungi, Amoebas, Molds

Cell Size

Some cells sizes and how to view them		
Type of cell	**Average Size**	**How can it bee seen?**
Virus	0.03 – 0.8 µm	Electron microscope (EM)
Bacteria cell (prokaryote)	0.5 – 5.0 µm	Light microscope or EM
Smallest human cell (sperm cell)	2.3 – 3.5 µm	Light microscope
Human red blood cell	7.5 µm	
Human cheek cell	60 µm	Light microscope
Mature human ovum	120 – 150 µm	
Amoeba	300 µm	
Grain of salt	300 µm	
Onion skin cell	400 µm	
Largest human cell (neuron)	Up to 1m long ! (=1,000,000 µm)	

- A fresh ostrich egg, which can weigh up to 3lbs.
- Nerve cells from the spinal cord of can be up to a meter long.
- Mycoplasma are the smallest known cells. These tiny, single celled bacteria don't have cell walls. Why are they important? Members of this group include pneumonia and other human pathogens.



Some Types of Living Organisms :-

1-Viruses :-

Viruses are a type of germ which lives and breed inside the Cells of animals . They are capable of living outside the animals but will not multiply in this situation.

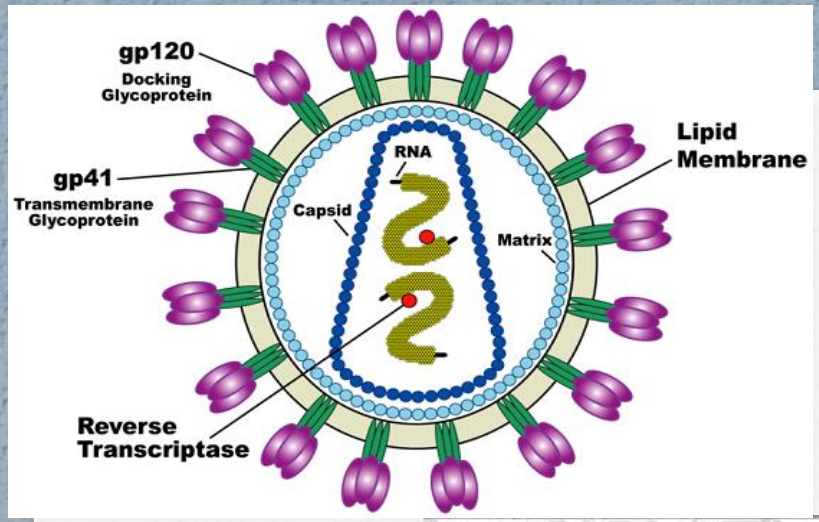
Ex .1:- HIV:- Human immunodeficiency virus

Ex.2:- HBS :- Hepatitis B .

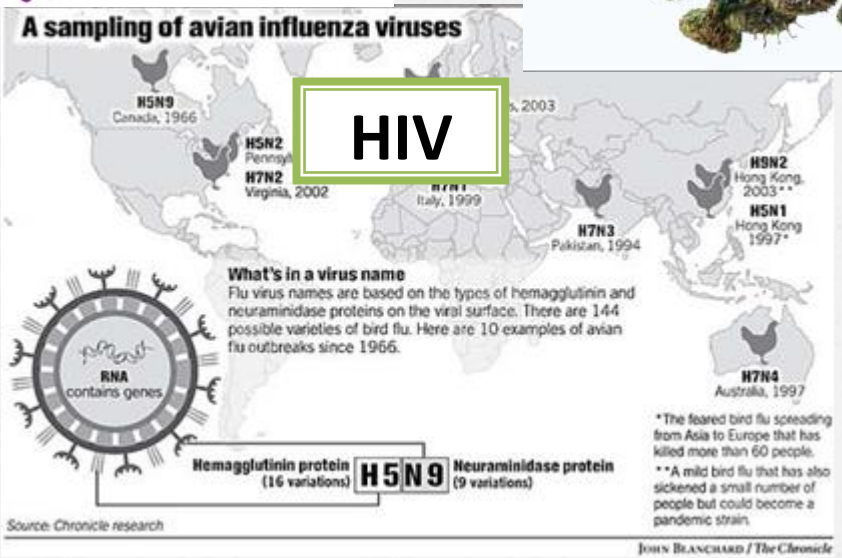
Ex.3:-H5N1 :-avian flu virus.

Ex.4:-H1N1 :-Swine flu virus

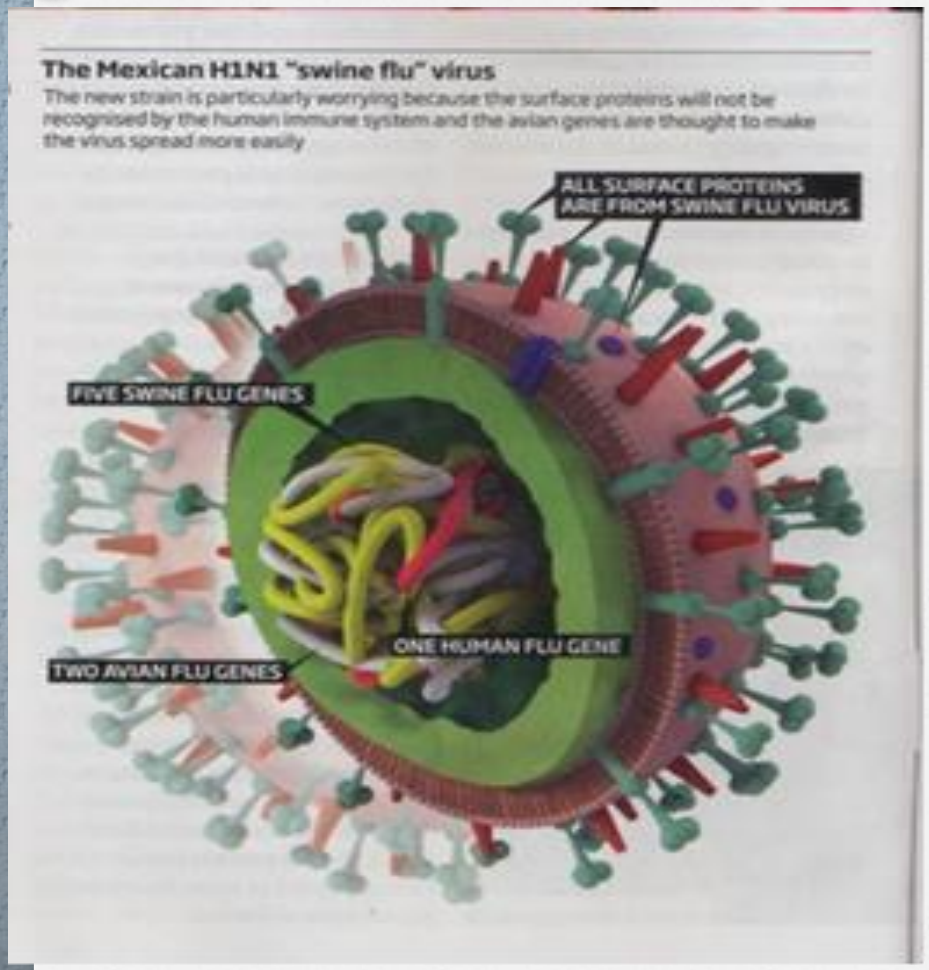
Ex.5:- Bacteriophage.


gp120
Docking
Glycoprotein
gp41
Transmembrane
Glycoprotein
Lipid
Membrane
RNA
Capsid
Matrix
Reverse
Transcriptase

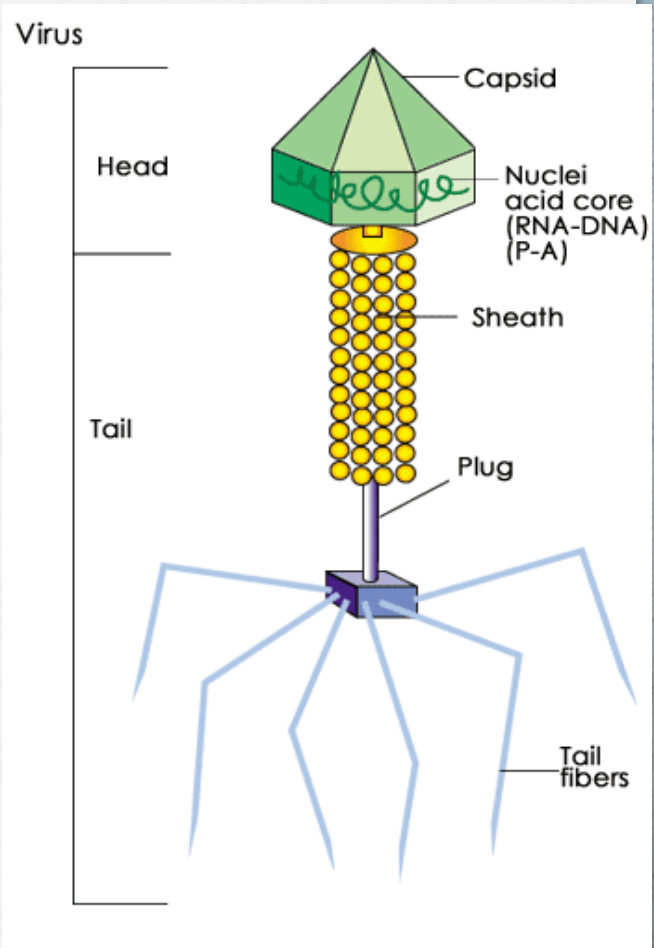
HIV


A sampling of avian influenza viruses
H5N9
Canada, 1966
H5N2
H7N2
Virginia, 2002
H7N3
Pakistan, 1994
H9N2
Hong Kong,
2003**
H5N1
Hong Kong
1997*
H7N4
Australia, 1997
What's in a virus name
Flu virus names are based on the types of hemagglutinin and neuraminidase proteins on the viral surface. There are 144 possible varieties of bird flu. Here are 10 examples of avian flu outbreaks since 1966.
RNA
contains genes
Hemagglutinin protein
(16 variations)
H5N9
Neuraminidase protein
(9 variations)
*The feared bird flu spreading from Asia to Europe that has killed more than 60 people.
**A mild bird flu that has also sickened a small number of people but could become a pandemic strain.
Source: Chronicle research
JOHN BLANCHARD / The Chronicle

H5N1



H1N1



Bacteriophage

2-Bacteria.

Bacteria are prokaryotic microorganisms and usually live between the cells of the infected animal and multiply both within the animal and outside. They are metabolically active and divide by binary fission. Medically they are a major cause of disease:

EX.1:- Salmonella causes salmonellosis.

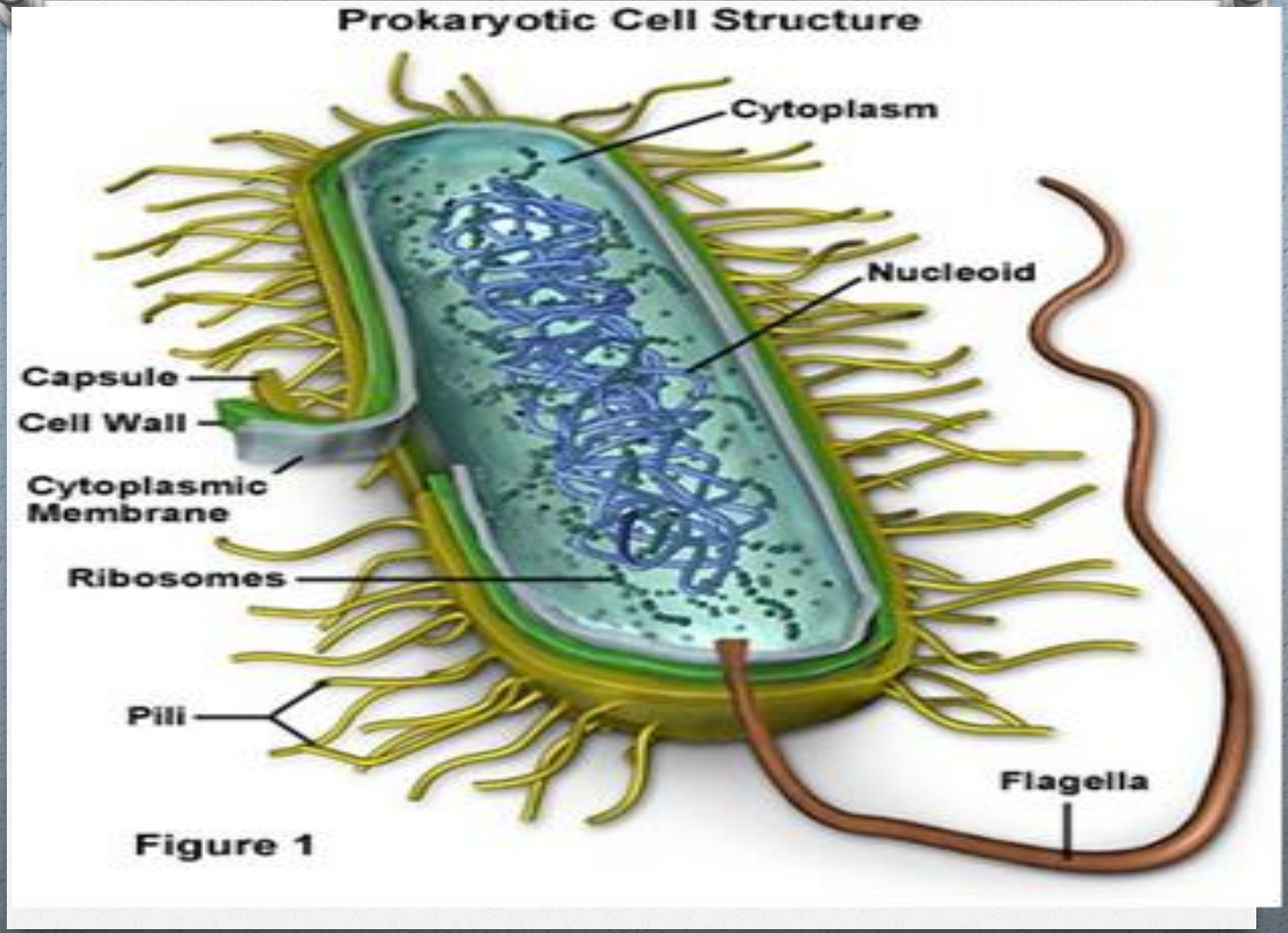
EX.2:-Shigella causes shigellosis.

EX.3:-Brucella causes Brucellosis.

EX.4:-Anthrax causes Anthrax.

EX.5:-Actinomycetes causes Actinomycosis.

EX.6:-Azotobacter.

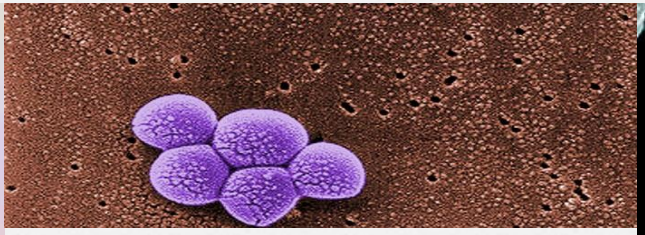

Prokaryotic Cell Structure
Cytoplasm
Nucleoid
Capsule
Cell Wall
Cytoplasmic Membrane
Ribosomes
Pili
Flagella
Figure 1

Types of bacteria

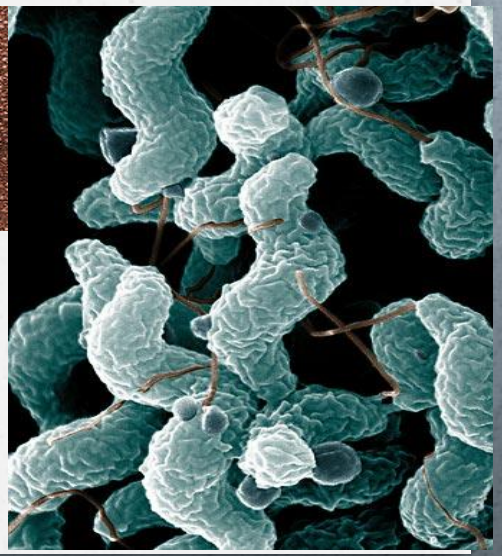
Microbiologists classify bacteria according to their shape:-

Spherical , rod-shaped , and spiral-shaped .pleromorphic bacteria can assume a variety of shapes.

Rod-shaped bacteria

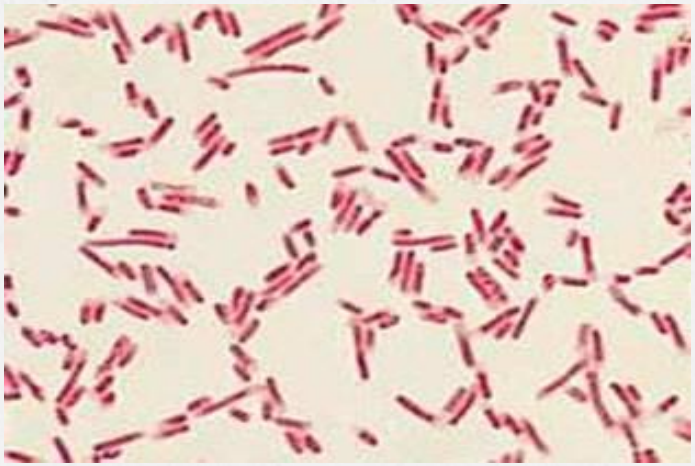


Spherical bacteria

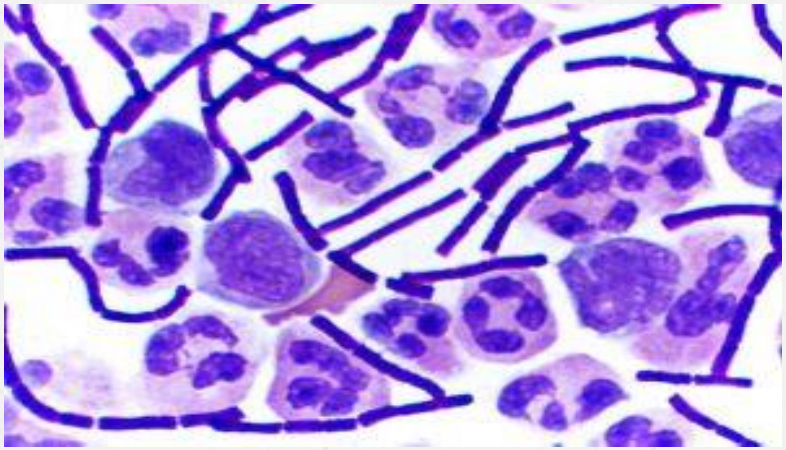


Spiral-shaped bacteria

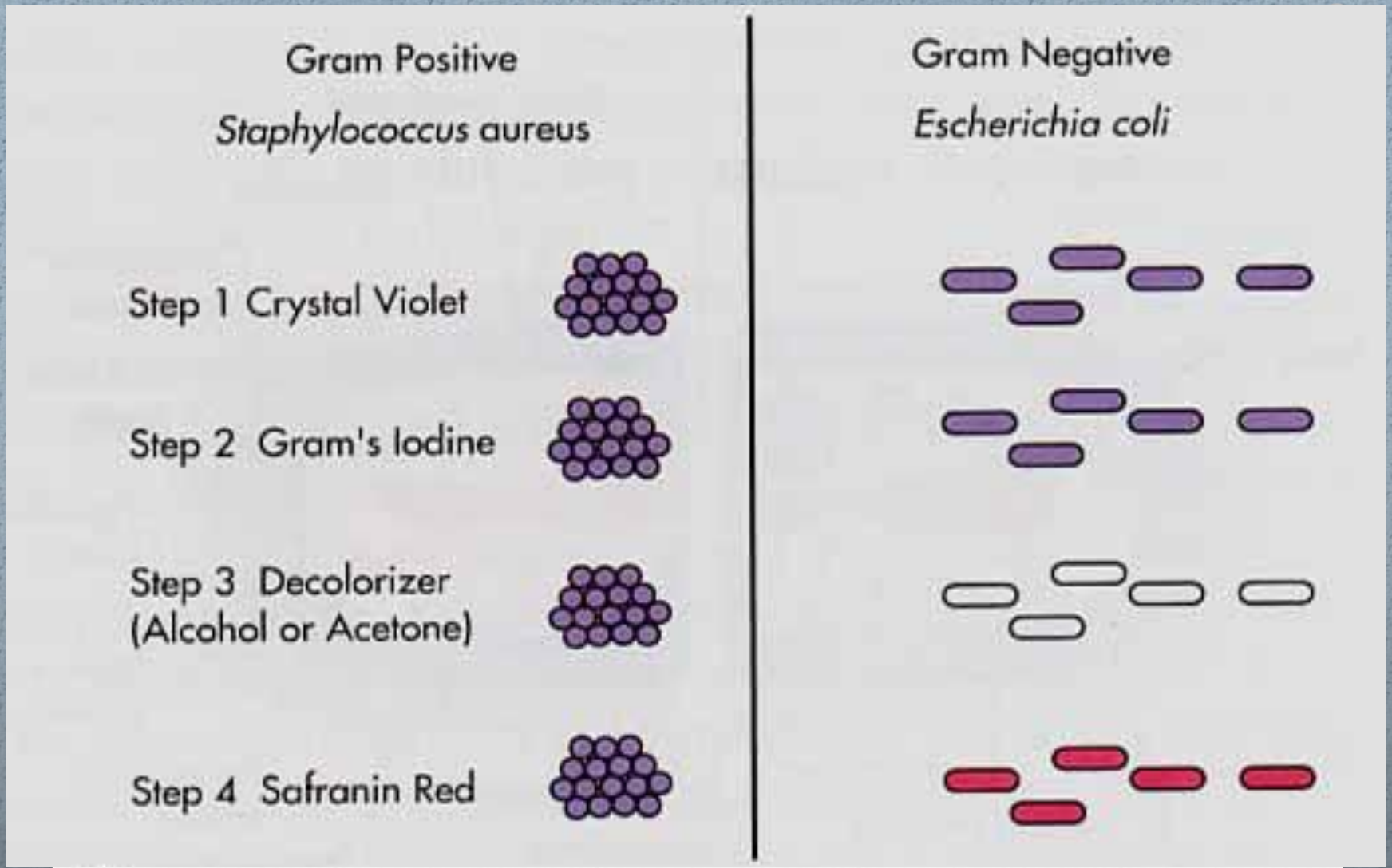
Bacteria may be further classified according to whether they require oxygen (aerobic or anaerobic) , and how they react to attest with Gram's stain (bacteria in which alcohol washes away Gram's stain are called gram-negative ,while bacteria in which alcohol causes the bacteria's wall to absorb the stain are called gram-positive .



Gram – negative bacteria



Gram – positive bacteria



Gram stain steps

3-Fungi

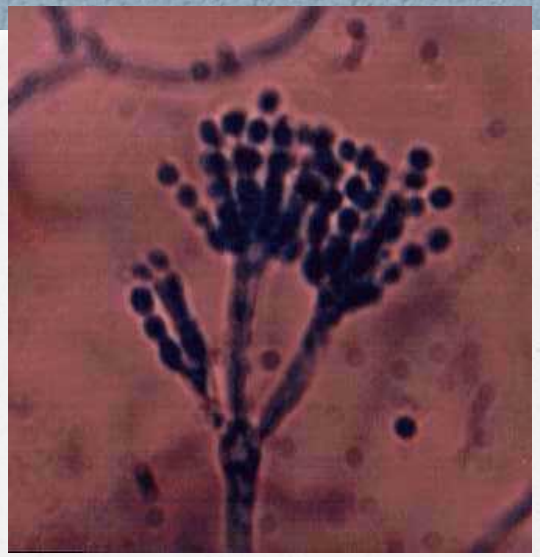
Fungi are osmoheterotrophic eukaryotes that play a key role in sustaining life on earth, that are probably more closely related to animals than to plant. Their vegetative structure may be filamentous or unicellular.

Ex.1:- Penicillium.

Ex.2:- Aspergillus.

Ex.3:- Candida (yeast).

Ex.4:- Mushroom.



Penicillium

Aspergillus

Candida (yeast)

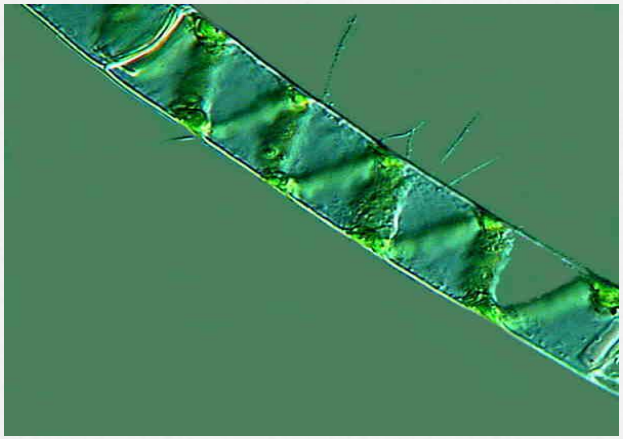
Mushroom

4- Algae

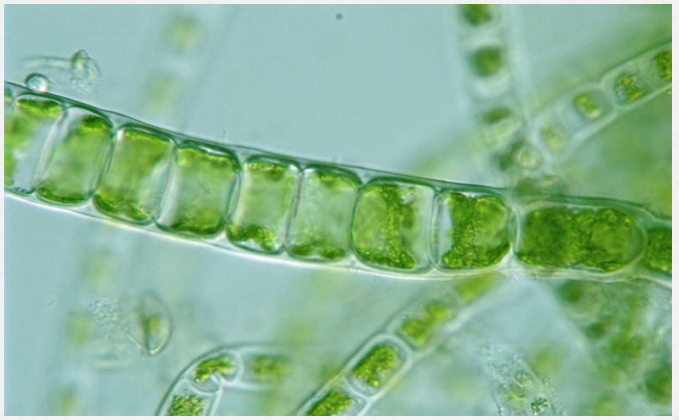
Algae are a large and diverse group of eukaryotic (complex-celled) photosynthetic organisms. mostly aquatic and a few are terrestrial. Theplant body ranges from unicellular to multicellular structures with no vasculature and little differentiation into various tissue systems thus they are referred to as thallophytes lacking true roots, stem and leaves.

Ex.1:- Spirogyra.

Ex.2:- Ulothrix .



Spirogyra

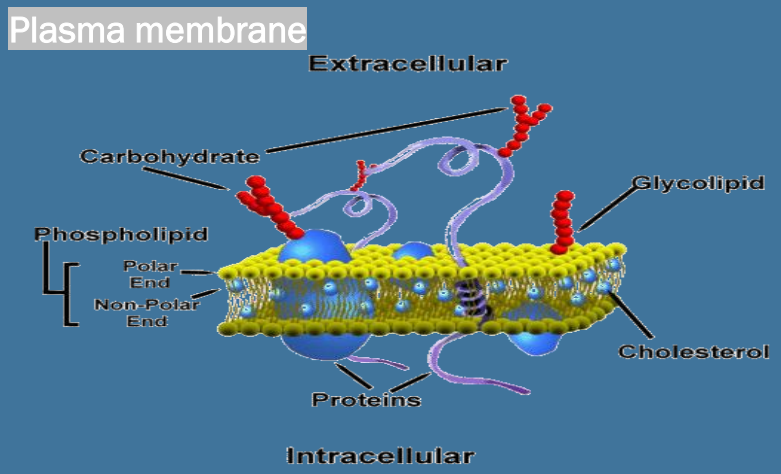
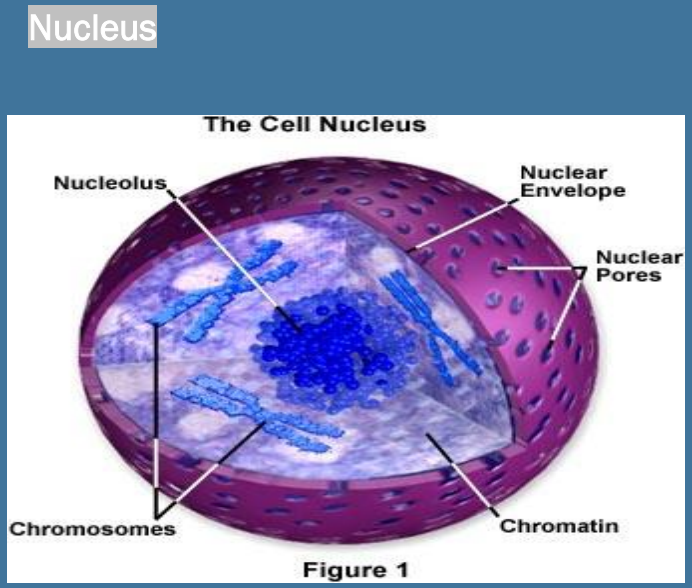


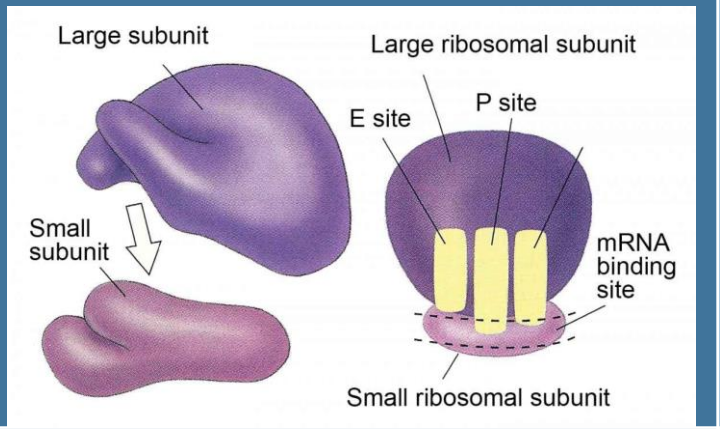
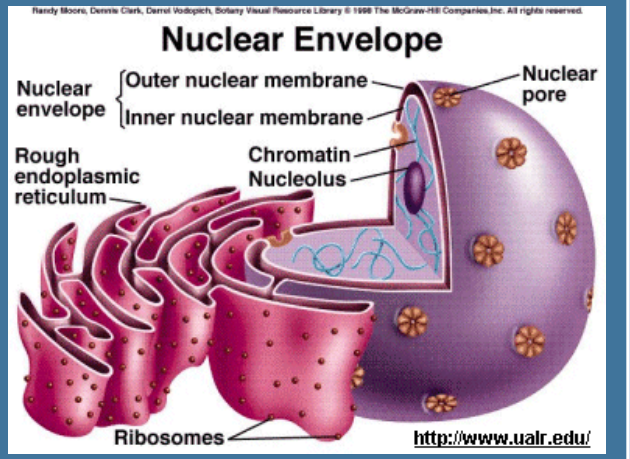
Ulothrix

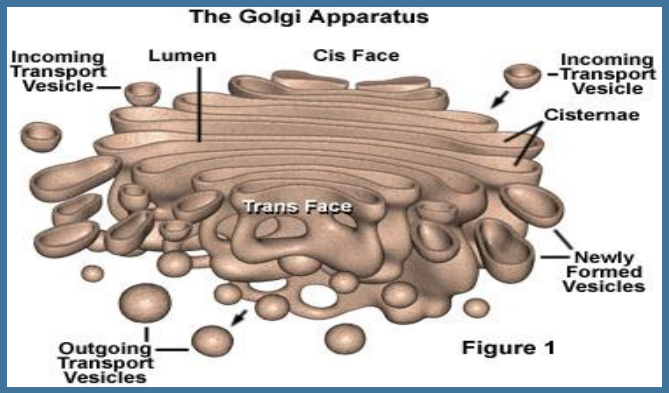
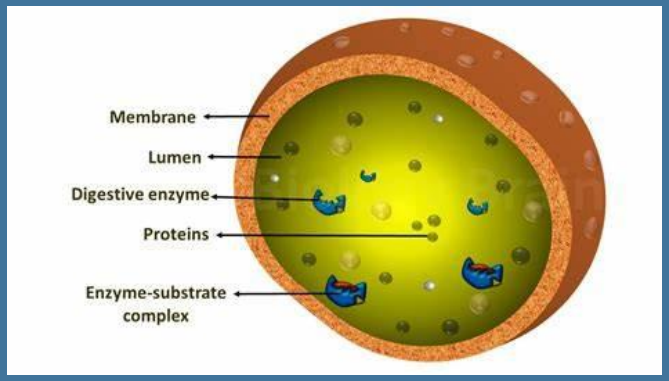
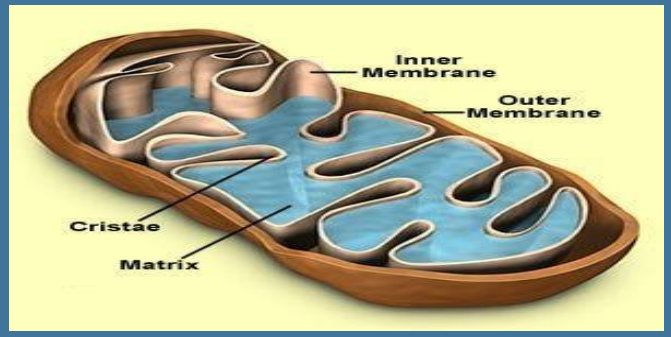
Benefits of Algae

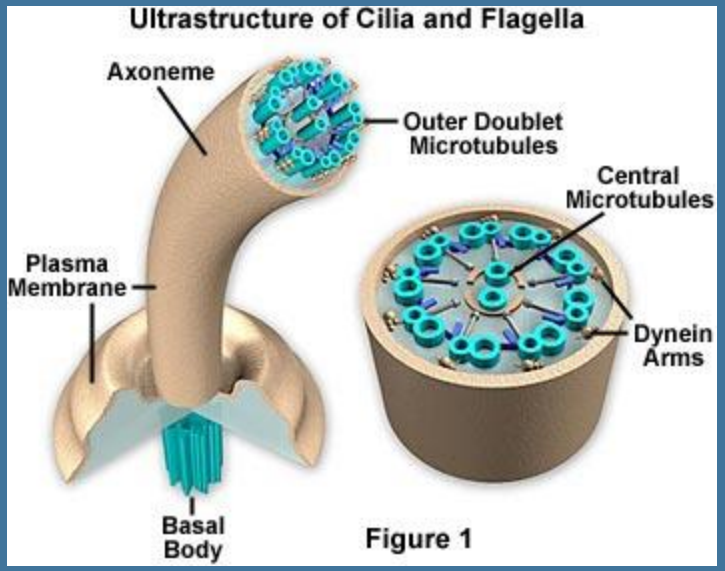
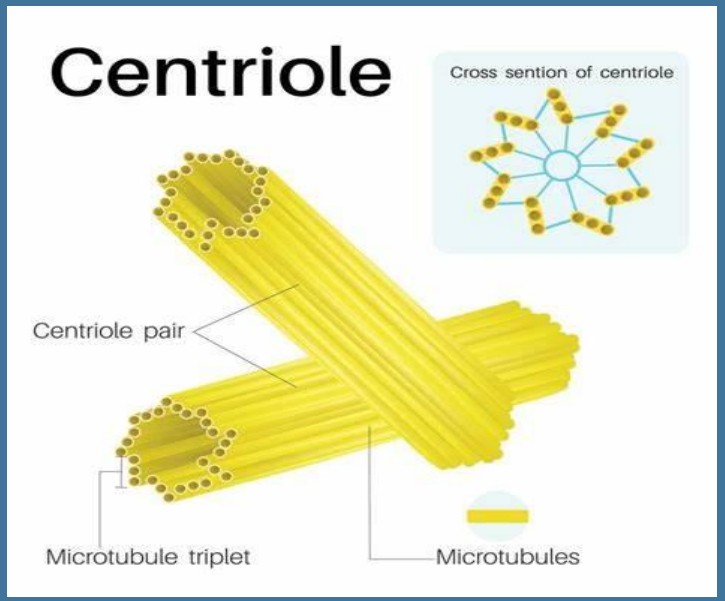
1. source of food.
2. O2 production.
3. CO2 Remover.
4. biogas production.

Animal cell

Name	Composition	Function
1-Plasma membrane 	Phospholipids bilayer with embedded proteins.	Define cell boundary, regulation of molecule passage into & out of cell.
2-Nucleus 	Nuclear envelope surrounding nucleoplasm, chromatin and nucleoli.	Storage of genetic information, synthesis of DNA & RNA.

3-Nucleolus	Concentrated area of chromatin, RNA and proteins.	Ribosomal formation.
4- Ribosome 	Protein and RNA in two subunits.	Protein synthesis.
5- Endoplasmic reticulum (E R) • Rough E R • Smooth E R  Endoplasmic reticulum	Membranous flattened channels and tubular canals.	Synthesis and / or modification of proteins and other substances , &transport by vesicle formation Protein synthesis Various,lipid synthesis in some cells

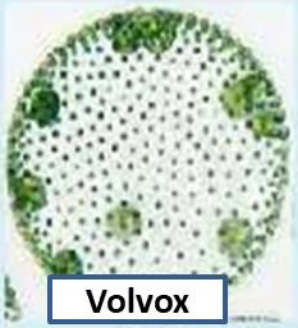
6- Golgi apparatus		Stack of membranous saccules.	Processing, packaging, and distribution of proteins and lipids.
7- Lysosome		Membranous vesicle containing digestive enzymes	Intracellular digestion.
8- Mitochondrion Mitochondrion		Membranous cristae bonded by an outer membrane.	Cellular respiration.

9- Cilia and flagella Cilia and flagella  	9 + 2 pattern of microtubules.	Movement of cell
10-Centrioles Centrioles  	9 + 0 pattern of microtubules.	It is concerned with the synthesis of microtubules (e.g. the spindle and aster microtubules present during cell division).

Pond Water Preparation

1. Gently stir the jar containing the water sample in order to ensure uniform distribution of organisms in the water.
2. Using a dropper, place two or three drops of pond water at the center of a clean, sterile microscopic slide.
3. Place a clean, sterile cover on top of the water drop (This should be done carefully, placing the slide on one edge at a 45 degree angle and gently laying it on top of the water to allow for even spreading of the water sample and remove bubbles)
4. Touch a piece of blotting paper on one side of the slide to absorb any excess water.
5. Place the slide on the microscope stage for observation.

MICROORGANISMS IN A DROP OF POND WATER

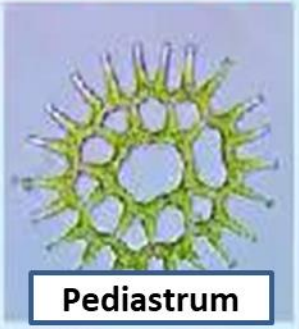

Volvox


Synura


Rotifer

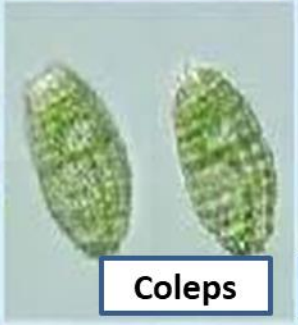

Bacteria


Heliozoa

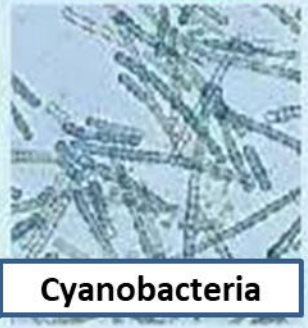

Pediastrum


Stentor


Spirogyra


Coleps


Chlamydomonas


Cyanobacteria


Nematod


Shelled Amoeba


Lacrymaria


Didinium


Vorticella

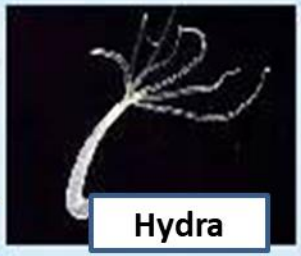

Gastrotrih


Diatom


Planarian


Dinoflagellate

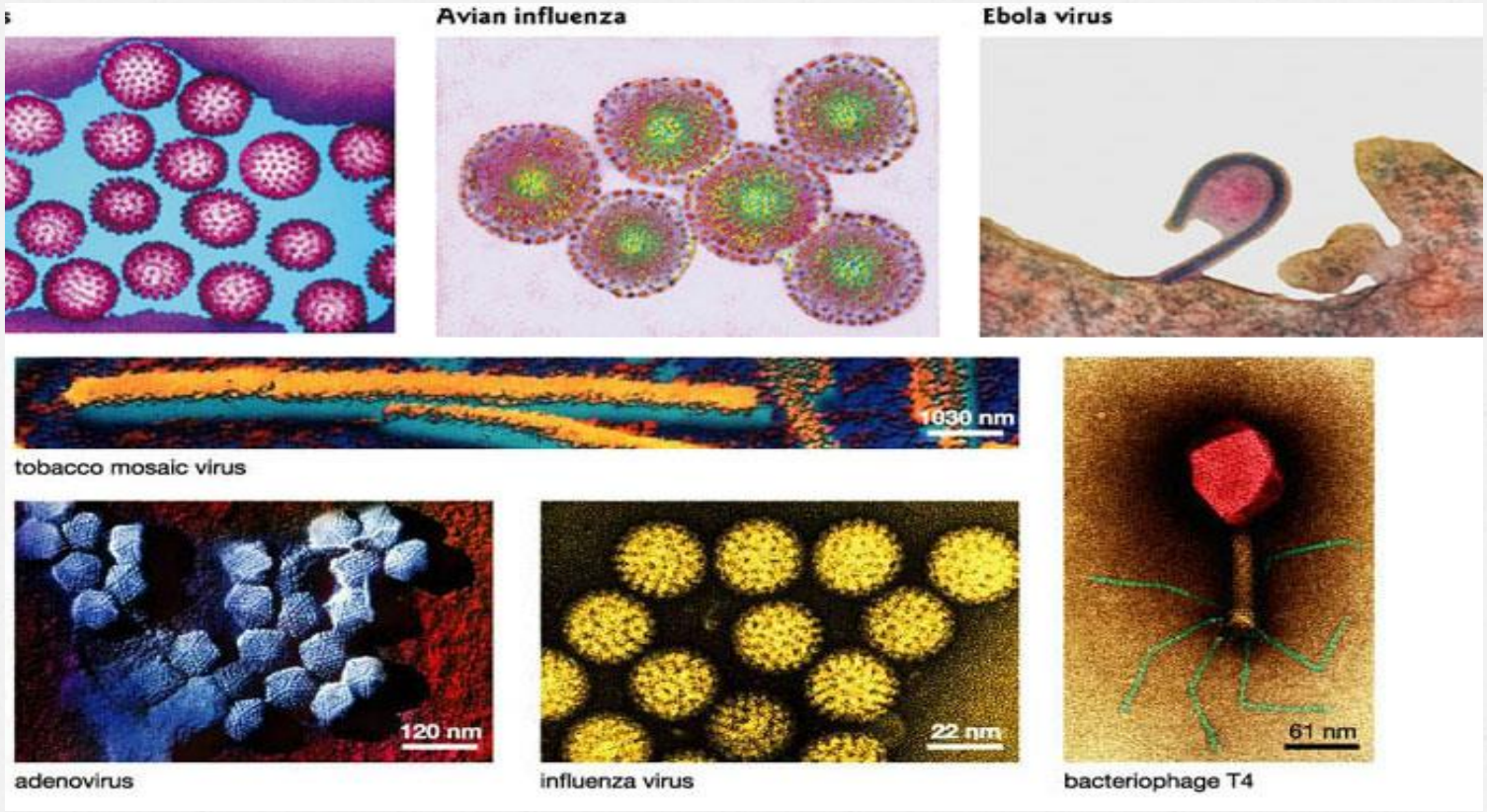

Mosquito larva


Hydra


Rotifer


Desmidium

Appendix



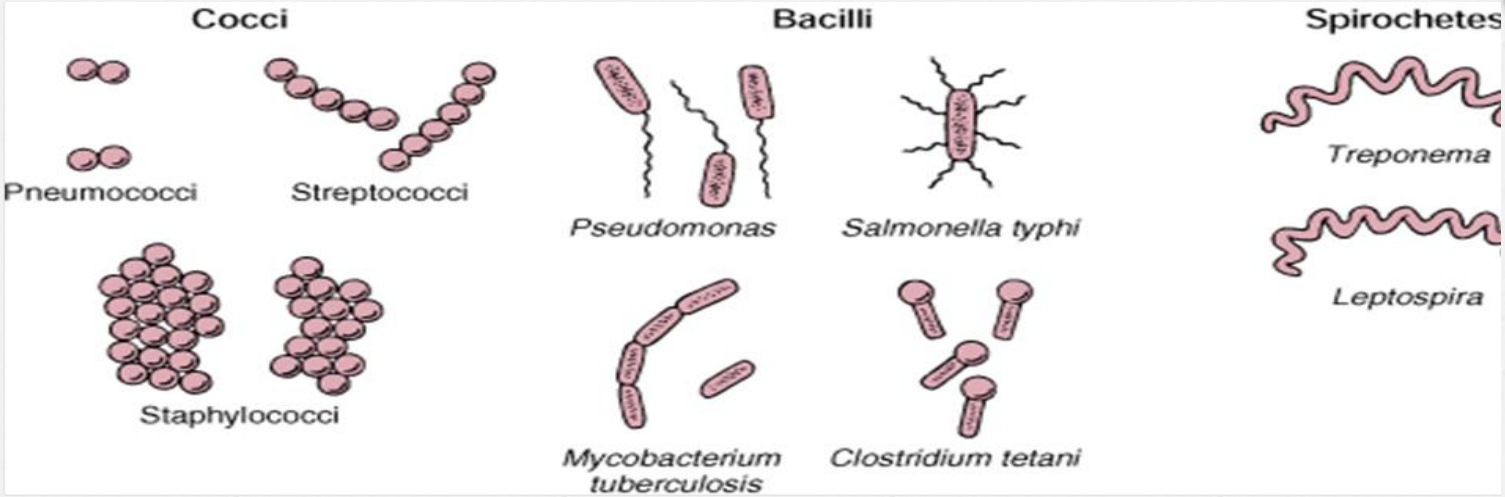
Some types of viruses

A

B

Bacterial growth on culture medium

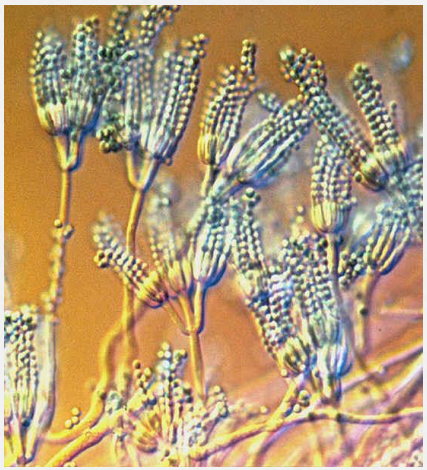
Bacterial cells under Fluorescente microscope



Some types and shapes of bacteria

The main three shapes of bacteria

Fungal growth on culture medium



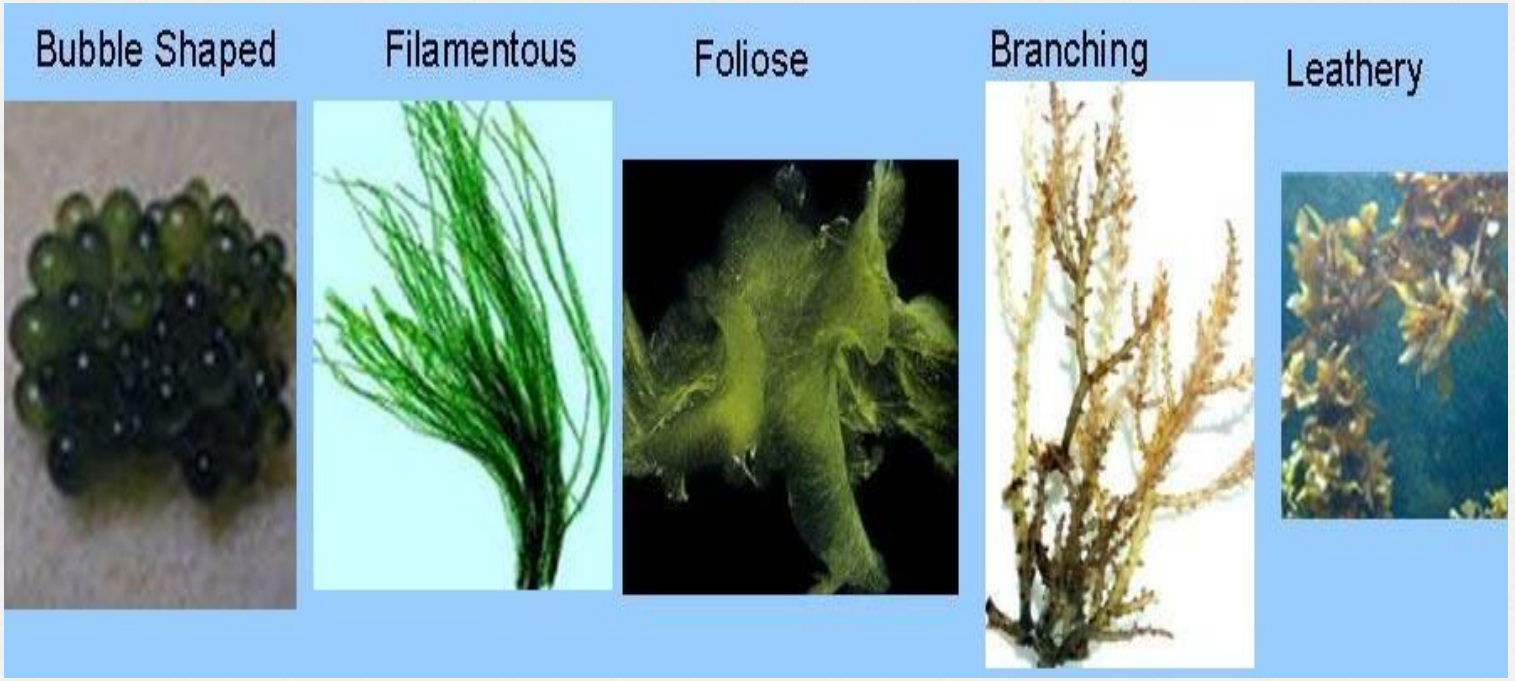
penicillium

Thrush caused by Candida

A

B

Mushroom



Some shapes of algae