

Living organism is ~~extra~~ a complex unit of physicochemical materials capable of self-regulation, metabolism & regulation. They have the ability to ~~be~~ interact with its environment, adapt, ~~learn~~ grow and move.

All organisms are -
• made of cells, reproduce to species of its own kind, - require food,
• maintain ~~homeostasis~~ homeostasis

Whittaker's 5 kingdom classification:-

Criteria:- Cell type, Nucleus presence, cell wall, nutrition, organisation

(1) complexity of the cell :- Eukaryotic cell (PROTISTA)
Prokaryotic cell (MONERA)

(2) complex organisation :- Multicellular/Eukaryotic
Unicellular

(3) Mode of nutrition :-
Autotrophs \downarrow PLANTAE
Saprophytes \downarrow FUNGI
Heterotrophs \downarrow ANIMALIA
(Yeast \rightarrow unicellular fungi) \rightarrow exception in Fungi category

- Autotrophs:- make their own food for nutrition
- Heterotrophs:- rely on feeding on other organisms for nutrition
- Saprophytes:- breaks down dead organic matter for nutrition

Distinction based on:-	MONERA	PROTISTA	PLANTAE	FUNGI	Animalia
Cell type:-	uni	multi	multi	multi	multi
Nucleus presence:-	doesn't have well defined nucleus	has well defined nucleus	✓	(Yeast - uni)	✓ well defined nucleus
Cell wall:-	✓	✓	✓	✓	×
Mode of nutrition:-	Auto/Hetero Saprophyte	Auto/Hetero (Parasite)	Auto	Saprophytes	Hetero
Eg:-	Bacteria, Blue green algae	Amoeba	Plants, Trees	Yeast, Mushrooms	Fish, Animals
Cell organelles	Lacks cell organelles	Flagella, cilia, contractile vacuole	High level tissue differentiation	High level tissue differentiation (Narrow system) Honeycomb like hyphae Narrowed hyphae \rightarrow mycelium	High level tissue differentiation

Reproduction: Meiosis, Self-Reproduction/Multiply: Mitosis

Cell theory:-

- 1) All living organisms are made of ^{unit of} cell
- 2) Cells are basic structure & function in an organism
- 3) Cells come from reproduction of pre-existing cells (cell division)

- Prokaryotic cells:
 - a) Doesn't have well defined nucleus - No nucleoid region which contains DNA
 - b) Contains cell membrane & cell wall [peptidoglycan]

- Eukaryotic cell:
 - a) Has well-defined nucleus & membrane bound organelles
 - b) Includes protista, fungi, plants, animals

- Types of DNA**
- 1) **Nuclear DNA:** ^{contains} ~~encodes~~ all cell's genetic information. It encodes all proteins for cell function, regulation & organization. It is involved in processes like replication, respiration, transcription and translation.
 - 2) **Mitochondrial DNA:** It encodes proteins for ATP synthesis. Hence, called powerhouse of cell
 - 3) **Chloroplast DNA:** It encodes proteins for photosynthesis.

Types of cell organelles:-

- 1) **Cell/Plasma membrane:** Double layered outer membrane made of phospholipids & proteins. It controls what enters and leaves the cell as it has pores in membrane
- 2) **Cytoplasm:** Jelly-like substance enclosed by the cell membrane. It ~~is~~ helps in chemical reactions to take place.

3) **Nucleus** :- It is the central center of the cell. It has 23 pairs of chromosomes in each cell. These chromosomes have chromatin (thread like) which contains DNA and store genetic info. (genes control cell characteristics)

(i) **DNA** :- It is the blueprint of the cell. It has a set of instructions which for basic functions of cell organelles

(ii) **Nuclear envelope** :- Double layered membrane which controls what enters & leaves the nucleus.

- **Inner membrane** :- associated with network of proteins which help maintain shape & structure of nucleus

- **Outer membrane** :- continuous with ER and has ribosomes.

(iii) **Nucleolus** :- It is inside nucleus and contains 1-3 nucleoli. It disappears during cell division

- **rRNA** :- Creates ribosomes \rightarrow Ribosome = rRNA + R protein

- **mRNA** :- Carries genetic info from DNA to ribosome and then gets translated to proteins.

4) **Cytoskeleton** :- Helps maintain structural integrity of the cell & move cell organelles.

- **Microfilaments** :- Made up of actin & myosin which help in muscle contraction which in turn is crucial for movement of cell organelles in the cell.

- **Microtubules** :- Made up of tubulin which help facilitate cell division

- **Intermediate filaments** :- Present betⁿ microfilaments & microtubules and help ~~max~~ provides mechanical supports

→ (only in animal cells)

5) Centrosome:- It plays a crucial role in organising microtubules and facilitates cell division.

- Centrioles:- Centrosome pair = Pair of centrioles \perp^r to each other. Centrioles are cylindrical structure made up of microtubules.

These centrioles appear during cell division forming mitotic spindles.

→ (only in plant cells)

6) Chloroplasts:- It contains chlorophyll which gives plants the green colour. It converts energy from light to glucose (food), hence it is autotrophic. It takes part in photosynthesis (enzymes & pigments).

- Outer membrane \rightarrow smooth, Inner membrane is modified into sacs called thylakoids (stack of thylakoids = grana).

- Stroma:- Gel like material surrounding thylakoids which contain DNA & ribosomes.

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1st part of photosynthesis \rightarrow takes place in thylakoids
 2nd part of photosynthesis \rightarrow " " " " stroma

7) Mitochondria:- It is powerhouse of cell. It is the site where cellular respiration takes place. It produces cellular energy called ATP (adenosine triphosphate).

- ATP:- It is also referred to as 'Energy currency of the cell'. Takes part in energy transfer, muscle contraction, & bio synthesis.
- Cristae:- It is the folded inner membrane. It increases its surface area for chemical reactions to take place (more).

Mitochondria comes from the cytoplasm of the egg cell during fertilization.

8) Endoplasmic Reticulum (ER) :- Synthesis of proteins & lipids takes place. It is a network of hollow membrane tubules connected to nuclear envelope & cell membrane.

- Rough ER :- It has ribosomes on its surface, protein synthesis takes place. These proteins are threaded in the interior of Rough ER to be modified & then transported.

- Smooth ER :- It does not have ribosomes and is associated with lipid synthesis. Lipids are ~~mem~~ steroids. It is connected at end of Rough ER.

- Ribosomes :- Made of ~~PR~~ Proteins + rRNA; 2 amino acids = Proteins. It is called protein factory since protein synthesis takes place. Ribosomes may be attached to Rough ER / be free in cytoplasm.

9) Golgi Bodies :- Stacks of flattened sacs. It receives proteins made by ER (cis face) & transports the modified proteins in vesicles (trans face).

It can also temporarily store proteins during processing & sorting stage.

10) Lysosomes :- It contains digestive enzymes which help break down food and get rid of the waste. ~~Cells~~

- Phagocytosis :- Cell takes in food by process of phagocytosis.

- Autolysis :- With help of enzymes in lysosomes, it can cause ~~self-de~~ self degradation / break down of cell. \rightarrow cell death.

- Autophagy :- Cell's own components are degraded \rightarrow recycling purpose.

11) Vacuoles :- Present in plant cell, absent in Animal & bacterial cells. Stores lipids, enzymes, proteins, sugar etc.