2. Biological Classification

- Biological Organisms are classified in to —

(i) Monera kingdom
(ii) Protista kingdom
(iii) Fungai kingdom
(iv) Plant kingdom
(v) Animal kingdom

★ **Kingdom Monera :**

- Bacteria is the Single or sole member of kingdom monera.
- Bacteria is Cosmopolitan Organism.
  ↓
  (found every where)
- Bacteria is the most abundant microorganism on this earth.
- Bacterias are found in Various shape. Like —

(i) Coccus → Spherical or Round

(ii) Bacillus → Rod shape
(iii) Spirillum → Spiral shape
(iv) Vibrio → Comma shape.

> Classification of Bacteria :-

(i) Archaebacteria
(ii) Eubacteria
(iii) Cyanobacteria

• Archaebacteria :-

• Originated from Greek Word "arkhaios".

• It is most Ancient bacteria.

• Archaebacterias are differ from other bacteria due to differences in their Cell Wall structure and function.

• Archaebacteria Can survive in extreme & harsh habitat or Condition due to their Cell Wall Composition.

• Archaebacteria Can Classify in to three type —

(i) Thermophiles
(ii) Halophiles
(iii) Methanogens

(i) Thermophiles :-

- It can found in hot thermal Spring or hot thermal Vent. Where temp. accided more than 100°c.

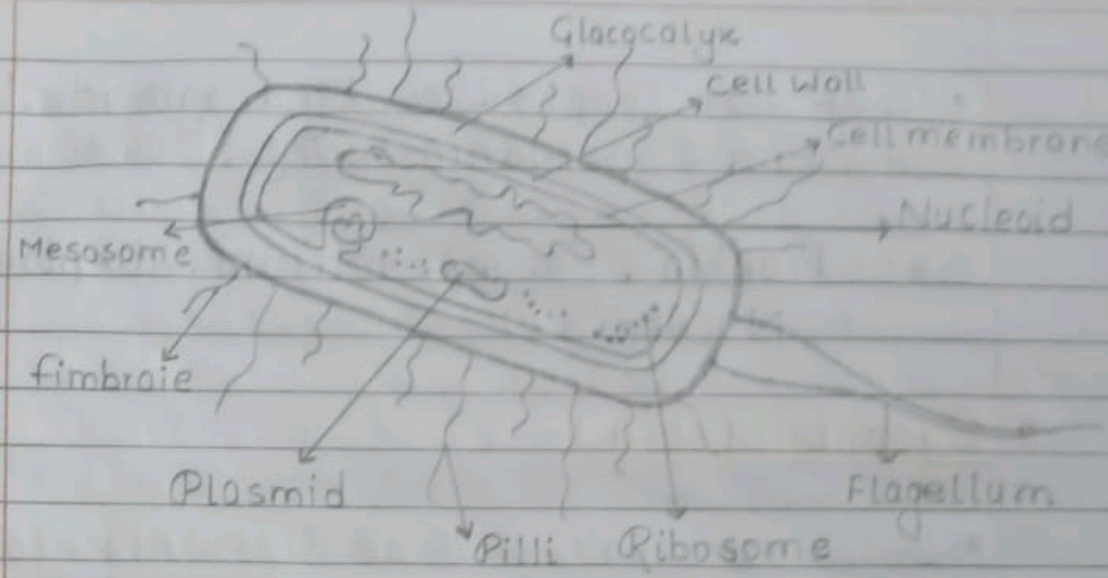
(ii) Halophiles :-

- These bacteria can found in highly Salt Concentration area or Salty area like — Hyper Saline lagoon

(iii) Methanogens :—

- These bacteria can found in marshy area.
- These bacteria can also found in elementry canal of cattle or in paddy field.
- Methanogens are responsible for production of Biogas (methane) from the dung of Cattles.

- Eubacteria :-
  - → True bacteria



- Eubacterias are characterised by presence of their cell wall.
- Actinomycetes is the type of Eubacteria.
- Actinomycetes is also called Ray-fungi or Mycelium or Actinobacteria.
- These bacterios are branched filamentous bacteria & it is intermediate between bacteria and fungi.
- These are fucultative anaerobes or heterotrophs & these are decomposes.
- These are Gram '+ve' bacteria.
- There cell Wall is made up of peptidoglycan and mycolic Acid.

- They can reproduce by fragmentation, Conidium, Sporangio spore, Oidium.

Ex:- Frankia, Corynebactrium, Streptomyces, & Nocardia.

- **Cyanobacteria :-**

- It is also called Blue Green Algae (BGA).

- Cyanobacterias are photoautotrophic bacteria.

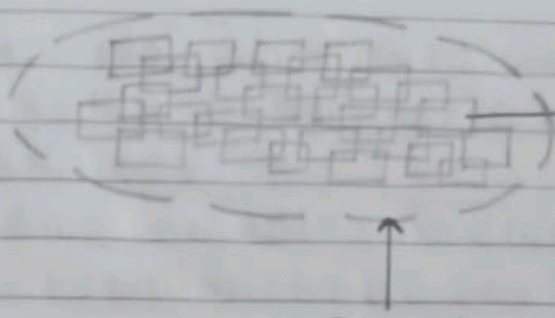
- These bacterias are oxynogenic photosynthesizer.

- Cyanobacterias having chlorophyll-a Similar like higher plants.

- Cyanobacteria may be aquatic or Terrestial.

- It is unicellular, filamentous and Colonial.

- Cyanobacterias fromm Colonies & it is Covered by gelatinous sheath.



- Cyanobacteria is the filamentous bacteria having a special type of cell that is called "Heterocyst".
- Heterocyst cell are responsible N_2 fixation.
- Locomotory organs are absent in Cyanobacteria.
- Cyanobacteria have great economic importance.

Ex:- Nostoc, Anabaena → Both helps in N_2 fixation.

Spirulina → These are single cell protei bacteria.

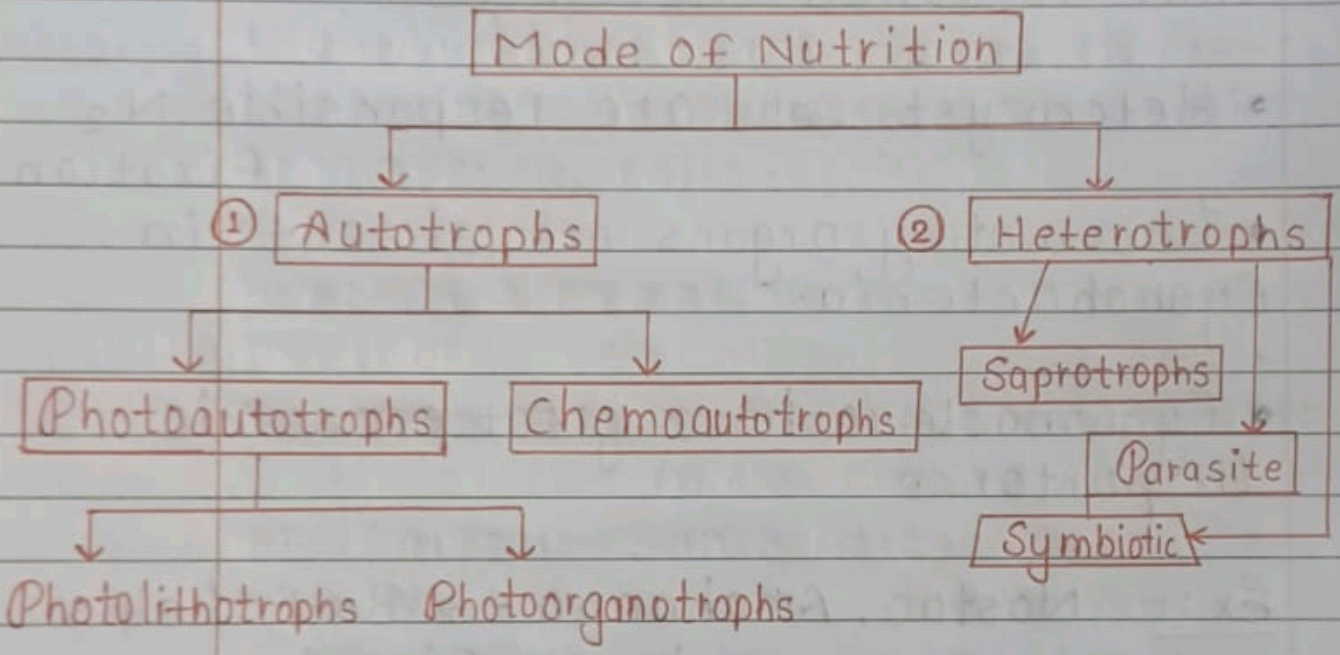
→ They are source of good protein Contain through a cell.

Mycoplasma → Mycoplasma is the smalle living organism.

→ Mycoplasma don't have cell wall. So their shape is not fixed.

→ It is also called "Joker of plant kingdom."
→ It is also called PPLO / Mycoplasma gallisepticum.
→ Mycoplasma may be pathogenic in plant and animal.
→ PPLO can also survive in the absence of Oxygen.

★ Mode of Nutrition in Bacteria :-



① **Autotrophs** :- Those bacteria who can Synthesize energy by their own.

* **Photoautotrophs** :- Bacteria that synthesised ATP using sunlight as energy source.

• **Photolithotrophs** :

→ Bacteria that uses in-organic chemicals for electron & proton receiver in the presence of light.

Ex:- Theospirulum — Purple Sulphur bacteria
— Chlorobium or green Sulphur bacteria.

• Photoorganotrophs :

→ Bacteria which are use organic chemical for electron & proton receiver in the presence of light.

Ex:- Rodospirulum — Purple Non-Sulphur bacteria.
— Chloronema or green Non-Sulphur bacteria.

* Chemoautotrophs :- Bacteria which uses chemical energy to Synthesised ATP.

• Electron & protons donor are inorganic chemicals rarely organic chemicals.

Ex:- Nitrosomonas, Nitrobacter, Theobacillus, Pherobacillus & Methanococcus.

② Heterotrophs :- Those bacteria who depend on other for their food Survival.

➤ Having three type :-

* Saprotrophs :- Digestion & enzymatic activities takes place outside body & then it is only absorbed bacteria then this mode of Nutrition is Called "Saprotrophs".

Ex :- Micrococcus.

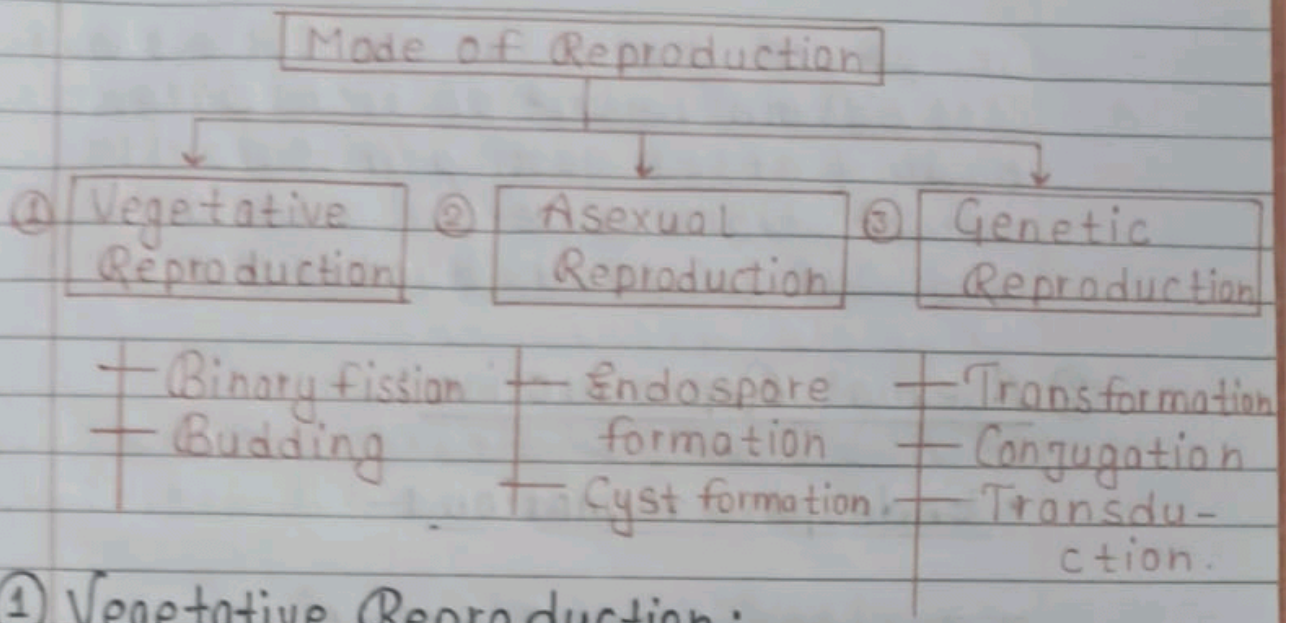
* Parasite :- Bacteria which present On or inside of another Organism is Called "Parasite."

Ex :- Salmonella.

* Symbiotic :- Bacteria which survive with another organism is Called "Symbiotic."

Ex :- Rhizobium.

★ Mode of Reproduction in Bacteria :-



① Vegetative Reproduction:

- **Binary Fission:—**

→ Binary fission is the common type of reproduction in bacteria.

→ In binary fission bacteria divided into two equal half and form two daughter bacteria.

→ Binary fission is occur through Amitosis Cell division.

→ Amitosis is the characteristic feature of Bacteria.

- **Budding:—**

→ In budding, an out growth produced

on parent bacteria i.e. called Bud. Bud obtain nutrition from parent body & after getting mature it detach from parent bacteria body and form a new bacteria.

② Asexual Reproduction :

- **Endospore formation :-**

→ When bacteria experienced unfavorable condition than bacteria reproduce by endspore.

→ During unfavorable condition bacteria confined their genetic material in to a small structure i.e. called Endospore.

→ This endospore is highly resistance from high temperature, radiation, desication, antibiotic & chemical then etc.

→ During favorable condition endospore germinate & form a new bacteria.

→ Endospore formation generally occur in bacillus type of bacteria.

→ Endospore process in which a new bacteria is reproduce is also called reproduction without multiplication.

- **Cyst formation :-**

→ During unfavorable condition bacteria produce a thick, hard & protective covering i.e. called Cyst.

→ In Cyst bacteria confined genetic material & under favorable condition bacteria breaks their Cyst & develop of new bacteria.

③ **Genetic Recombination :**

- In bacteria when asexual reproduction is absent for short duration than Sexual reproduction occur i.e. called Genetic Recombination.

- In genetic recombination transfer of gene occur from one bacteria to another bacteria.

➤ Genetic recombination is of 3 type :-

ⓘ **Transformation :-**

→ In this process One bacteria gene transfered in another bacteria.

→ It was experimentally proved by Griffith in his transforming principle experiment.

Bacteria — Streptococcus Pneumoniae
or
E. Coli

② Strain (variety)

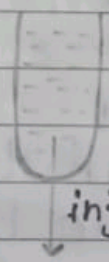
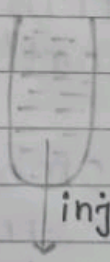
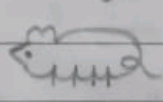
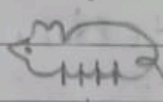
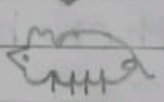
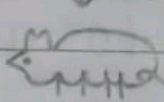
(R-Strain) (S-Strain)

Rough → Mucous/lipid → Absent

(R-Strain) → Non-Virulent or Not-diseases Causing

(S-Strain) → Virulent or Disease Causing

Smooth → Mucous/lipid → More

	R-Strain	S-Strain	S-Strain (Heat killer)	S-Strain (Heat killer) + R-Strain
				
	inject	inject	inject	inject
Mouse				
Result:-	Live	Die	Live	Die

Conclusion :-

→ From S- strain some of the gene transfer in to R- strain. so, it become transform.

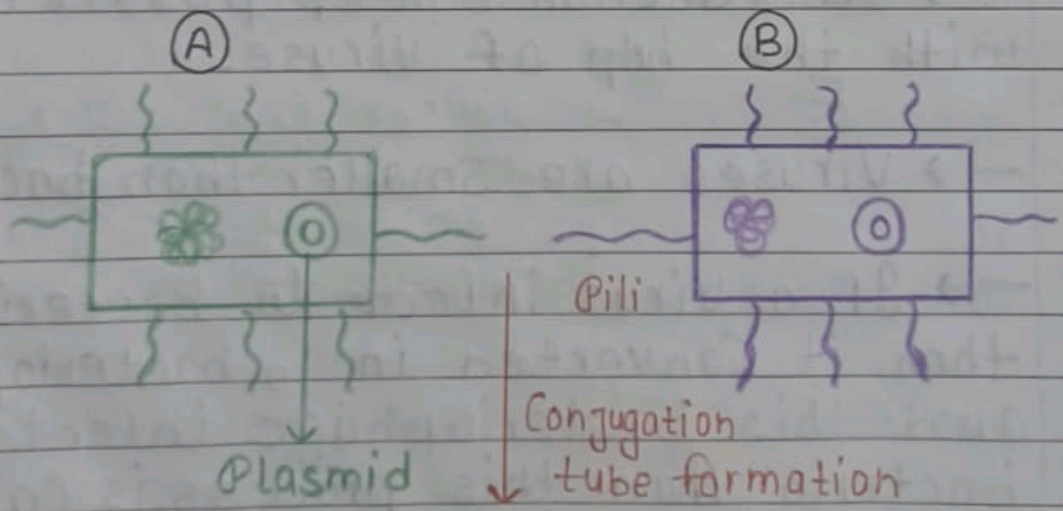
(ii) Conjugation :-

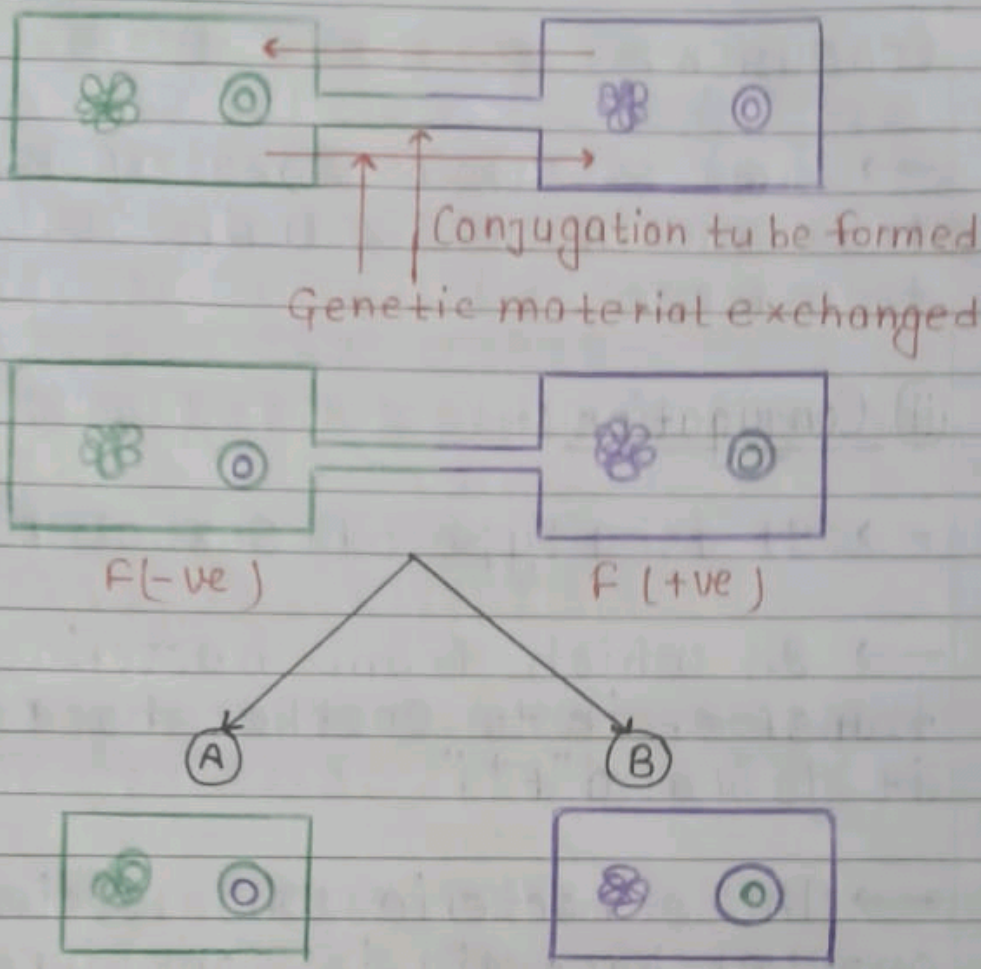
→ It is a type of sexual reproduction.

→ In which from bacteria gene is transfer in to another bacteria than it is called "F+".

→ Those bacteria who receive gene from another bacteria is considered "F−".

→ In Conjugation, Conjugation tube is form with the help of pili.



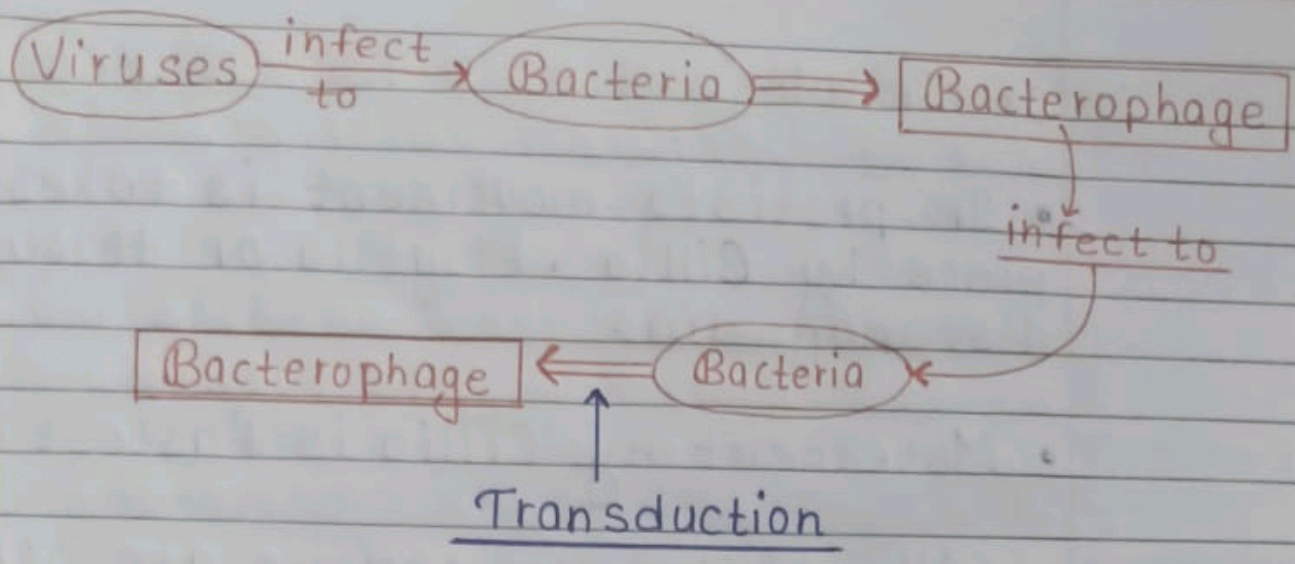


(iii) Transduction :-

⟶ Transduction can be possible by with the help of Viruses.

⟶ Viruses are smaller than bacteria.

⟶ If a virus infect to bacteria than it converted in to bacteriophage. and this bacteriophage infect to bacteria than this process is called Transduction.



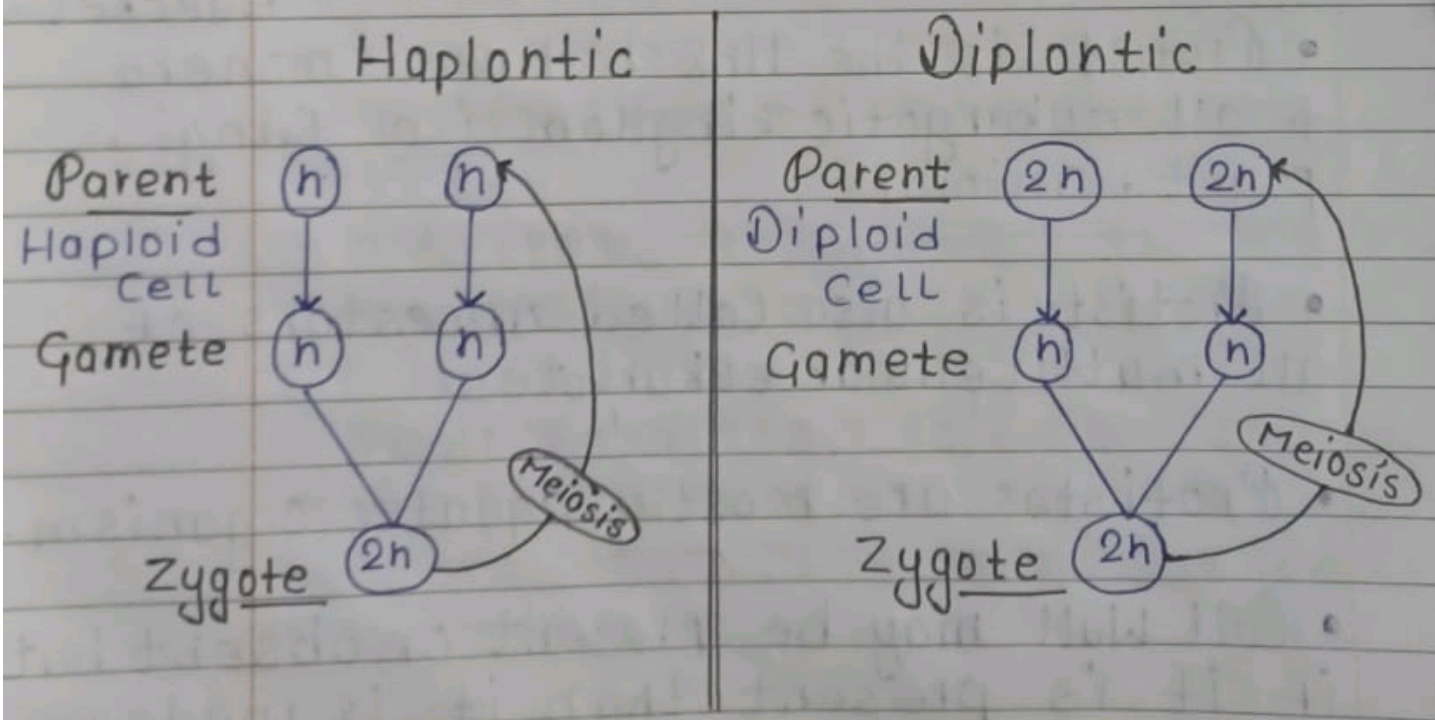
★ Kingdom Protista :

- Protista is a Unicellular Eukaryotic Organism.
- All single Cell eukaryotes are placed under protista.
- Term protista Was given by "Ernst Haeckel".
- Protista is the link between monera & all eukaryotic kingdom i.e. fungi, plant, animal.
- Protista is also Called Ancestors of all multicellular eukaryotes.
- Protistas are mostly aquatic organism.
- Cell Wall may be present or absent but if it is present than it is made up

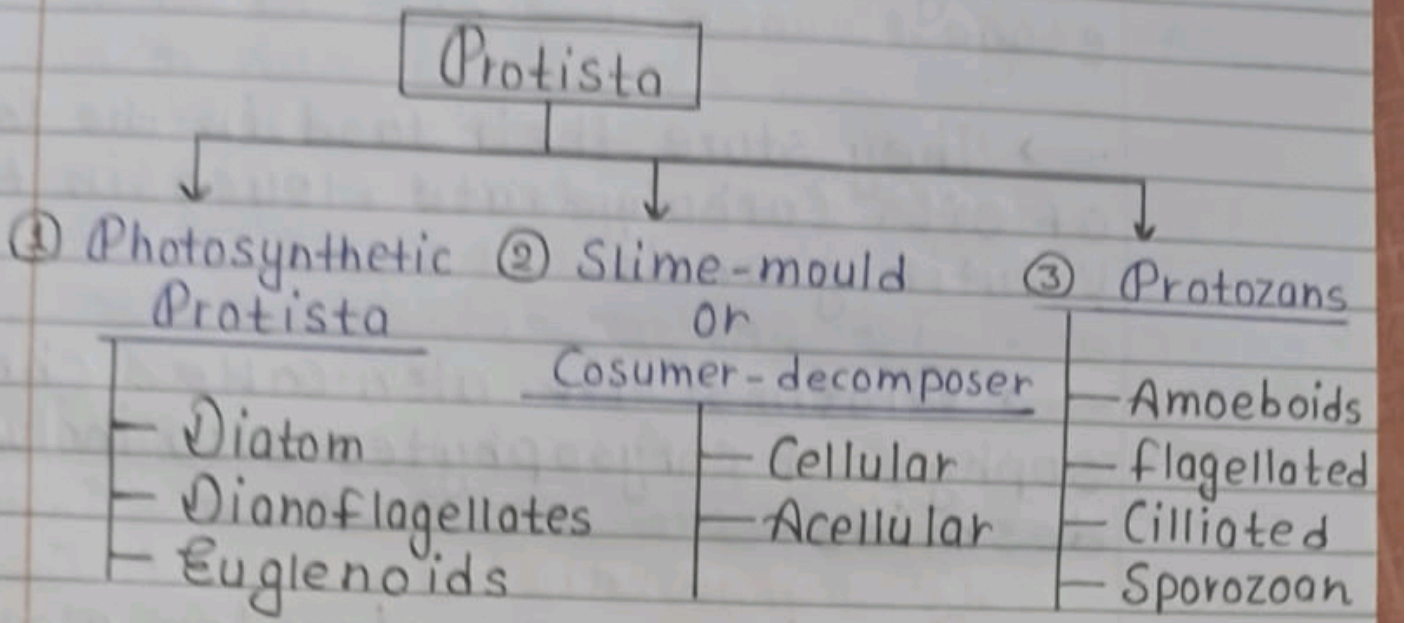
of Cellulose.

- In protista movement is takes place by Cillia, flagella or through Pseudopodia.
- Movement by Cillia is fastest.
- Cilia & flagella pauses 9+2 arrangement of microtubules.
- In protista both type of reproduction is found i.e. Sexual & Asexual.
- Life Cycle is either haplontic or diplontic.

* What is Haplantic & Diplontic ?



➤ Protista can classify in to three type :-



① Photosynthetic Protista :

- **Diatoms :-**

→ It belongs to chrysophyceae or Bacillophyceae class.

→ These are mostly rod in shape.

→ They Contain chlorophyll-a & c as well as Carotenoids & xanthophyll.

→ They have special type of xanthophyll i.e. Diadinoxanthophyll & Diatoxanthophyll.

→ They have Cell Wall & it is made up of Cellulose with Silica.

→ They have flagella but occur during mature or reproductive stage.

→ They store their food in the form of oil, Carbohydrate, leucosin & Volutin granuls.

→ Diatoms are also called chrysophyte & chrysophytes also includes desmids.

→ Desmids means golden Algae.

→ Desmids may be golden brown algae.

→ Diatoms found both in fresh water as well as marine water.

→ Diatoms are also called "cheif producer of Ocean".

→ Diatoms are also called "Jwelles of plant kingdom".

→ Since in their Cell Wall Silica is present along with cellulose.

→ Their Cell Wall appears like Soap-box.

→ Silica Cell Wall of Deaddiatoms are indestructible i.e. Why these Collected in to bottom of sea & form sea bed.

→ These material are rough and hard & it is used in toothpaste, Polishing materials, for making of insulating bricks, filter in brewing industries, insulator of refrigerator, making of sound proof material & it is used in filteration of Oils & shirup.

Ex:- Noviculla, Mellosilla & Cyclotella.

• Dianoflagellates :-

→ Dianoflagellates belong to Dianophyceae or Pyrophyceae.

→ Dianoflagellates are photosynthetic Protista and they Contain chlorophyll-a & chlorophyll-c.

→ They also Contains other pigments like Carotenoids & Xanthophyll (peridinin)

→ They Contain Cell Wall i.e. made up of Cellulose & Pectine.

→ They have two flagella One flagella is in transverse Way while other flagella is longitudinaly arranged.

→ Cell Wall is originated from cell furrow between the Wall plate.

→ Dinoflagellates having unequal length of flagella.

→ Dinoflagella is Commonly Called Golden Brown Organism.

→ It also occur in yellow, Brown, Blue or Red Colour.

→ Dinoflagellates are also Called Armourd Organism due to cell Wall having Cellulose as well as pectin.

→ Dinoflagellates are also Called Whriling whip.

→ Since, There two flagella Cause whriling movement.

→ They are also Called fire algae. Since, They have Bio-luminescence.

→ Dianoflagellate having character of Prokaryote as well as eukaryotes. Like prokaryote absent of Histone protein and Eukaryote.

→ Nuclear membrane & Nucleolus is present & Cell of type there messo-karyotes Consider.

→ Dianoflagellates like granuls & gymnodium are toxic which releases toxin due to which marine fish die.

- Ex :- Noctiluca, Gonyaulax & Dryosysteale

- <u>Euglenoid</u> :-

→ These are belongs to class Euglenophyceae.

→ Euglena Was previously kept under plant kingdom due to photosynthetic pigments but later on it placed under animal kingdom due to absence of Cell Wall as Well as Nutrition style.

→ According to R.H. Whittaker five kingdom classification euglenoid kept under kingdom protista.

→ Euglenoid is the connecting link between plant and animal.

→ Euglenoids have chloroplast which store chlorophyll-a & chlorophyll-b & xanthophyll (Zea-xanthophyll) also have.

→ Euglenoids are lack of cell wall but at the place of cell wall a thin protein layer is present i.e. called Pelical.

→ Euglenoids are lack of cell wall.

→ They store their food in the form of paramylon & fat.

↓

Divided starch

→ Euglenoids have contractile vacuoles that help in osmoregulation.

→ Euglenoids have two flagella in which one is larger & another is smaller.

→ Euglenoids follow haplontic like cycle & Meiosis is zygotic.

→ Euglenoids follow asexual reproduction in which they use Binary fission & Cyst formation.

→ Sexual reproduction is absent.

Ex:- Euglena & Paramima.

② Slime Mould :

- These are also called false fungi.
- These are Saprotrophic. Since for their food they depend on dead & decay matter.
- Slime moulds are connecting link b/w Animals & fungi.
- Slime moulds are classified in to two types :—

(I) Acellular form or Plasmodium.
(II) Cellular form or Pseudoplasmodium & Myxamoeba.

- Acellular :-

→ Their body is made up of wall less multinucleated protoplasm.

→ These are diploid in nature.

→ They form frutting body or Sporangia.

→ They store their food material in the Glycogen + fat.

- Cellular :-

→ Their body is made up of amoeboid Cell but Wall less.

→ Their Spores Can disverse by air.

→ They are haploid in Nature.

→ They follow asexual reproduction But their Spore have Cell Wall. Slime moulds of acellular form follow gametic meiosis while in Cellular form their zygote is form through meiosis.

③ Protozoans :

Feature	Amoeboids	Flagellated	Ciliated	Sporozoan
① Type of Organism	– Mostly free living – Few Parasites	– Either free living – Parasites	– Mostly free living – Few Parasites	All are endopara-site
② Habitat	– Fresh Water – Sea Water – Moist Water	– Fresh Water – Sea Water	– Fresh Water – Sea Water	Found Within other Organism.
③ Key	Marine form have Silica Cell on their Surface	– Sexual reproduction rare. – Parasites, Symbiont+ Commens-alism	– Have Cavity – Movement through Cilia + Water Store in gullet	– Have infection Spore
④ loco-motary Organ	Pseudopodia	Flagella	Silica	Absent
Ex:–	Entamoeba, Amoeba	Trypanosoma	Paramecium	Plasmodium.

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★ Kingdom Fungi :

- Fungi are Eukaryotic Organisms.
- Fungi are Heterotroph, Parasitic & Saphrophytes.
- Study of fungi is Called "Mycology".

➤ Fungi found almost everywhere i.e. in —

(i) Air
(ii) Water
(iii) Soil
(iv) Plants
(v) Animals

- Unicellular Fungi are Considered under yeast. Whereas most of the fungi are muticellular.

Ex:- Yeast ⟶ Pullaria & Aullaria.

- Fungi shows Symbiotic relationship- i.e.

(I) Fungi + Plant root = Mycorrhiza

(II) Algae + Fungi = Lichen

- First antibiotic Was discovered by Fungi i.e. Penicillium Notetum.

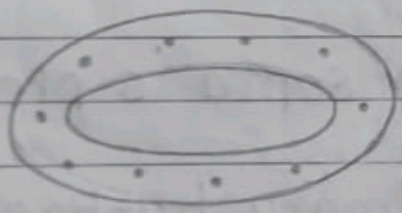
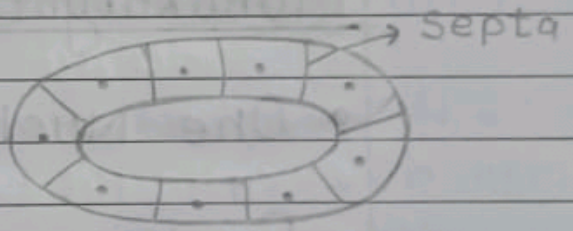
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* Body Organisation :

- Fungi are made up of thin thread like structure is called "Hyphae".
- Hyphae can be simple or in C arrangement, this type of network is called "Mycelium".

➤ Mycelium is of two type :—

① Asepta
② Septate

Asepta	Septate
	
Ex :- Phycomycetes	Ex :- Ascomycetes

➤ Septate is of two type :—

(i) Simple Septa

(ii) Dolipore Septa

Simple Septa	Dolipore septa
	
Ex:- Ascomycetes	Ex:- Basidomycetes

Due to arrangement of mycelium two Condition occur —

(I) Monokaryotic Condition
(II) Dikaryotic Condition

Monokaryotic Condition :-

- One Nucleus per septa is present.
- Features of Primary hyphae is Occur.

Ex:- Ascomycetes & Basidomycetes

Dikaryotic Condition :-

- Two Nuclei per septa is present.

Ex:- Ascomycetes & Basidomycetes

* Cell Wall of Fungi :-

- It is made up of Polysaccharide & chitin (i.e. fungal cellulose.).
- Chitin is the Homopolymer of NAG.
- Reserve food material are store in the form of Glycogen & oil.
- They have golgi body in the form of Sigmented or unconnected form i.e. Called Dictyosome.
- Fungi are parasite or Symbiotic Saprotroph on the basis of their Condition.
- Fungi from their whole body in the form of Thallus for reproductive str. i.e. Called Holokarpic fungi.

Ex :- Yeast.

- If Some of the part of fungi get transform in to reproductive str. i.e. Called Eukarpic fungi.

Ex :- Penicilium.

* Reproduction in fungi :-

➤ Fungi shows all type of reproduction:

1. Vegetative Reproduction
2. Asexual Reproduction
3. Sexual Reproduction.

1. Vegetative Reproduction :-

- They follow —

(i) Fragmentation Ex :- Agaricus

(ii) Fission Ex :- Yeast

(iii) Budding Ex :- Yeast

- Budding in yeast is called Torulation.

2. Asexual Reproduction :-

- They follow —

(i) Zoospore / Planospore :

- Uniflagellated or Biflagellate and Motile Spore.

Ex :- Synchytrium , Saprolegina.

(ii) Sporangio spore / Aplano spore :

- Non - Motile

Ex :- Rhizopus & Mucor.

(iii) Conidia :

- Thin Cell Wall, Non-motile than Exogenus spore & Develope at the tip of Hyphae.

Ex :- Penicilium & Aspergillus.

(iv) Chlamydo Spore :

- Thin cell Wall, Resting Spore, Non-motile & Exogenus.

Ex :- Rhizopus & Mucor.

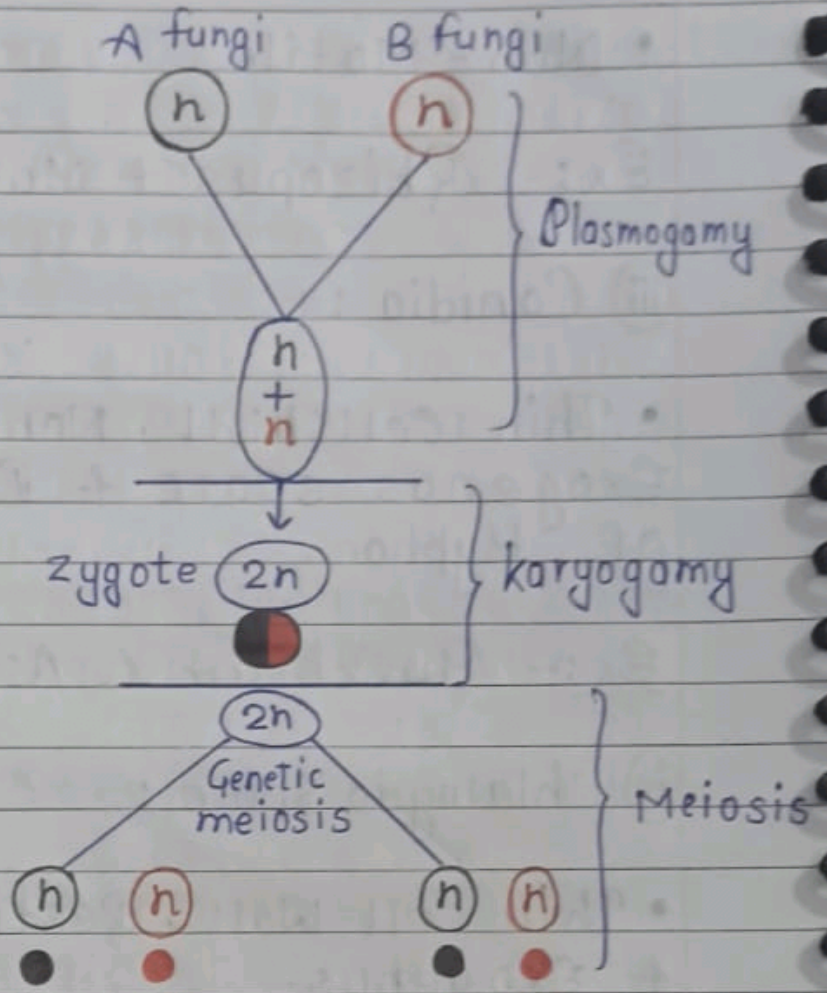
(v) Oidia :

- Thin cell Wall, Non-motile & Exogenus.
- In high Sugar Concentration oidia buds behave like yeast. i.e. Why it is also Called Tolura stage.

Ex :- Rhizopus & Mucor.

③ Sexual Reproduction :-

① Plasmogamy
② karyogamy
③ Meiosis



① Plasmogamy :-

- When 2 haploid cell of different fungi about to fuse & form n+n. i.e. Plasmogamy.
- Both the haploid cell come from different parent (fungi) & they may be motile or non-motile.

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② Karyogamy :-

• When 2 haploid nuclei comes together in plasmogamy get fuse & form diploid zygote then it is called karyogamy.

③ Meiosis :-

• In zygotic cell gamatic meiosis meiosis occur & form 4 different haploid cell then it is called meiosis.

➤ Classification of fungi (4- type) :-

① Phycomycetes
② Ascomycetes
③ Basidiomycetes
④ Deuteromycetes

Phycomycetes :

• These fungi are also called "lower level of fungi."

Habitat :- They are found in water, on wood and some paracytic plant.

Structure of mycelium :- Their mycelium is unbranched and aspetate so, multinucleated and it is called Acellular Coencycytic.

Reproduction :-

- They formed by Asexual reproduction in which they use zoospore / planospore and these spores are edogenically produce.
- They follow sexual reproduction in which they use plasmogamy, karyogamy and meiosis.
- Their gametes are may be isogamy Similar morphology of gamete) or disimilar i.e. Anisogamus or oogamus.

Ascomycetes :

- Ascomycetes are also called "Soc fungi."
- These fungi are mostly multicellular except yeast.
- They are mostly saprotrophic, Some are paracytic, decomposers and Some are caprophilous (growing on dung).

Structure of mycelium :-

- Branched, uninucleated and Septate.

Reproduction :-

- They reproduce by Conidia formation.
- Conidia is exogenously formed on a filamentous Conidiospore.
- Conidia germinate to form new mycelium.

Sexual Reproduction :-

- Their Sexual spore are Called Ascopore.
- Due to ascopore, name of this fungi group is Called Ascomycetes.
- Ascopore formed inside Ascus.
- Sexual reproduction occur in three step i.e. Plasmogamy, Karyogamy & Meiosis.
- Asci are arranged in fruiting body i.e. Why they are Called Ascocarp.
- On each ascus 4 to 8 ascospore are formed.
- After maturing of ascocarp and ascus, Ascopore become out and germinate to form new mycelium.

Example of Ascomycetes :-

① Penicilium :

→ Alexander fleming discover penicilium from a fungi name Penicilium Notatum.

→ Penicilium discovery was Serendipity.

→ This penicilium was work on staphylococcus bacteria for commercial production of penicilium. We use fungi penicilium chrysogenum.

→ Penicilium chrysogenum Was first discover Antibiotic and for this eminent discovery Alexander Flaming, chain and Florey awarded Nobel Prize.

② Aspergillus :

→ It is also called "Weeds of laboratory".

→ Aspergillus Secrete Citric acid :

③ Morels and Truffles :

→ These fungi are edible since, they produce flavour in chesse.

④ Neurospora :

→ It is also called Pink or Red mould.

→ It is also called drosophilla of plant kingdom.

→ Beadle and Tatum proposed one gene one enzyme hypothesis in neurospora and awarded Nobel prize.

⑤ Claviceps purpurea :

→ It cause ergot disease of Bajra.

→ Most potent narcotic drug (LSD) is isolated from Claviceps purpurea.

⑥ Yeast :

→ Previously yeast was included in kingdom fungi But. Five kingdom classification placed them in to kingdom protista.

→ Yeast are used in Beverage & Bakery.

→ Yeast is the source of Vitamine-B_{12} (Riboflavin).

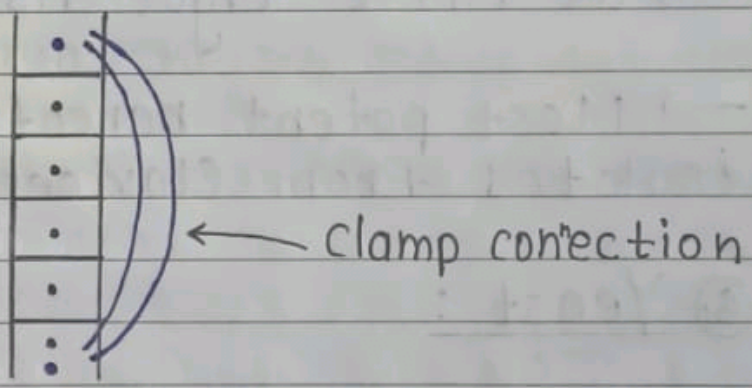
Basidomycetes :

- It is also called Bracket fungi, Puffballs or Club fungi.

Habitat :- They are found in soil, on logs and Tree stumps.

Mycelium :- There mycelium is branch unisepted or Bisepted.

- In basidomycetes uninucleated cell due to clamp connection



Reproduction :-

- Reproduction of basidomycetes is mainly occur in vegetative reproduction in which they use fragmentation.
- Asexual reproduction is absent.
- Sexual reproduction is takes place

but sex organ is absent.

- Sexual reproduction takes place by two different genetically vegetative cell or Somatic cell.

- In Sexual reproduction plasmogamy occur in two genetically different Vegetative cell which lead to formation of Dikaryotic structure. Which Ultimately give rise to basidium.

- Karyogamy & Meiosis occur in basidium to form 4 haploid basidospore.

- Basidospores are exogenously in origin.

- Basidospores are arranged on fruiting body. So, it is called BasidoCorp.

Example of Basidomycetes :-

Agricus (Mushroom), Ustilago (smut) and Puccinia (Rust fungus).

- Agricus are edible but some fungi are toxic.
- Amanita is poisonous and Hallucination (imaginary World).

Deuteromycetes :

- It is also called imperfect fungi.
- In deuteromycetes imperfect fungi called since, they have sexual reproduction is absent.

Habitat :- They are found in Saprophytic, Parasitic but mostly are decomposer.

Mycelium :- Branch, Septate, multi-nucleated or Uninucleated.

Reproduction :-

- They follow asexual reproduction by Conidia.
- Sexual reproduction is absent.

Example of Deuteromycetes :-

1. Colletotrichum
   - Causes red dot in Sugarcane.
2. Alternaria
   - Causes blight diseases in potato.
3. Trichoderma
   - Causes ringworm, itching & Eczema.

★ VIRUSES :—

- It was discovered by "D.J. Ivanowsky". (1892)
- First discovered Virus is TMV (Tobacco Mosaic Virus) in 1892.
- Given by — Beijerinek and Pasteur.
- Viruses are Smaller than Bacteria.
- Stanley first experimently proved Viruses are Crystallised i.e. Contain of Crystal protein.
- They are inert outside their Specific host cell.
- Viruses are obligate Parasites.
- Once Virus infected the Cell it take over cellular machinery & start replication and clone increase their number enormously.
- Virus kill the Parasite.
- Virus have either DNA or RNA but never we both.

• If Virus infect bacteria then it form bacteriophage.

• Study of Virus is Called Virology.

• Virus has Special mode of replication once virus inter in to the host cell.

• It will utilise all living resource and ultimately kill to the host.

Non-Living Characteristic of Virus:

→ Protoplasm is absent.
→ Absence of Enzyme.
→ No respiration.
→ No metabolism.
→ Virus Can't be grown in culture medium.

Living Characteristic of Virus:

→ Virus shows living characteristic inside the host cell.

→ Viruses have genetic material which can Synthesize for Covering & uses ribosome of host cell.

→ Virus Can mutate.

→ Virus can multiply inside host cell.

• Virus Consist of two Component :-

(i) Central Core
(ii) Capsid

Central Core :

→ It is made up of genetic material either DNA or RNA generally genetic material of animal but mostly they have animal DNA.

→ Generally genetic material of plant virus is RNA except CMB & Potato leaf roll virus.

Capsid :

→ Protein Coat of Virus is called Capsid & its unit is called Capsomere.

→ Capsid + Core protein = Nucleoprotein

★ VIROIDS :—

• It was discovered by "T. O. Diener." (1971)

- It is Smaller than Virus.
- It has free RNA.
- If in a Virus protein Coat i.e. Capsid. Capsid is absent than it Called Viroids.
- RNA of Viroids having low molecular Weight.
- It Causes disease like, potato Spindle tuber disease.

★ **PRIONS :—**

- If a protein of Viruses are abnormly or roughly folded & it is found in Virus than this type of Virus is Called Prions.
- Prions Causes neurological disease.
- Their Size are Similar to Viruses.
- They Cause disease like BSE (Bovine Spongiform encephalopathy) & it Commonly Called mad cow & it is occur in Cattle.

• Similar disease like mad cow occur in Human being i.e. called CJD (Cr. Jakob disease).

★ LICHENS :—

• It is the Symbiotic relation between algae and fungi. They show same evolution and same extinction activities for both species.

• Lichen shows physical Contact.

• In lichen fungi sides cell Component are called Mycobiont while algae side cell Component are called Phycobiont.

• Lichens are Heterotrophic & Autotrophic.

• Lichens are indicators of being life in particular region.

• Algae prepare food from fungi & fungi provide shelter & absorb mineral Nutrition & Water for Algae.

★ ★ ★