TNPL

Page No.:

Date (2+3Q)

BIOLOGICAL CLASSIFICATION

Topic :- • Basic Classification • Monera • Protista
• Fungi • Virus.

Classification :- Old Work

Non-Scientific | Scientific Basis

① Aristotle

• Morphological Basis => plant → herb → shrub → tree

• On the basis of RBC (Animals) → with RBC (Enaima)
→ without RBC (Anaima)

→ Two Kingdom Classification

↳ Linnaus (18th century)

1. Plantae
2. Animalia

Basis of cell wall

Plantae	Animalia
- Algae	- Sponges
- Bryo	- Flatworm
- pterido	- Protozoan
- Gymno	- Fish
- Angio	• Birds (Aves)

- Fungi ★
- Bacteria ★
- Archaebacteria

Drawback

(1) Prokaryotes kept with Eukaryotes
(2) Autotropic and Heterotrophic - together
(3) photosynthetic and non-photosynthetic kept together.
(4) Unicellular and multicellular kept together.

• Only few character - cell wall - considered ∴ so.

Q. Agaricus (Fungi) is present in _____ Kingdom in Two Kingdom classification

a) Plantae
b) Animalia
c) Fungi ×
d) Monera. ×

- With time → Understanding Increase (Classification) → Plantae & Animalia same

Three Kingdom Classification

↳ Ernst Haekel

Plantae + Animalia → Protista
- Bacteria
- Protozoa
- Fungi
- Diatoms

Four Kingdom Classification → Copeland

Plantae
- Fungi

Animalia

Protista
- Protozoa
- Diatoms

Monera
Bacteria
Cyanobacteria
Archaebacteria

Five Kingdom Classification → R.H. Whittaker

Plantae

Animalia

Protista → Unicellular Eukaryotes

Monera → Prokaryotes

Fungi

Five Kingdom → Criteria

* Cell structure. → Prokaryote & Eukaryote
* Thallus organisation. → Unicellular, multicellular
* Mode of Nutrition.
* Phylogenetic Relationship.
* Mode of Reproduction.

Six Kingdom Classification – Carl Woes

Three Domain

3rd Domain

Protista
Fungi
Plantae
Animalia

Monera

1st Domain

2nd Domain

Our Observation.

- How Classification has changed.
- What we are looking forward –

With time ↓ more phylogenetic Criteria → more refined would be Classification.

NCERT

Table 2.1

Type of Ques?

- Basis of 5 kingdom Classification
- Chlamydomonas, Chlorella → Green Algae

↓

Protista (But acc. to five kingdom)

KINGDOM FUNGI

Habitat
Structure
Nutrition
Reproduction

Introduction

- Heterotropic Organism.
- Found everywhere - Saprophytic Nutrition.
  - may be : Rot of Orange, Mushroom, Puccinia - Rust - Fungus, Yeast → Brewing (Alcohol), → Baking, Toad stool - poisonous fungi.

Habitat - Warm and Humid (Not grow in Refrigerator)

Structure: means (i) Cell structure (ii) Thallus Organisation.

- Filamentous thread like
- Elongated, tube

A Septate Hyphae (Multinucleated, Coenocytic)

Cont°. Cytopl.
↳ generally unbranched

Septate hyphae
- may be branched

Dead matter

Mycelium

together

Hyphae

Mycelium

fruiting body.

Aseptate Mycelium

↳ Spore present

Filamentous Organism

Algae, Fungi, Protonema → Multicellular.

- Fungi (Multicellular) → Form hyphae → Mycelium (except Yeast (unicellular))

- **Cell Detail :** → Pigment – Carotenoid (no chlorophyll)
  → Cell wall – Chitin and polysaccharides.
  → Storage – Glycogen.

Nutrition : ① Most common → Saprophytic
↳ Release Enzyme Outside
↳ Complex Organic → Simple Organic → Absorb

② Parasitic – Many fungi as Parasitic on plant & Animal

③ Symbiotic
(i) Lichen → Algae – Photosynthetic
→ Fungi – Absorb Mineral

(ii) Mycorrhizae – Fungal association with Roots of higher plants (Gymno, Angio)
eg: Genus = Glomus,
mineral – mainly phosphorus.

Reproduction
① Vegetative → Fragmentation.
→ Fission.
→ Budding.

② Asexual – Proper division to form spore
- Division – Mitosis
- Spore form – Asexual spore

Asexual Spores ⇒ ① Conidia
② ~~Zoospore~~
② Sporangiospore → Zoospore
→ Aplanospore

R.V. Mohan Hari Ram

Page No.:
Date: / /

② Sexual => Gamete Formation → Zygote formation
↳ Zygospore

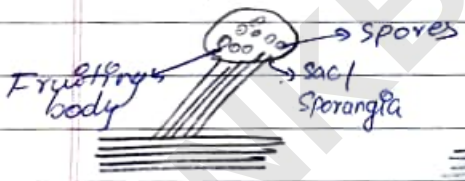
Sexual Spores ⇒ ① Oospores
② Ascospores
③ Basidiospores

(General) ② Asexual Reproduction – By Spores

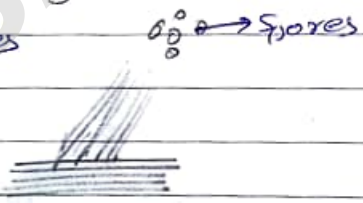
Mycelium (n) (Haploid) → haploid mycelium develop Fruiting body → Fruiting body (n) + mycelium (n)
oooo Spore (n)

⇒ Type of Spore:

① Endogenous & Exogenous



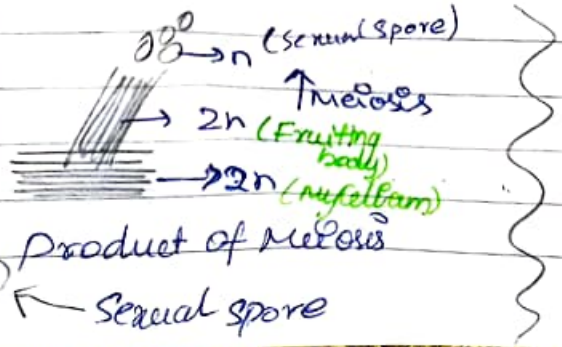
Endogenous



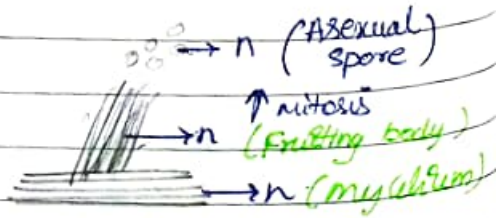
Exogenous.

② Motile / Non-motile
↓ Zoospore
↳ Aplanospore

③ Meiosis / Mitosis



Product of Meiosis
(Gamete) ← Sexual spore



Product of Mitosis
Asexual spore.

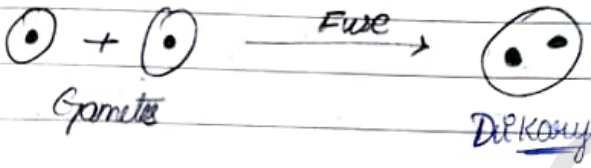
General

① Sexual Reproduction

Proper Sexual Repo. → Gamete & Zygote form.
After Gamete formation ↓

Three Step

① Plasmogamy → Fusion of two protoplasm



② Karyogamy - Fusion of two Nuclei ⇒ Zygote formed In fruiting body

③ Meiosis ⇒ Meiosis occur to form haploid spore.

Classification of Fungi

① Thallus (morphology of Mycelium)
② fruiting
③ mode of spore formation

① Deuteromycetes (No sexual Reprodn)

True Sexual Reproduction

Lower fungi

A Septate

Phycomycetes
- Zygomycetes
- Oomycetes

Higher Fungi

Septate

Ascomycetes (Sac Fungi)

Basidiomycetes (Puff ball, Mushroom)

Examples of Fungus :

Phycomycetes ⇒ Albugo, Rhizopus, Mucor.

Ascomycetes ⇒ Penicillium, Yeast (Unicellular), Aspergillus, Sac fungi Claviceps, Neurospora, truffles, Morels (Edible)

Basidiomycetes ⇒ Agaricus (Mushroom), Ustilago, Puccinia, Toad stool, Puff ball

Deutero mycetes ⇒ Alternaria, Colletotrichum, Trichoderma

Special about eg: (more → see individually)

Phycomycetes → Coenocytic.
- Albugo – Parasitic fungi on mustard
- Rhizopus – Bread mould

Ascomycetes
- Penicillium – Multicellular – Antibiotic production
- Yeast – unicellular – ~~Saccharomyces~~ (Saccharomyces) (Unicellular)
- Neurospora – Used extensively in biochemical and genetic work.
- morels and truffels – edible – Considered delicacies.
- Aspergillus – Aflatoxin || • Claviceps = LSD (Hallucinogen)

Basidiomycetes
- Agaricus – Mushroom
- Ustilago – Smut
- Puccinia – rust fungus

Deuteromycetes
- Trichoderma – [Trichodyrma polysporum – Cyclosporin A)
- Alternaria – Early blight of potato | • Colletotrichum – Red rot of sugarcane

① Phycomycetes (Algal fungi)

a) Habitat :
- on decaying substance
- water (Only aquatic fungi)
- Obligate parasite → Depend only on the organisms.

b) Structure – Aseptate
- unbranched
- Multinucleated
- Coenocytic

c) Nutrition : Parasitic, Saprophytic.

d) Reproduction : → Vegetative → Fragmentation

→ Asexual → Asexual spore.

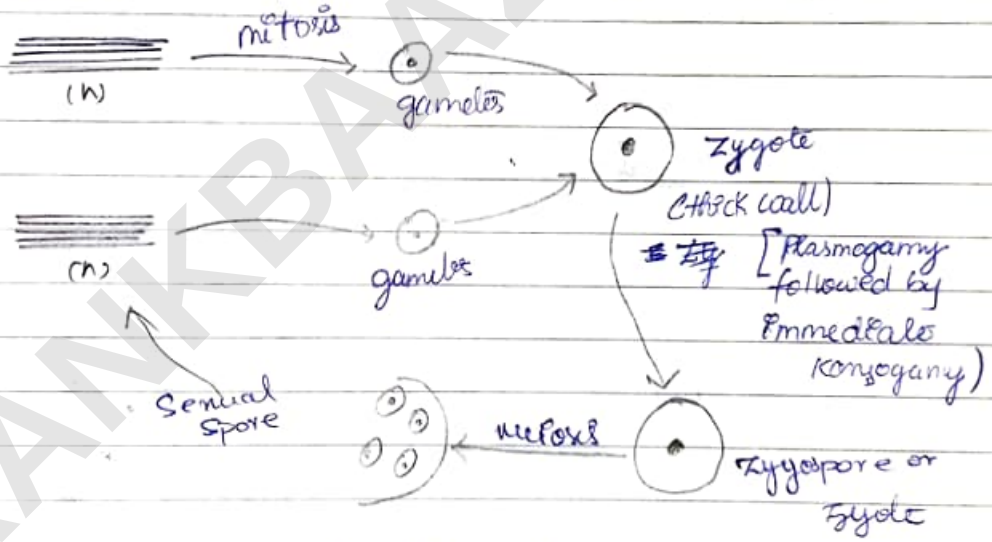
→ Endogenous Asexual spore.

→ Motile (Zoospore)

→ Non-motile (Aplanospore)

: Sexual Reproduction — Lifecycle : Albugo = Oogamous

Same species (Isogamous, Anisogamous, Oogamous)



phycomycetes → Sexual → Endogenous.
→ Asexual

Eg : Albugo, Mucor, Rhizopus.

Classification (Phycomycetes)

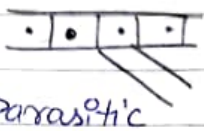
Zygomycetes
- Mucor
- Rhizopus
- Zoospore Absent

Oomycetes
- Albugo
- Phytophthora (Late blight of potato)
* ~~Cellulose~~ Cell wall - cellose
* Zoospore

② Ascomycetes → Sac fungi

ⓐ Habitat - Saprophytic
- Grow on dung - Coprophilus

ⓑ Structure ★ Unicellular - yeast - Saccharomyces
Non-filamentous
★ Multicellular - Filamentous.



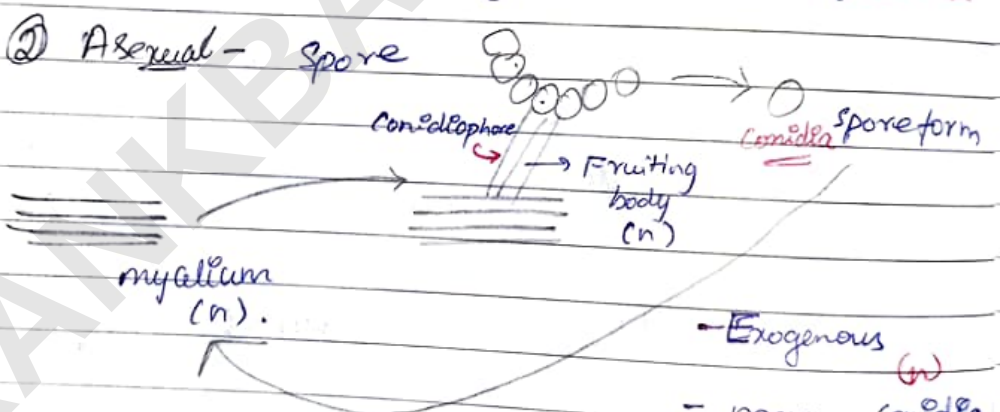
Septate, branched.

ⓒ Nutrition 1. Parasitic
2. Saprophytic
3. Symbiotic

ⓓ Reproduction :

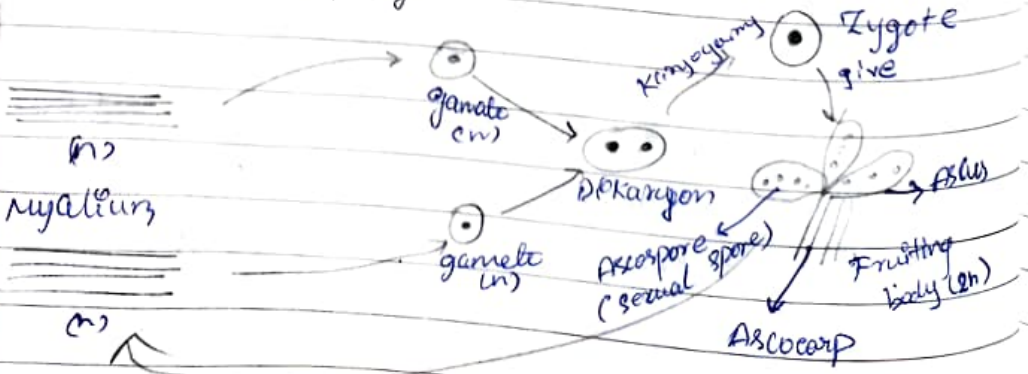
① Vegetative - Budding, fission, Fragmentation (Yeast)

② Asexual - Spore



- Exogenous (n)
- name - Conidia
- non-motile
[No flagella]

③ Sexual - Life cycle



developed from zygote
Fruiting Body → Diploid → Sexual F.B. – produce spore by meiosis
→ Haploid → Asexual F.B. → produce spore by mitosis

Examples → Saccharomyces.
→ Monascus purpureus.

- Yeast – Non-Filamentous
- Penicillium (P. notatum – Antibiotic)
- Aspergillus (toxin – Aflatoxin)
- Claviceps (Give LSD (Hallucinogen)
- Morels & truffles — delicacious
- Neurospora → Biochemical & Genetics study.
- Morels & truffels → Edible.

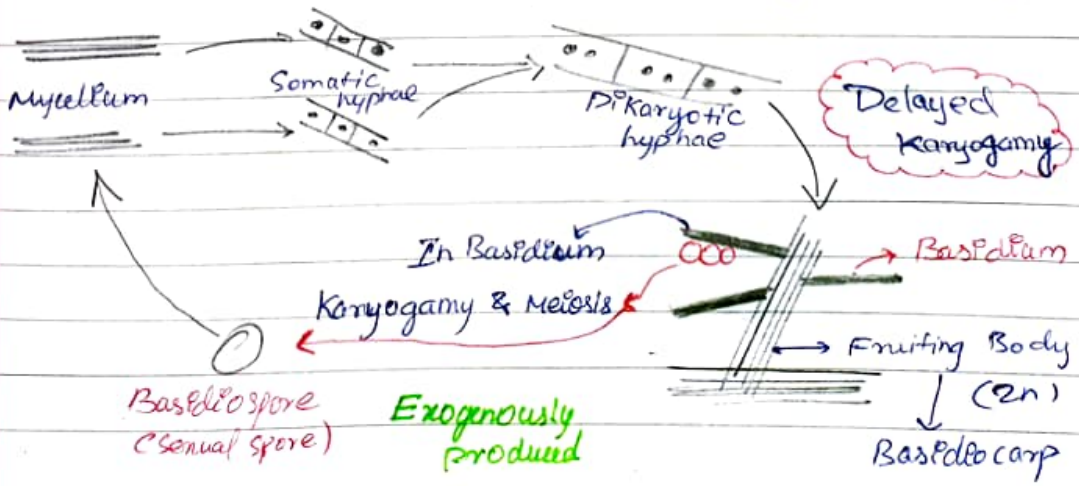
(3) Basidiomycetes (Mushroom, Puff ball, toad stool, Bracket Fungi)

(a) ⇒ Habitat – Saprophytic
↳ Grow on wood (Epixylic)

(b) ⇒ structure – Septate, branched

(c) → Nutrition → Saprophytic, parasitic, Symbiotic

(d) Reproduction →
(1) Vegetative – Fragmentation
(2) Asexual → Spore Absent
(3) Sexual – • Sexual organ, gamete Absent.
• Sexual Reproduction by Somatic hyphae



Deutero → Alternaria – Early Blight of Potato
Phyco → Phytophora – Late blight of potato

TNPL
Page No.:
Date: / /

(4) Deuteromycetes (Imperfect)

Fungi – classification → Require detail of Sexual Spore and fruiting body
↳ Sexual Reproduction – Absent
↓
not yet discovered
↓
Temporarily Placed
If discovered → Transfer to other group

(a) Habitat :
- Mineral Cycling / saprophytic

Hyphae – Septate
Spore – Asexual – Conidia.
Sexual – Absent.

Perfect Stage – Sexual Rep. → Fruiting body
Imperfect Stage – Asexual Rep → Fruiting body.

eg :
- Alternaria – Early blight of potato
- Colletotrichum – Red Rot of Sugarcane
- Trichoderma –

	Asexual Spore	Sexual Spore
Phycomycetes	Endo Sporangiospore	Endo Zygospore
Ascomycetes	Exo Conidia	Endo Ascospore
Basidiomycetes	Absent	Exo Basidiospore
Deuteromycetes	Exo (Conidia)	Absent

Fungi (Imp)
(1) eg → use
(2) Type of Asexual & Sexual Spore (Sex. Rep)

Type

Monera → (i) Habitat
(ii) Structure & Shape
(iii) ~~Nutrition~~
(iv) Reproduction

- Bacteria is the sole member of Monera

Number → Largest number of microbe (most Abundant)

Habitat → Soil, Air, Water] Cosmopolitan

Unusual Habitat ⇒ • Acidic • High temp
• deep sea • Stomach of Ruminant.

Bacteria → Archaebacteria
→ Eubacteria

Structure and Shape

→ classification.

(1) Coccus ○ (2) Bacillus

(3) Vibrio (4) Spirillum

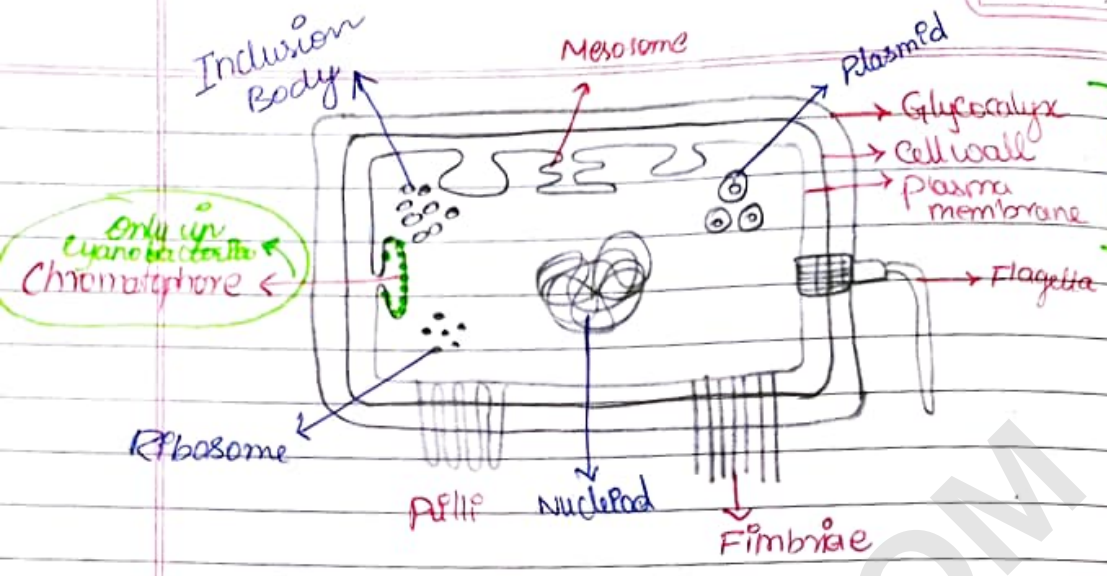
Ques

Q. Most common — Bacillus
Q. Do not have flagella — Coccus
Q. Which shape contain Spore — Bacillus
Q. Which contain flagella Spirillum.

↳ They have simple structure
↳ But ~~Complex~~ more extensive metabolic diversity.

→ Autotrophic → ~~Photo~~ → Chemo
→ Hetero → Sapro

Mycoplasma — live without O_2
lack cell wall
— pathogenic in animals & Plants



★ Cell Envelop

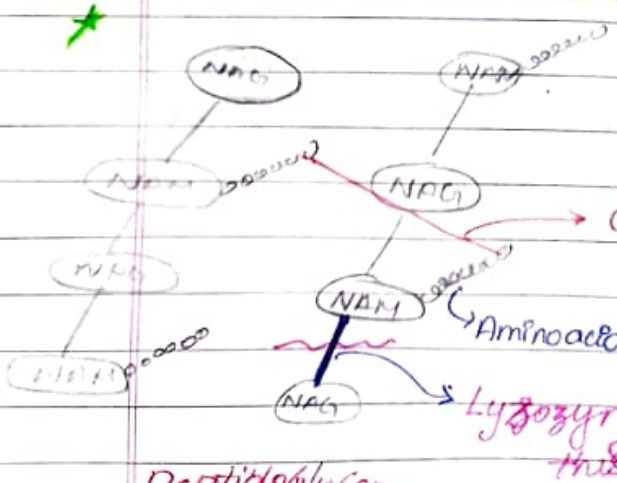
① Glycocalyx (outermost)

maybe → Sleme layer
↳ Loose and slimy
→ Capsule
↳ thick and tough.
↳ [S- strain have Capsule]

② Cell wall

Plant – Cellulose.
Fungi – chitin → Also found in exoskelton of Arthropods.
Bacteria
↳ Carbohydrate + Amino Acid
(Glycan) (Peptide)

★ Cell wall of Bacteria = Peptidoglycan ★

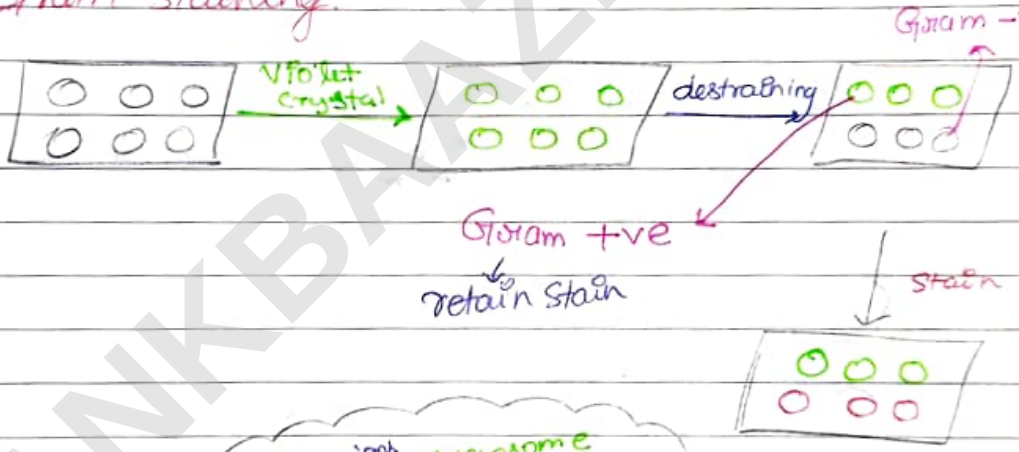


Gram positive And Gram negative Bacteria

On the basis of ~~Cell envelope thickness~~ Gram staining.

Gram positive	Gram -ve
eg: • Lactobacillus • Clostridium • Streptomyces	eg: • Rhizobium • E.coli • Cyanobacteria • Mycoplasma.
Feature: * Mesosome Thick cell wall	Feature: P - Porins P - ~~Pilli~~ T - ~~Toxins~~ Thin cell wall

Gram Staining.



(3) Cell membrane
- Extensions → Mesosome
- Extensions → chromatophore
- ↳ Bilipid layer (Phospholipid)

POQ ★ Plasma membrane is structurally similar in both prokaryote and Eukaryote.

Mesosome → Extensions of plasma membrane.

Shapes on the basis of Surface Area.

Gram +ve

Mesosome (continue)

Role ⇒ ① Have Enzyme for respiration (Analogous to Mito in Euka)

② Cell wall formation

③ Secretion

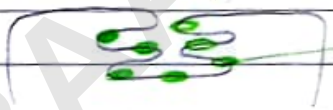
④ DNA Replication

⑤ Cell division.

Chromatophore

Gram -ve

↳ In some prokaryotes like Cyanobacteria there are other membranous extension in the cytoplasm called chromatophore which contain Pigments.

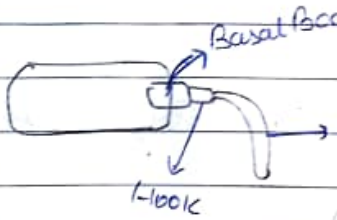


★ Surface Structure

① Flagella ② Fimbriae ③ Pili

① Flagella

(Motile Str.)



Prokaryote	Eukaryote
Flagellin	Tubulin

Made up of protein

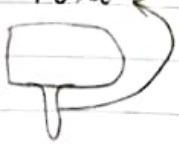
↳ Flagellin

Non-Motile

↳ Bacteria without Flagella

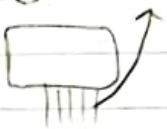
Eg: Cocci, Nostoc, Mycoplasma

③ Pili



- Tubular Shape
- Special protein
- less in no. & large in size

② Fimbriae



- Bristle Shape
- more in no. & smaller in size.
- Help to attach on surface.

Surface structures of bacteria that do not play role in motility.

Surface structure = Flagella (help in motility) + Fimbriae + Pili (do not play role in motility)

★ Nucleoid

- Type of DNA : In bacteria, double stranded, circular, single chromosome (considered)
- ~~Any~~ proteins : Histone absent but +vely charged protein help in packaging the DNA.
- Role – Nucleoid – Main DNA – all important Gene (Genomic DNA)

*We consider ~~Monerans~~ to be haploid (as they have single chro.)

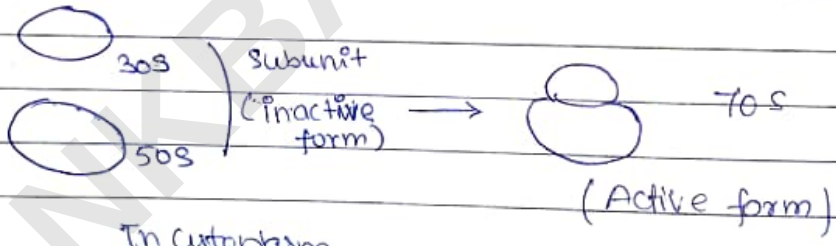
Plasmid → Extra chromosomal DNA. (Other than Nucleoid)
- → Self Replicating → have Origin.
- → Double stranded
- → Circular.

How plasmid Differ from Nucleoid
- Not present in all Bacteria
- plasmid provide Extra feature

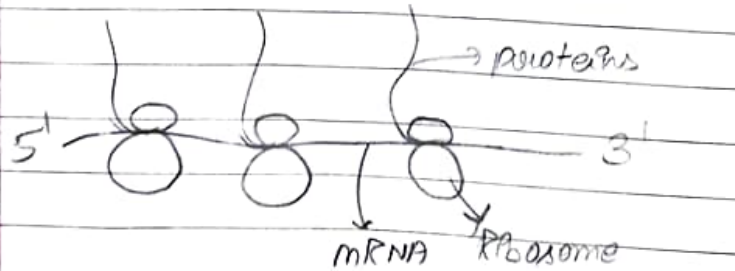
Type of Plasmid

(1) R - Plasmid - Resistance against Antibiotic
(2) Col - plasmid - produce Protein Colicins
↳ kill other bacteria
(3) F - Plasmid - Fertile Plasmid
(help in sexual Reproduction)
(4) Degradation plasmid - pseudomonas putida
↓
Break oil spill
[Bioremediation]

★ Ribosome → Organelle within Organelle
→ Present in both Prokaryote and Eukaryotes
→ (10 - 20) nm



80S → 60 + 40 | 70S → 50S + 30S



↳ Many ribosome on single mRNA → polysome / polyribosomes.

★ Inclusion Bodies

In Eukaryotes → for storage membrane bound structure involve

- In prokaryotes, No membrane bound organelle

↳ How they store?

- Insoluble form
- without any membrane
- in the form of Granules.

eg: → Sulphur Granules
→ phosphorus granules
→ cyanophycean granules (amino acid storage)
→ Glycogen granule
→ Gas vacuoles — not lipid layer
- Cyanobacteria
- Green Sulphur bacteria
- Purple Sulphur bacteria

Structure ↑

★ Nutrition in Monera (Simple in structure, Complex in metabolic diversity)

Autotrophic (less)
- Extra needed
- Lactobacillus
- Antibiotic producing

Chemo autotrophs
Photo autotrophs

Heterotrophic (more)

Saprophytic (most)
- Rhizobium eg.
- Frankia

Symbiotic
- Cirrus canker

Parasitic
- Typhoid
- Tetanus
- Cholera

Inorganic Energy → Organic (Glucose)
(CO2)

★ Chemoautotrophic bacteria / Chemosynthetic bacteria

→ Energy come from Chemical Rxn.
→ Oxidation occur Outside the cell.
→ Energy released is used to make food.
→ Recycle Nutrients like Sulphur, P, N, Fe.

A → AD → E → Food

Mineral Nutrition Pg 201

$NH_3 \rightarrow NO_2^-$ (nitrite)
Nitrosomonas, Nitrococcus

$NO_2^- \rightarrow NO_3^-$
Nitrobacter, Nitrocystis ✗

★ Photoautotrophic Bacteria

CO_2 —Energy→ Glucose
Hydrogen
(from H donor)

Anoxygenic

Hydrogen donor → H_2S, etc
↳ other than H_2O

Pigment → Green – Bacteriochlorophyll
Purple – Bacteriopurpurin

- If H_2S used ⇒ Byproduct → Sulphur or Sulphate

★ eg: (i) Green Sulphur bacteria
- Pigment → Bacteriochlorophyll
- H_2S used

(ii) Green Non-Sulphur bacteria
- pigment → Bacteriochlorophyll
- Other than H_2S used

(iii) Purple Sulphur bacteria
- Pigment – Bacteriopurpurin
- H_2S used

(iv) Purple Sulphur bacteria
- pigment – Bacteriopurpurin

Oxygenic

CO_2 → Glucose
↓2 steps

(i) $H_2O + X \rightarrow XH_2 + O_2$
(ii) $CO_2 + XH_2 \rightarrow$ Glucose $+ X$

★ Source of Hydrogen
↳ H_2O

★ eg: (in prokaryotes)
↳ Cyanobacteria ★ ★
↓contain
Chl a (must present)

- If H_2O used ⇒ byproduct O_2

Q. Which of the following is

(i) Autotrophic prokaryote
a) Lactobacillus (Hetero – Supro) b) Nitrosomonas (Auto – Che) c) Chlorella (Eukaryote ↳ Plant ↳ Green) d) Rhizobium (Hetero – Symb)

(ii) Anoxygenic
a) Nostoc (Cyanobacteria) O_2 b) Chlorella (Green Algae) O_2 c) Green Sulphur bacteria ~~O_2~~ d) Chara (Green Algae) O_2

(iii) Oxygenic
a) Spirulina b) Nostoc c) Anabena d) All
↳ Cyanobacteria
O_2

Reproduction

- Asexual
  - Favorable (Monotype)
    - Fission / Binary fission
    - E. coli divides in 20 minutes.
  - Unfavorable
    - Spore form
    - Wall
    - Can tolerate high temp, pH
- Sexual
  - Some primitive method of DNA transfer occur.
  - PRIMITIVE METHOD
  - (NO true sexual reproduction)
  - i.e. NO Gametes, NO zygote, NO Sex Organ
  - only DNA transfer occur.

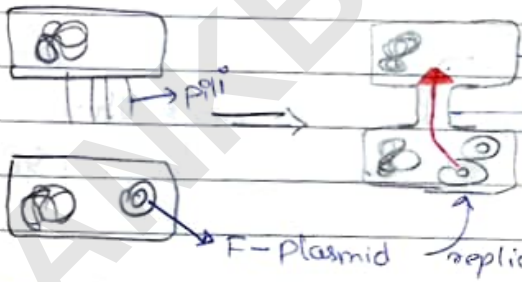
Type of Sexual Reproduction

(1) Transformation (2) Conjugation (3) Transduction

(1) Transformation

- DNA enter from medium.
- By Griffith

(2) Conjugation



- DNA transfer from one bacteria to Another.

(3) Transduction:

- DNA transfer through Virus

Examples of bacteria

Archaebacteria (Primitive Bacteria) → Difference ← Eubacteria (true bacteria)

Archaebacteria	Eubacteria
Cell wall: Pseudomurein	Peptidoglycan ⇒ Murein
Cell membrane:	
∘ unilayer	∘ lipid bilayer
∘ Ether linkage	∘ Ester linkage
∘ Branch chain lipid	
* Histones are present in some Archaebacteria	
* 16 - S rRNA	

Types of Archaebacteria

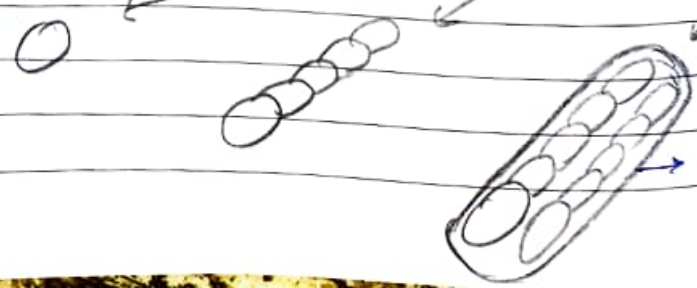
Methanogens
Obligate Anaerobe)
Location ⇒ Marshy area
→ Ruminant stomach
$CO_2 \longrightarrow CH_4$
eg: Methanobacterium

Halophiles
↓
high salt conc.
(2-5 Molar)

Thermoacedophiles
Temperature (↑) 80°C
Acid → pH = 2
eg: Thermus Aquaticus
(Sulphur Spring)

* Eubacteria
① Cyanobacteria ② Mycoplasma ③ Actinomycetes

① Cyanobacteria:
∘ Habitat → Aquatic - Freshwater, Marine, terrestial.
∘ Structure → may be unicellular, Filamentous, Colonial



- Cell wall → Peptidoglycan
- Flagella – x
- Pigment - Chl a ~~Chl b~~ Nahi hota
- Storage – Cyanophycean Granules

- Chromatophore present
- form blooms in polluted water bodies.
- Heterocyst ⇒ Some Cyanobacteria contain specialised cells to fix At. N_2.
  - ↳ Nitrogenase → not like O_2
  - ⇓
  - Chl a absent in Heterocyst ★
- Example Nostoc, Anabena, Oscillatoria & Spirulina

★ ~~Symbiotic association~~

(i) Azolla – Fern – in leaf ⇒ Cyanobacteria (Anabena)

(ii) Coralloid root – cycas ↓ Coralloid (Anabena)

★ Mycoplasma
- ↳ Smallest (PPLO)
- → Lack cell wall → Shape not fix
  - ↳ Gram –ve
  - ↓
  - Penicillin not effective
- ↳ Can Survive without O_2
- ↳ Can be parasitic in Animals & Plants.

Kingdom Protista – Unicellular Eukaryotes

Features :
→ well defined Nucleus
→ Flagella – 9+2 array → of tubulin Protein
→ Membrane bound organelle
→ Fusion of gamete, Zygote
→ Aquatic

Mode of Nution
- photosynthetic
- Saprophytic
- Heterotropic

1. Chrysophytes
2. Dinoflagellates
3. Euglenoids
4. Slime moulds
5. Protozoa

~~Chrysophytes~~ Brown	~~Saprophytic~~ red	~~Heterotrophic~~ green
Chrysophytes	**Dinoflagellates**	**Euglenoids.**
Diatoms & Desmids (Golden Algae)	It may be Red, Brown or Blue	
Habitat: Fresh water + Marine	(M) Marine (Not Sorry)	(F) Freshwater
Cell wall: Cellulose + Silica (Indestructible Silica)	* Stiff cellulose Plates	* Cell wall Absent Protein cover → Pellicle (make cell flexible)
→ Like Soap case – overlapping	Longitudinal, Transverse	Flagella, pellicle
Flagella Absent	- Two flagella	- Two Flagella
Non-motile → [float passively in water] → Plankton	• One transverse • one longitudinal	• unequal size • Apical

Brown | Algae | Red | Green ...(continue)

Chrysophytes	Dinoflagellates	Euglenoids
Pigment ◦ Chl a ◦ Fucoxanthin	◦ Chl a ◦ Phycoerythrin (Red Pigment)	◦ Chl a ◦ Chl b } Pigment like higher plants
Storage Leucosin (× Not Need)	Starch	Paramylum
Special :→ ◦ Cell wall (Diatom) → Stiff ↙ Indestructable (Collect at bottom) ⇓ Diatomaceous Earth ↓ Due to Rough surface ↳ used for polishing, Syrup making, Filteration. * Chief producer in Ocean.	Gonyaulax (Red Dinoflagellata) ◦ Divide by Binary fission ↓ (Rapid Multiple) Red tide * Some are poisonous (harm Aquatic life)	◦ Mainly Autotrophic ↓ But in absence of Sun light ↓ they become predator of small organism. [Mixotrophic]

Slime moulds

Habitat – Grow on decaying twig

Structure

→ Plasmodium (under favorable condition)
→ multinucleated
→ No cell wall
→ slimy appearance.

Life cycle of Slime moulds

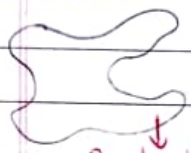
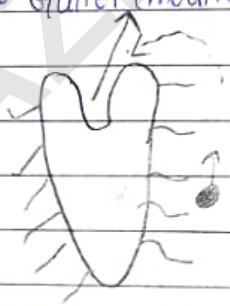
◦ true Cell wall
◦ Dispersed by Air currents.

Protozoans

Relatives to Animalia:

- Cell wall Absent
- Heterotrophic

→ Aquatic, Free living / Parasitic (Freshwater marine)

Amoeboid	Flagellates	Ciliates	Sporozoans
• Fresh water • Marine forms (Silica Shell) • terrestrial  Pseudopodia eg: * Amoeba * Entamoeba histolytica	• either free living (or) parasitic → have flagella eg: Trypanosoma ↓ Causes sleeping diseases	• Actively moving organisms as there is 1000's of cilia • Gullet (mouth)  • The coordinated movement of cilia causes the water laden with food to be steered into the gullet.	~~• have infectious~~ spore like stage in their lifecycle eg: The most notorious is Plasmodium (malarial parasite)

Virus (not get place in 5 Kingdom classification)

Basic feature:

- Acellular / non-cellular
- Exception of cell theory
- Enter into host cell & Control machinery
- Obligate parasite - completely dependent on host
- Intracellular parasite
- It have either DNA (or) RNA
- only Virus (& viroids) → Genetic Material → RNA

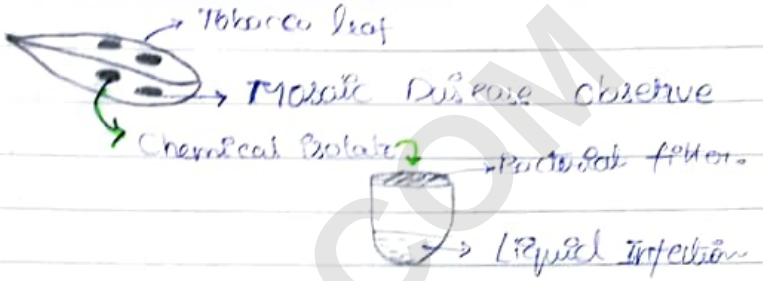
Living cell have both DNA & RNA

- Do not have any metabolic pathway
- But enzyme can be present.

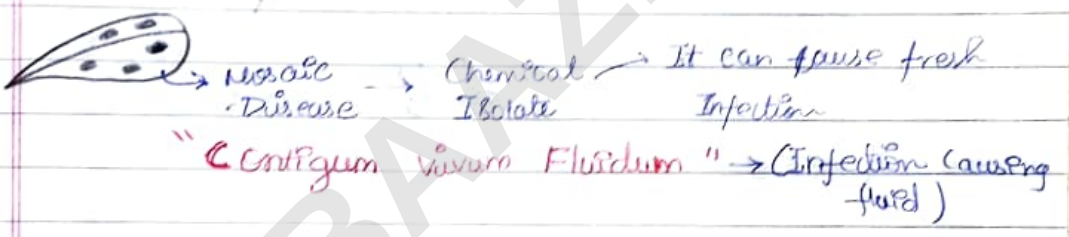
Discovery:

→ Virus term (Infectious fluid) - term given by Ivanowsky. Louis Pasteur.

① Ivanowsky ⇒



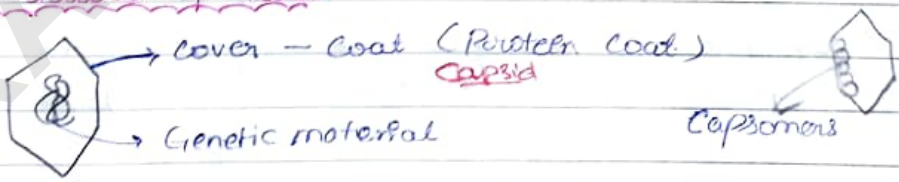
② Beijernek ⇒



③ Stanley ⇒

- First-time Virus Crystallize
- Virus is mainly Protein (≠ Nucleic acid)

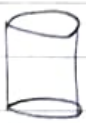
Structure of Virus



i.e n × Capsomeres = capsic

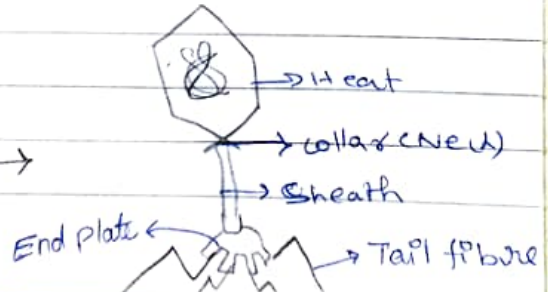
★ Protein Cover → two type of Symmetry (Shape)

(1) Cylindrical / helical



(2) Spherical / Polygonal

(3) Complex →



Classification of Virus

DNA Virus

- **Single stranded DNA**: Φ X174
- **Double stranded DNA**:
  - Herps
  - Hepatitis I
  - Lambda phage
  - Bacteriophage

RNA Virus

- **Single Stranded RNA**: H – HIV, I – Influenza, V – TMV, M – Measles, M – Mumps, R – Rabies / Rhino Virus.
- **Double Stranded RNA**

Symp. Mosaic formation, leaf rolling, curling, yellowing & vein clearing, dwarfing & stunted growth

Plant Virus ↳ ss RNA Virus

Animal Virus ↳ ss RNA, ~~ds DNA~~ ds DNA, ds RNA

Bacteriophage ↳ ds DNA

eg: λ – phage, T_2 Phage

↳ **Life Cycle**

- Lytic ⇒ (Bacteriophage) ↳ Lysis of host cell ↳ Hershey and Chase experiment
- Lysogenic ⇒ Virus genome multiply with host genome.
  ↳ Prophage : Virus DNA get attached to DNA of the host cell.

When cell become weak, Lysogenic cycle get transform into lytic cycle.

Viroids

discovered by ↳ T.O. Diener

~~Key~~ ~~Infectious~~ ~~Protein~~ ~~Coat~~

↳ Infectious particle without protein coat
↳ RNA – which is infectious

⇒ Molecular weight → Low
→ size Smaller than Virus
→ ss RNA

R.V. Mohan Hari Ram

→ Disease ⇒ PSTD → Potato spindle Tuber disease

Prions : (By Prusiner) - Size equal to virus
→ Protein which can be infectious
→ prions can be destroy folding of protein
→ Wrongly folded Protein can damage Neurons.

Disease : (1) Scrapie disease ✗
(2) Kuru disease ✗
(3) Mad cow disease ✓ → Analogous variant
(4) CJD (Creutzfeldt - Jakob disease)

Lichen : (Pollution indicator - Sulphur dioxide)
→ Symbiotic association b/w algae & fungi
(Phycobiont) ↳ Mycobiont
→ Fungi is around 90% and mainly Ascomycetes and few Basidiomycetes.
→ Algae is single cell green Algae (Chlorella, Protococcus) and Cyanobacteria
→ Heterism → Master : fungi · Slave : Algae (Produce food) Concept

↳ 3 type of lichen on the basis of structure
(1) Crustose
(2) Foliose - leaf like
(3) Fruticose

Note Sexual Reproduction Absent in Lichen

★ Role of Lichen
1. Pollution indicator for SO_2
2. Litmus obtain from lichen
3. Some lichen like Reindeer moss (or) Island moss are edible.
4. Usnea provide Usnic acid, help in plant succession.

— X —