ULTIMATE KCET

CRASH COURSE 2026

Botany | Lecture - 01

Biological classification , Plant Kingdom

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Topics to be covered

1. Biological classification
2. Plant kingdom
3.
4.

BIOLOGICAL CLASSIFICATION

① Aristotle → Founder of taxonomy
↳ Earliest attempt to classify organism

Animals : • Enima → Red fluid ✓
• Anima → Red fluid ✗

Plants : • Herb, shrub, tree
(Used morphological characters for plant)

② Kingdoms

* 2-kingdom
↓
Carolus Linnaeus

	Plantae	Animalia
• Response to external stimulus	✗	✓
• Mode of Nutrition	Auto	Hetro
• Locomotion	✗	✓
• Cell wall	✓	✗
• Contractile vacuole	✗	✓

* 3-Kingdom
↓
Heckel
(Plantae, Animalia, Protista)

* 4-Kingdom
↓
Copeland
(Plantae, Animalia, Protista, Monera)

* 5-kingdom
↓
R.H. Whittaker (1969)
↓
(Plantae, Animalia, Protista, Monera, Fungi)

⇒ Basis :
- Mode of Nutrition
- Body organisation
- Reproduction
- Phylogenic relationship
- Cell structure

ⓐ Drawbacks of earlier classification

- Prokaryotes & Eukaryotes are placed together (Blue green Algae) (Green Algae)
- Unicelled & Multicelled are placed together (Chlamydomonas, Chlorella) (Spirogyra)
- Autotrophs & Heterotrophs are placed together (Plants) (Fungi)

ⓑ R.H Whittaker's classification (5-Kingdom)

- Prokaryotes & Eukaryotes were separated
- Unicelled & multicelled were separated
- Autotrophs & Heterotrophs were separated

ⓒ 5th-Kingdom

Plantae, Animalia, Protista, Monera, Fungi

- Prokaryotes → Monera
- Eukaryotes → Plantae, Animalia, Protista, Fungi
  - Unicelled → Protista
  - Multicelled → Plantae, Animalia, Fungi
    - Autotrophs → Plantae
    - Heterotrophs → Animalia, Fungi
      - Cell wall ✓ → Fungi
      - Cell wall ✗ → Animalia

R.H Whittaker
↓
5-kingdom (1969)

ⓓ 6th-Kingdom

Archaebacteria | Eubacteria | Eukaryotes
(Monera) → Prokaryotes
Protista, Fungi, Plantae, Animalia
→ 3-domain system

③ Kingdom Monera

- Bacteria are the sole members → Cell wall: Non-cellulosic → polysaccharide / Amino acid

* Bacteria

- most abundant microorganism
- Some are Autotrophs, Majority are Heterotrophs (depend on other organism) → depend on dead organic matter
- Some are pathogenic, Many are parasite (disease causing)
- They have most extensive Metabolic diversity
- They are simple in structure, but very complex in behaviour
- They live in extreme habitats: Hot springs, deserts, snow, deep oceans etc.

∴ Bacteria occur almost everywhere.

* Shape of Bacteria

* Reproduction in Bacteria

- Asexual
  - Binary fission (mainly)
  - Spore formation (unfavourable condition)
- Sexual → primitive type of DNA transfer.

ⓐ Archaebacteria → Survive in most harsh conditions, B/c they have different cell str.

- **Halophiles**
  - Extreme salty area
- **Thermoacidophiles**
  - Hot springs
- **Methanogens** → produce methane (Biogas)
  - Marshy areas
  - Gut of cattles: → cow, buffaloes

ⓑ Eubacteria → True bacteria; Rigid cell wall + Flagellum (if motile)

Peptidoglycan

- **Autotropic Bacteria**
  - **photosynthetic**
    - → Cyanobacteria / (Blue-green algae)
    - Fresh water/marine water
    - Terrestrial algae
    - chl-a → photosynthesis
    - Unicellular/colonial/filamentous
    - Colonies surrounded by Gelatinous Sheath
    - Forms Blooms in polluted water bodies
    - Some Fix atm-N_2 by special cells → Heterocysts
      - Nostoc
      - Anabaena

• Nostoc (filamentous BGA)

  - **Chemosynthetic**
    - Oxidise inorganic substance → NO_3^-, NO_2^-, NH_3 → Release Energy → ATP production
    - Nutrient recycling → N, P, Fe, S
- **Heterotropic Bacteria**
  - Most abundant
  - Majority are important decomposers
  - Many have significant impact on Human affairs.
  - Used in:
    - milk → (Lactobacilli) → curd
    - Antibiotics production
    - N_2-fixing in legume, Rhizobium roots.
  - Some are pathogenic (Disease causing) → "Cholera, Typoid, Tetanus, Citrus canker"

ⓒ Mycoplasma/PPLO

- Smallest living organism
- Lack cell wall
- Can survive without oxygen
- pathogenic to both plant & animal

(A) Kingdom Protista (Primarily aquatic)

- → Do not have well defined boundaries
- → Provide link with: plants, animals and Fungi.
- → Reproduce Asexually and sexually by cell fusion and Zygote formation.

(a) Chrysophytes

- Photosynthetic (chl-a)
- Freshwater / Marine waters
- Cellwall ✓, Flagella ✗
- They are microscopic and float passively in water current → Plankton
- eg: → Desmids (Golden algae)
  → Diatoms (Chief producers of oceans)
  - 2-thin overlapping shells → fit together as soap box.
  - Have wall embedded with silica ∴ Indestructible walls.
  - Their accumulation over billion of years → Diatomaceous Earth → Polishing, Filtration, Syrups

(b) Dinoflagellates

- Photosynthetic (chl-a)
- Mostly marine
- Cellwall ✓, 2 unequal flagella
  - one longitudinally
  - other transversally
- They appears: → yellow, green, brown, Red (depending on main pigment)
- have stiff & thick cellulosic plates on outer surface of wall.
- eg: Gonyaulax (Red dianoflagellate) → Rapid multiplication → Red tides (Red sea) (Toxin)

(c) Euglenoids

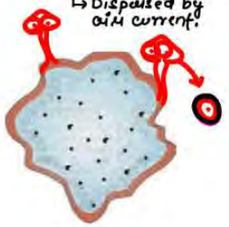
- Fresh water → Stagnant water
- Cell wall ✗ : but they have protein rich pellicle → provide flexibility
- 2 flagella: one short, one long
- Mixotropic Nutrition
  - → Sunlight ✓: Photosynthetic
  - → Sunlight X: Heterotrophs
- Their pigment similar to Higher plants.
- eg: Euglena

(d) Slime moulds

- Saprophyte
- Body move along decaying twigs and leaves → engulf organic material

- Favourable condition: Forms Plasmodium (grow several feet)
- Unfavourable condition: Forms Fruiting bodies → at tip

* Spores
- → Possess true wall
- → Extremely resistant
- → Dispersed by air current.



(e) Protozoans

Heterotrophs, predators, parasite, primitive

Amoeboid	Flagellated	Ciliated	Sporozoans
• Fresh/marine water • moist soil • have pseudopodia → False feet → Capture prey • Marine form have silica shells • eg: • Amoeba • Entamoeba (parasite)	• Free-living or parasitic • Flagella ✓ • Parasite form cause disease → Sleeping sickness • eg: • Trypanosoma	• Aquatic • ∵ Cilia present ∴ they move actively • have cavity (Gullet) → open outside to cell surface • Coordinated movement of cilia cause water & food steered into gullet. • eg: paramoecium	• have Infectious spore like stage • eg: plasmodium → • most notorious • malarial parasite

⑤ Kingdom Fungi / (Mycota)

- Great diversity in morphology & habitat

eg: → Common mushroom, Toadstools
→ puccinia (Wheat rust causing) → disease
→ penicillium (Antibiotics)

* Fungi → Basidiomycetes, Ascomycetes, Deuteromycetes, Phycomycetes

* Heterotrops: saprophytes, parasite, Decomposers, symbionts → Lichens (FAL), Mycorrhiza (FRM)

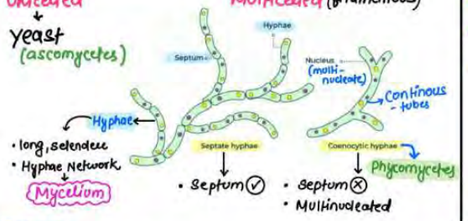
* cosmopolitans: occur in air, water, soil, on animals & plants.
Grow in warm and Humid environment.

* cell wall: chitin + polysaccharide

ⓐ Structure

Unicelled → Yeast (ascomycetes)

Multicelled (filamentous)



ⓑ Reproduction

- Vegetative: Fragmentation, Budding, Fission → unicellular
- Asexual: Conidia → non-motile (exo), sporangiospore, zoospore → motile (endo)
- Sexual: oospore, ascospore, basidiospore

→ 3 steps: ① Plasmogamy (Fusion of protoplast) → ② Karyogamy (Fusion of nuclei) → ③ meiosis (Reductional division)

→ Intervening dikaryon stage: Dikaryophase
→ 2nuclei per cell
eg: • Ascomycetes • Basidomycetes
ABD

ⓒ Spores

Sexual	Asexual	Exospore	Endospore
• Basidospore • Ascospore • oospore • zygospore	• conidia • zoospore (motile) • Aplanospore (non-motile) • Sporangiospore	• Basidospore (S) • conidia (A) BC	• Remaining

⑥ Fungi classified on the basis of: Mycelium, mode of spore, fruiting bodies

	Basidomycetes	Ascomycetes	Deuteromycetes	phycomycetes
Mycelium	Branch & septate	Branch & septate	Branch & septate	unbranch & aseptate (Coenocytic)
Asexual Spore	✗	Conidia (exo)	Conidia (exo)	• zoospore (M) (endo) • Aplanospore (NM) (endo)
Sexual Spore	Basidospore (exo)	Ascospore (endo)	✗	• zygospore → iso/aniso/oo
Fruiting body	Basidiocarp	Ascocarp	✗	✗
Example	U: Ustilago (Smut) P: Puccinia (Rust) A: Agaricus (Mushroom)	C: Clavicepus A: Aspergillus N: Neurospora (used in genetic work)	A: Alternaria C: Colletotricum T: Tricoderma	R: Rhizopus → (Bread mould) A: Albugo → (mustard parasite) M: Mucor
Imp points	• Common forms → Bracket fungi, → mushrooms, → puff balls • Sex organ absent • Basidospores forms Basidium exogenously • Plasmogamy by fusion 2 vegetative somatic cells of diff strains • Karyogamy and meiosis by 4 basidospores.	• Known as: sac fungi • Other examples → yeast (nearly unicellular), → penicillium (mostly multicellular), → morells & truffels (Edible & delicacies) • They are: (grow on dung) → Coprophilous, → saprophytes, → parasite, → Decomposers	• called: Imperfect fungi • Some are → saprophytes, → parasite • majority are → decomposers (help in mineral cycling)	• Found in → aquatic habitat, → Decaying wood, → moist & damp places, → as obligate parasite on plants. • Coenocytic hyphae ✓

⑦ VIRUS :

→ venom / poisonous fluid

→ Non truly living, non-dead, non-cellular
↳ B/c they did not find place in classification

↗ B/c they characterised by inert crystalline structure outside living cell

ⓐ * Ivanosky

- microbe
- TMV (Tobaco mosaic virus)

→ they are smaller than bacteria
↓
∴ they pass through bacterial proof filters.

* Beijernick

- Named pathogen: "virus"
- Healthy plant —(tobaco extract of infected plant)→ Diseased plant
- Infectious living fluid:
  → Contagium-Vivum-Fluidum

* Stanly

- Virus could crystallised
  ↓
  crystals consist proteins
  [inert outside & specific to Host cell]

ⓑ Virus are

- Infectious particle
- obligate parasite
- Nucleoprotein
- Non-truly living
- Host specific

Composed of

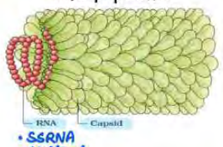
Genetic material
- infectious
- have either RNA / DNA
- No virus have both RNA & DNA

protein coat (called) Capsid
↓
made of small Subunits (called) Capsomeres
↳ protect the nucleic acid
↳ arranged in helical or polyhederal form.

Host	Genetic material in virus
Bacteria	ds DNA
plants	ss RNA
Animals	ss RNA / ds RNA / ds DNA

ⓒ * TMV (Tobacco mosaic virus)

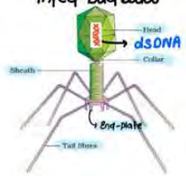
↓
infect plants



- SSRNA
- Helical

* Bacteriophage

↓
infect bacteria



ⓓ Viral diseases

In animals	In plants
• mumps	D: Dwarfing and stunted growth
• Small pox	Y: yellowing of leaf
• herpes	L: Leaf rolling & curling
• Influnza	M: mosaic formation
• AIDS (HIV)	V: vein clearing

⑧ VIRIODS

virus − protein coat = viroid

- T.O Discase: 1971
- Free RNA of low molecular weight
- Lack protein coat
- Smaller than virus
- Cause: potato spindle tuber disease
  ↳ PSTD

PRIONS

- Abnormally folded protein
- Similar size to virus
- Cause Neurological disease
  → Bovine spongiform encephalopathy (BSE) (mad cow disease)
    ↳ in cattles
  → Cr-Jacob disease (CJD)
    ↳ in humans

LICHENS

- Fungi + Algae
  ↓
  Mycobiant — phycobiant
  ↓ — ↓
  Heterotropic — Autotropic
  ↓ — ↓
  provide shelter — provide food

* Lichens are good pollution indicator
∴ Not grow in polluted area

Mycorhiza

- Fungi + Roots

⑨ Some Imp points:

* Plantae
  - few members are partially heterotrophic
    - insectivorous plant: • Bladderwort • Venus fly trap
    - parasitic plant: • Cuscuta
  - life cycle of plant has two distant phase: • diploid sporophyte • Haploid gametophyte
    - Alternation of generation

* Animalia
  - lack cell wall
  - Show Holozoic mode of nutrition
  - Higher forms show elaborate sensory & neuromotor mechanism

* Some acellular organism → Virus, Viroids, lichens → not included in 5-Kingdom Classification.

* Summery.

Characters	Five Kingdoms				
	Monera	**Protista**	**Fungi**	**Plantae**	**Animalia**
Cell type	Prokaryotic	Eukaryotic	Eukaryotic	Eukaryotic	Eukaryotic
Cell wall	Noncellulosic (Polysaccharide + amino acid)	Present in some	Present with chitin	Present (cellulose)	Absent
Nuclear membrane	Absent	Present	Present	Present	Present
Body organisation	Cellular	Cellular	Multicellular/ loose tissue	Tissue/ organ	Tissue/organ/ organ system
Mode of nutrition	Autotrophic (chemosynthetic and photosynthetic) and Heterotrophic (saprophytic/parasitic)	Autotrophic (Photosynthetic) and Heterotrophic	Heterotrophic (Saprophytic/ Parasitic)	Autotrophic (Photosynthetic)	Heterotrophic (Holozoic/ Saprophytic etc.)

PLANT KINGDOM

① Classification system

Artificial
- Given by Linnaeus
- Earliest system
- It used only gross superficial morphological characters → habit, colours, number etc.
- Based on vegetative characters or androecium structure

- Drawbacks:
  - → Separate closely related species
  - → equal weightage to vegetative and sexual characters → more affected by environment

Natural
- Given by Bentham & Hooker
- Based on natural affinities
- It include both external & internal features

* Internal features (U are APE)
- → Ultra structure
- → Anatomy
- → Phytochemistry
- → Embryology

Phylogenetic
- Based on evolutionary relationship between organism
- Organism of same taxa have common ancestor.

② Branches of Taxonomy
(when no fossil evidence were available)

Cytotaxonomy
- Based on cell structure and chromosome number, structure, behaviour

Chemotaxonomy
- Based on chemicals which are present inside cells.
  - → Crystals
  - → N_2-Bases (A, T, C, G)

Numerical Taxonomy
- 'n' numbers of characters are studied by computers
- Codes and numbers assigned → +/-/0

③ ALGAE
- → Chlorophyll ✓
- → Simple thalloid str (undifferentiated plant body)
- → Autotropic & largely aquatic (FW & MW)
- → Perform 50% CO_2 fixation on earth
- → It increase dissolved O_2 by photosynthesis

* Edible algae: PLS (Porphyra) (Laminaria) (Sargassum) + 70 species of marine algae

* Produce Hydrocolloids (water holding substance)
- → Algin (Brown algae)
- → Carrogen (Red algae)

* Commercial product: Agar → obtained from Gelidium & Gracilaria → used to
- Grow microbes
- make icecream & jellies

* Forms of algae

Unicellular	Filamentous	Colonial	Massive bodies
• Chlamydomonas • Chlorella → Space food → protein rich	• Ulothrix • Spirogyra • Ectocarpus*	• Volvox	• Kelp*

* Reproduction in algae

Vegetative	Asexual	Sexual
• by Fragmentation → {Fragments develop into thallus}	• By Spore → Zoospore (common) → motile	• By fusion of gametes • zygote formation

Sexual → Isogamous / Anisogamous / Oogamous

Isogamous:
- Flagellated (motile): • Ulothrix
- Non-Flagellated (non-motile): • Spirogyra

Anisogamous:
- Eudorina

Oogamous:
- → large female gamete (non-motile)
- → small male gamete (motile)
- • Fucus (Brown)
- • Volvox (Green)

④ Types of algae

Green algae
Chlorophyceae

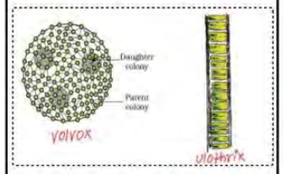
Brown algae
Phaephyceae

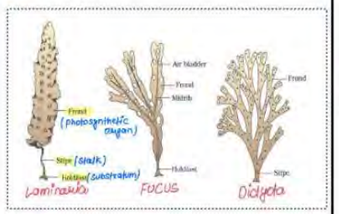
Red algae
Rhodophyceae

- Algae + Fungi : Lichen
- Algae + Animals : eg: sloth bear

⑤	CHLOROPHYCEAE G	PHAEPHYCEAE B	RHODOPHYCEAE R
Habitat	• Fresh water (mainly) • Brakish water • salt water	• Marine (mostly) • Fresh water (rare)	• marine/salt water (mostly) → warmer region • Fresh water (some)
pigments	• Chl-a, b	• Chl-a, c • carotenoids • xanthophylls → Fucoxanthin (Responsible for variation in colour from olive green to Brown)	• Chl-a, d • Y-phycoerythrin (red pigment)
Food storage	• Starch • oil droplets pyrenoids	• Mannitol • Laminarin (complex carb)	• Floridean starch (Similar to amylopectin and glycogen)
Flagella in Zoospores	• 2-8 Flagella • equal & apical pear shape	• 2 Flagella (Bi-flagellate) • unequal & lateral pear shape	• Non-flagelate (non-motile)
Cell wall	• cellulose + pectin (inner) (outer)	• cellulose + Algin (Gelatinous covering) (inner) (outer)	• cellulose + pectin + polysulphate esters agar, caragen
Body organisation	• unicellular (C,G) • Filamentous (FUS) • colonial (V)	• multicellular	• multicellular → Complex body organisation
Asexual Reproduction (Spore)	• motile spore (flagelate zoospore)	• motile spore (Biflegelate zoospore)	• non-motile spore ○ ○○○
Sexual Reproduction (gamete)	• Isogamous (U,S) • Anisogamous (E) • oogamous (V)	• Isogamous • Anisogamous • oogamous (F) mainly	• only oogamous (non-motile)

	CHLOROPHYCEAE	PHAEPHYCEAE	RHODOPHYCEAE
Some important point	Special bodies inside Chloroplast → pyrenoids ↓ contain protein besides Starch Variable chloroplast shape → Discoid, plate, reticulate, spiral, ribbon, Cup-shape.	protoplast have → plastids → Nucleus → Central vacuole • Range: simple → profusely branched (ectocarpus) (kelp) ↓ filamentus ↓ 100 metre tall * Gametes pyriform/pear-shape ↳ fertilise in water or within oogonium	• occur in both → surface and deeper ocean. • In sexual Reproduction: → They need water for fertilisation. → complex post fertilization event occur.
Example:	V: volvox S: Spirogyra U: Ulothrix C: Chlamydomonas C: Chaara, Chlorella E: Euglena S S X	S: Sargassam E: Ectocarpus L: Lamanarian / kelp F: Fucus D: Dictyota	G: Gracilaria G: Gelidium P: porphyra P: polysiphonia





⑥ BRYOPHYTES

- Gametophyte (n) is main plant body and sporophyte (2n) parasite on gametophyte (Photosynthesis)
- Amphibians of plant kingdom, B/C they need water for Sexual Reproduction
- Non-vascular: xylem & phloem ⊗ {B/C they are very thin}
- 1st Embryophytes of plant kingdom
- Small, non-woody, occurs in damp, humid & shaded area
- Homosporous
- Lack true roots, stems, leaf {But they have: Rhizoid (Root like), Stem like, leaf like Structure}
- male sex organ: Antheridium → produce bi-flagellate antherozoids
- Female sex organ: Archegonium (flask shape) → produce single egg
- Types: Liverworts & mosses

Gametophyte → free-living → Dominant
Sporophyte → Non-free living

* zygote do not undergo reduction division immediately
zygote ← Gametophyte ← spore ← meiosis SMC
zygote → Embryo → sporophyte

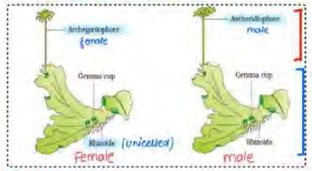
* Sex organs are jacketed and multicelled

* Importance of Bryophytes:

- Sphagnum (mosses) → provide peat → used as fuel & packing material → B/C of their water Holding capacity {Hygroscopic}
- Mosses with lichens → 1st organism to colonise rock ∴ have great ecological importance
  → Decompose Rock by making suitable for growth of higher plant.

* A: Mosses reduce impact of falling rain & prevent soil erosion
R: B/C Mosses forms dense mats on soil.

ⓐ Liverworts



Sporophyte (2n) → parasite/dependent
Gametophyte (n) → photosynthetic

* Reproduction

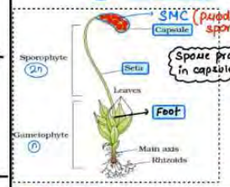
Asexual
- Fragmentation of thalli
- specialised structures formation: Gemmae
  Green multicellular gemmae → asexual bud
  ⇒ Gemmae detach from parent & form new individual

Sexual
- by male & female sex organ (on same or diff thalli)
- * spore → germinate {direct development} → Gameto-phyte (free-living)

* imp points:

- plant body → Thalloid [Dorsiventral & closely appressed]
- Rhizoid → unicellular & unbranch
- Leafy members → tiny leaf like appendages in two rows on stem like structure.
- Location → moist shady area → banks of streams, marshy ground, etc
- Example → Riccia, Marchantia

ⓑ Mosses



* Sporophyte in mosses is more elaborate than liverworts.
* mosses have elaborate mechanism of spore dispersal.

* Stages

1st stage / protonema stage → develop directly from spore
2nd stage / Leafy stage → develop from secondary protonema as lateral bud

⇒ Protonema → Green, creeping, branched, filamentous

* Reproduction

Asexual
- Fragmentation
- Budding in sec-protonema

Sexual
- Sex organ produced at apex of leafy shoot.

* Imp points

- plant body → Foliose (erect)
- Rhizoid → Multicellular & branched
- example → Funeria, Polytrichum, Sphagnum

• provide peat
• Used as fuel

⑦ PTERIDOPHYTE

Sporophyte : free-living
- Dominant
- photosynthetic

gametophyte : free-living
- photosynthetic

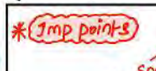
- → Sporophyte is main plant body
- → used for medicinal purpose, soil binders & ornamentals.
- → Include : Ferns & Horsetails
- → vascular tissue → xylem & phloem ✓ : but poorly develop ∴ need water for fertilization
- → Location : Cool, damp, shaddy, sandy soil areas
- → True roots, stem, leaf present ✓
- → Limited and Restricted to narrow geographical region
- → Female gametophyte retained on parent sporophyte
- → zygote develop into young embryo take place within female gametophyte → precursor to seed habit.

Evolution ↑ Responsible for

* Spores
  - Homospores
    - majority of pteridophyte
  - Heterospores { microspore / megaspore }
    - * Selaginella
    - * Salvinia

* Example:
  - → Psilopsida (P)
  - → Lycopsida (L, S)
  - → Sphenopsida (E)
  - → Pteropsida (PAD)

* Imp points



- Small leaf → Selaginella (micro-phyll)
- large leaf → Fern (macro-phyll)

Sporophylls

Normal arrangment
- Heterospore
- SMC (2n) —meiosis→ spore (n)
- Homospore —mitosis→ Gametophyte / Prothallus
  - inconspicuous (poorly develop)
  - Small & multicellular
  - Free-living, independent

Compact arrangment of sporophylls → Strobili / Cones
- Selaginella
- Equisetum

* Examples

psilopsida	Lycopsida	sphenopsida	pteropsida
Psilotum	• Lycopodium • Selaginella	• Equisetum	• Pteris • Adiantum • Dryopteris PAD

Selaginella

Equisetum

* Other examples:
  - Ferns
  - Salvinia


Ferns


Salvinia

⑧ GYMNOSPERMS → ovules & seed both naked before & after fertilization

Naked Seed

* Sporophyte : free-living
* Gametophyte : Not free-living

- Sporophyte is main plant body & Gametophyte depend on sporophyte
- Include: tree, shrubs
- Tallest tree: sequoia (giant redwood tree)
- Cones/strobili are present
- Pollen grain (male gametophyte) :
  - highly reduced & limited
  - Carried by air current
  - pollen tube discharge Gametes near mouth of Archegonia.

eg: Pinus, Cycas, Cedrus, Sequoia, Ginko

- Pinus: • MEB • winged pollen grain
- Cycas: • COUP
- Cedrus: Branch
- Sequoia: giant redwood tree
- Ginko: living fossil

Ginko

ⓐ Roots (Tap root)

- Mycorrhiza {Roots + fungi} → Pinus
- Coralloid root {Root + N_2-fixing cyanobacteria} → Cycas

ⓒ Stem

- unbranch → Cycas
- branch → • Pinus • Cedrus

ⓑ Leaf {well adapted to tolerate extreme conditions}

- Simple leaf
- Compound leaf
  - pinnate
  - palmate
  - • Cycas (persist for few years)
- Conifers
  - • Needle like : to Reduce surface area
  - • Thick cuticle and : sunken stomata to Reduce water loss

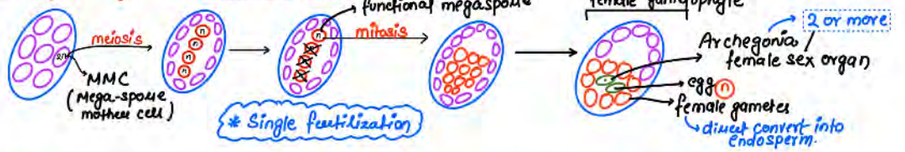
ⓓ Strobili/cones (compact arrangement of sporophyll)

Male	micro-sporangia	micro-sporophyll	male Strobili / micro-sporangiate
Female	Mega sporangia	Mega sporophyll	Female Strobili / mega sporangiate

ⓔ Sexuality

- Monoecious/Bisexual {male & female part present on same plant} → Pinus
- Dioecious/Unisexual {male & female part present on diff plant} → Cycas
  - • male cone
  - • mega sporophyll

ⓕ Megasporogenesis (Gymnosperms)



ⓖ

	BRYOPHYTE	PTERIDOPHYTE	GYMNOSPERM
Main plant body: (Dominant)	• Gametophyte	• Sporophyte	• Sporophyte
Dependency	• Sporophyte depend on gametophyte	• Sporophyte & gametophyte both are independent	• Gametophyte depend on sporophyte
Photosynthetic structure	• Gametophyte	• both sporophyte & Gametophyte	• Sporophyte
Vascular tissue	✗	✓ (poorly develop)	✓
Structure	• Root like str • Stem like str • leaf like str Lack true str	• True Root, stem, leaf present.	• True Root, stem, leaf present.
Spores type	• Homospores	• Both Homo & Hetro (S,S)	• Heterospores
Gametes	• motile gamete → flagellated	• motile gamete → flagellated	• Non motile gamete (except: cycas & Ginko)
Gametophyte	• well developed	• poorly develop	• highly Reduced
Imp point	• Liverworts : Gemmae • Mosses : protonemma	• Gametophyte known as → prothallus	• Cone / strobili present
Example	• Liverworts → Riccia, Marchantia • Mosses → Funaria, Polytrichum, Sphagnum FPS	• Psilopsida : Psilotum • Lycopsida : Lycopodium, Selaginella • Sphenopsida : Equisetum • Pteropsida : Pteris, Adiantum, Drypteris → Ferns, Salvinia DP PLEASE	• S : Sequoia • P : Pinus MBB • G : Ginko • C : Cycas, Cedrus CUUP

Question No. - 01

All eukaryotic unicellular organisms belong to

A Monera

B Protista

C Fungi

D Bacteria

Question No. - 02

The five kingdom classification was

A R.H. Whittaker

B C.Linnaeus

C A. Roxberg

D Virchwo

Question No. - 03

Organisms living in salty areas are called as

A Methanogens

B Halophiles

C Heliophytes

D Thermoacidophiles

Question No. - 04

Naked cytoplasm, multinucleated and saprophytic are the characteristics of

A Monera

B Protista

C Fungi

D Slime molds

Question No. - 05

An association between roots of higher plants and fungi is called

A Lichen

B Fern

C Mycorrhtza

D BGA

Question No. - 06

A dikaryon is formed when

A Meiosis is arrested

B The two haploid cells do not fuse immediately

C Cytoplasm does not fuse

D None of the above

Question No. - 07

Contagium vivum fluidum was proposed by

A D.J. Ivanowsky

B M.W. Betjerinek

C Stanley

D Robert Hook

Question No. - 08

Associations between Mycobtont and Phycobtont are found in

A Mycorrhiza

B Root

C Lichens

D BGA

Question No. - 09

Difference between Virus and Viroid is

A Absence of protein coat in viroid but present in virus

B Presence of low molecular weight RNA in virus but absent in viroid

C Both A and B

D None of the above

Question No. - 10

With respect to fungal sexual cycle, choose the correct sequence of events

A Karyogamy, Plasmogamy and Metosis

B Metosis, Plasmogamy and Karyogamy

C Plasmogamy, Karyogamy and Metosts

D Metosis, Karyogamy and Plasmogamy

Question No. - 12

Members of phycomycetes are found in

i. Aquatic habitats

ii. On decaying wood

iii. Moist and damp places

iv. As obligate parasites on plants

Choose from the following options

A None of the above

B i and iv

C ii and iii

D All of the above

Question No. - 13

Choose the correct with respect to earliest for scientific basis of classification

A It was proposed by Aristotle

B Plants were divided as trees, shrubs & herbs on the basis of their morphological characters

C Animals were classified into two groups that are those which have red blood and those that did not

D All of these

Question No. - 14

01 00

How many kingdom according to five kingdom classification and Linnaeus system of classification is/are dedicated for prokaryotes exclusively

A 1, 0

B 1, 1

C 2, 0

D 3, 1

Question No. - 14

Moneran cell wall is composed by-

A Polysaccharide (Non cellulose) only

B Polysaccharide (cellulose)

C Polysaccharide (chitin)

D Amino acid and Non cellulosic polysaccharide

Question No. - 15

R.H Whittaker classification is/are based upon-

A Cell structure & body organisation

B Mode of nutrition & reproduction

C Phylogentic relationship

D All of these

Question No. - 16

Choose the correct about 3 - domain system

A. Two domain are dedicated for prokaryotic while one domain is dedicated for eukaryotic

B. One domain is dedicated for prokaryotic while two domains are for eukaryotic

C. It has seven kingdom which are categorised in 3 - domain

D. It has six kingdom of which one kingdom is in first and third domain while 5 - kingdom is second domain

Question No. - 17

Unicellular eukaryotic are categorised in -

A Monera

B Protista

C Plantae

D Animalia

Question No. - 18

How many of the following does belong to Protista Amoeba, Spirogyra, Chlamydomonas, Chlorella, Paramecium

A 5

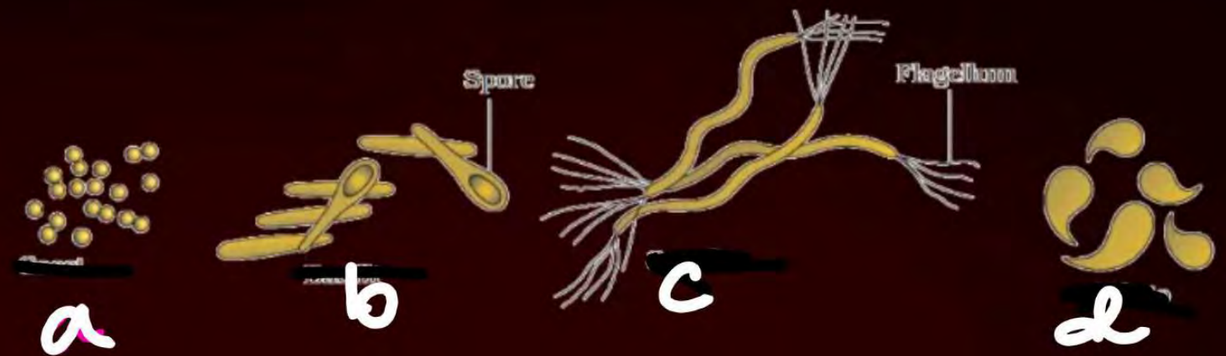
B 4

C 3

D 2

Question No. - 19

Identify shape of bacteria



A a = cocci, b = rod – shaped, c = bacilli, d = comma – shaped

B a = spherical coccus, B = Bacilli, c = spirilla, d = vibrio

C a = cocci, b = spirilla, c = vibrio, d = Bacilli

D a = vibrio, b = spirilla, c = bacilli, d = coccus

Question No. - 20

Choose the correctly stated statement

A Bacterial structure and behaviour are complex.

B Bacterial structure and behaviour are simple

C Bacterial structure is complex while behaviour is simple

D Bacterial structure is simple while behaviour is complex

Question No. - 21

Synthesis of own food from inorganic substrate is occur in -

A Autotrophic nutrition - type

B Chemosynthetic autotroph

C Photosynthetic autotroph - Sunlight

D All of these

Question No. - 22

Match the column – I and Column – II

	Column – I		Column – II
(i)	Halophiles	(a)	Marshy area
(ii)	Thermoacidophiles	(b)	Salty area
(iii)	Methanogens	(c)	Hot springs

A (i) – c, (ii) – b, (iii) – a

B (i) – c, (ii) – a , (iii) – b

C (i) – b, (ii) – c, (iii) – a

D (i) – b, (ii) – a, (iii) – c

Question No. - 23

Locomotory structures in protists are

A Flagella

B Cilia

C Pseudopodia

D All

Question No. - 24

Protista form a link with -

A Plants only

B Animals only

C Fungi only

D Plants, animals and fungi

Question No. - 25

Chief producers in ocean are

A Dinoflagellates

B Diatoms

C Euglenoids

D Green algae

Question No. - 26

Photosynthetic protists are -

A Euglenoids, Diatoms and Dinoflagellates

B Euglenoids and slime moulds

C Diatoms and Zooflagellates

D Desmids + Ciliates

Question No. - 27

Dinoflagellates have -

A. A single flagellum in the transverse groove between the cell plates

B. A single flagellum in the longitudinal groove between the cell plates

C. Two flagella one lies longitudinally and the other transversely in a furrow between the wall plates

D. No flagella

Question No. - 28

I. Instead of a cell wall they have a protein rich pellicle making their body flexible.
II. They have 2 flagella, a short and a long one.
III. They have mixotrophic nutrition
IV. In light they are photosynthetic, but act as heterotroph (predating other smaller organism) when they are in dark.
V. They are connecting link between plants and animals.

The above statements are assigned to -

A Dinoflagellates

B Slime mould

C Desmids and Diatoms

D Euglena ✓

Question No. - 29

Which of the following is correct about the slime mould?

I. Its thalloid body, plasmodium, has pseudopodia for locomotion and engulfing organic matter

II. During unfavourable conditions plasmodium differentiates and produces fruiting bodies, sporangium

III. Spores possess no true cell wall.

IV. They are dispersed by air current.

V. Being extremely resistant, spores survive for many years.

VI. Plasmodium can grow upto several feet.

A. I, II, IV, V, VI

B. I, II, III

C. I, II, III, VI

D. II, III, VI

Question No. - 30

Paramecium

A. Is a ciliated protozoan

B. Shows water current movement by cilia which helps the food to be steered into gullet

C. Has a cavity (gullet) that opens to the outside of the cell surface

D. All

Question No. - 31

The cells of the body of a multicellular fungus are organized into rapidly growing individual filaments called

A Mycelium

B Rhizoids

C Hyphae

D Dikaryon

Question No. - 32

Which one is unicellular fungus?

A Puccinia

B Toad stool

C Penicillium

D Yeast

Question No. - 33

Coenocytic hypha is

A Uninucleate hypha

B Multicellular hypha

C Multinucleate hypha without septae

D Hypha in coelom

Question No. - 34

Reproduction in fungi can take place by all of the following vegetative methods except

A Gemmae

B Fragmentation

C Fission

D Budding

Question No. - 35

Fungi show asexual reproduction by all of the following spores except

A Conidia exo

B Oosopore

C Sporangiospore endo

D Zoospores endo

Question No. - 36

All the following belong to phycomycetes except

A Penicillium / asco

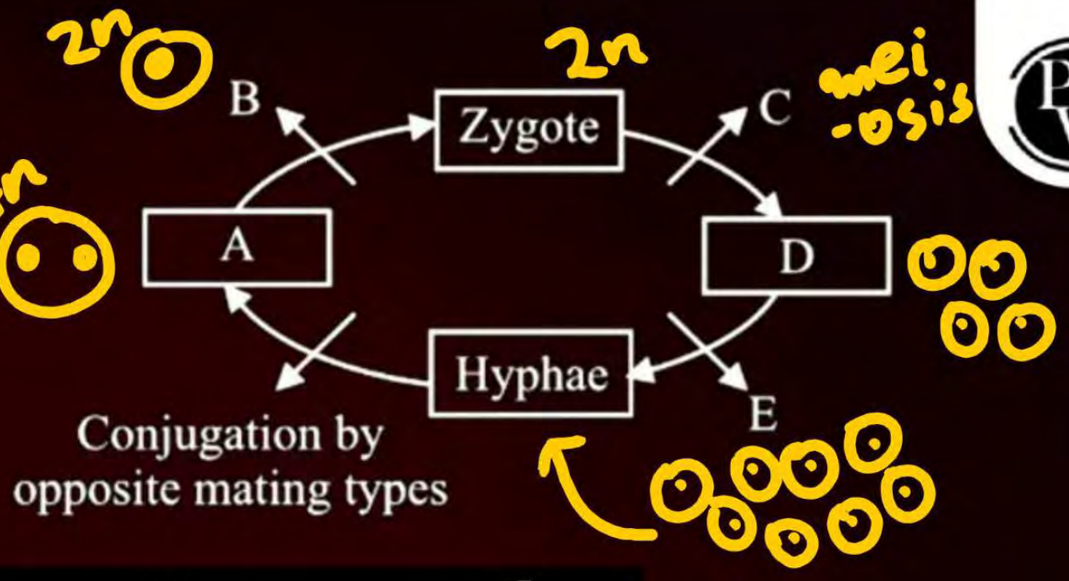
B Rhizopus (bread mould)

C Mucor

D Albugo

Question No. - 37

The above diagram shows a generalized life cycle of a fungus. The appropriate terms for A to E are –



	A	B	C	D	E
A	Mycel ium	Mito sis	Mei osis	Fertiliz ation	Spore
B	Fertiliz ation	Meio sis	Mito sis	Dkary otic cell	Amitos is
C	Dikary otic phase	Fertili zation	Mei osis	Spores	Mitosis
D	Meio sis	Mito sis	Spo re	Fertili zation	Fertiliz ation

Question No. - 38

Which of the following is false about deuteromycetes?

A They reproduce only by asexual spores (conidia)

B Mycelium is branched and septate

C They have only parasitic forms

D They have no sexual stage (perfect stage)

Question No. - 36

I. Mycelium is branched and septate
II. No asexual spores are generally formed
III. Vegetative reproduction by fragmentation is common
IV. Sex organ are absent but sexual reproduction takes place by somatogamy
V. Karyogamy ad meiosis occur in basidium to form haploid exogenous 4 basidiospores
VI. Basidia are arranged in basidiocarp.

The above characters are assigned to -

A Sac fungi

B Club fungi

C Algal fungi

D Fungi imperfecti

Question No. - 01

Cyanobacteria are classified under

A Protista

B Plantae

C Monera

D Algae

Question No. - 02

Fusion of two motile gametes which are dissimilar in size is termed as

A Oogamy

B Isogamy

C Anisogamy

D Zoogamy

Question No. - 03

Holdfast, stipe and frond constitutes the plant body in case of

A Rhodophyceae

B Chlorophyceae

C Phaeophyceae

D All of the above

Question No. - 04

A plant shows thallus level of organization. It shows rhizoids and is haploid. It needs water to complete its life cycle because the male gametes are motile. Identify the group to which it belongs to

A Pteridophytes

B Gymnosperms

C Monocots

D Bryophytes

Question No. - 05

A Prothallus is

A. A structure in pteridophytes formed before the thallus develops

B. A sporophytic free living structure formed in pteridophytes

C. A gametophyte free living structure formed in pteridophytes

D. A primitive structure formed after fertilization in pteridophytes

Question No. - 06

Plants of this group are diploid and well adapted to extreme conditions. They grow bearing sporophylls in compact structures called cones. The group in reference is

A Monocots

B Dicots

C Pteridophytes

D Gymnosperms

Question No. - 07

The embryo sac of an Angiosperm is made up of

A 8 cells

B 7 cells and 8 nuclei

C 8 nuclei

D 7 cells and 7 nuclei

Question No. - 08

If the diploid number of a flowering plant is 36. What would be the chromosome number in its endosperm

A 36

B 18

C 54

D 72

Question No. - 09

Protonema is

A Haploid and is found in mosses

B Diploid and is found in liverworts

C Diploid and is found in pteridophytes

D Haploid and is found in pteridophytes

Question No. - 10

The giant Redwood tree (Sequoia sempervirens) is a/an

A Angiosperm

B Free fern

C Pteridophyte

D Gymnosperm

Question No. - 11

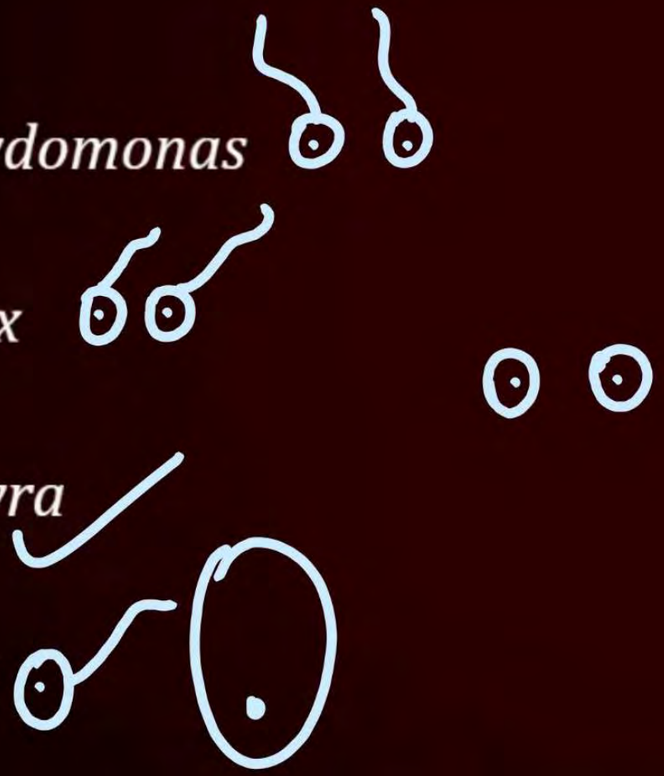
Isogamy with nonflagellated gametes is found in

A *Chlamydomonas*

B *Ulothrix*

C *Spirogyra*

D Volvox



Question No. - 12

Most algae are characterized by

A Presence of embryo

B Presence of multicellular jacketed sex organs *Spirogyra*

C Possessing thalloid plant body ✓

D Presence of photosynthetic independent sporophyte 2n

Question No. - 13

Agar-agar commonly used in culture medium is obtained from

A *Gelidium*

B *Chara*

C *Sargassum* [redacted]

D *Polysiphonia*

Question No. - 14

Fucoxanthin is found in plants belonging to group

A *Gelidium*

B Rhodophyceae

C Pheophyceae

D Chlorophyceae

Question No. - 15

Pyrenoids contain

A Protein

B Starch + protein

C Pheophyceae

D Chlorophyceae

Question No. - 16

Chlorophyll a, d and phycoerythrin as major pigments occur in

A Green algae

B Brown algae

C Red algae

D Blue green algae

Question No. - 17

Red algae differ from the green algae as they lack

A Chlorophyll a

B Specialised sex organs

C Cellulose in their cell wall

D Flagella throughout the life

Question No. - 18

A class of algae, characterised by pyriforrn zoospores with two laterally inserted flagella, is exemplified by

A *Volvox*

B *Fucus*

C *Eudorina* Green (aniso)

D *Poiphyra*

Question No. - 19

Select the incorrect statement w.r.t. bryophytes

A Commonly growing in moist and shaded areas

B Dependent on water for sexual reproduction

C Lack true roots, stem and leaves

D Zygote undergoes reduction division immediately to form spore

Question No. - 20

Sporophyte of bryophytes is

A Free living sporophyte

B Free living gametophyte

C More differentiated than that of ferns

D Non green structure dependent on sporophyte

Question No. - 21

The main plant body of bryophytes is

A Free living

B Unicellular

C Divided into foot, seta and capsule

D Is more developed than gymnosperms

Question No. - 22

Since _____ form dense mats over the soil they reduce the impact of falling rain and prevent soil erosion.

A Mosses

B Algae

C Seed plants

D Ferns

Question No. - 23

Statement A : Protonema is formed in mosses and liverworts.

Statement B : Protonema represents sporophytic stage of bryophyte.

A Only (A) is correct

B Only (B) is correct

C Both (A) and (B) are incorrect

D Both (A) and (B) are correct

Question No. - 24

In which of the following features bryophytes do not resemble green algae?

A Thalloid plant body

B Absence of vascular tissues

C Need of water for sexual reproduction

D Presence of embryo

Question No. - 25

Heterospory is not found in

A Liverworts and mosses

B Selaginella and Salvinia

C Dicots and monocots

D Cycas and Cedrus

Question No. - 26

In pteridophytes the sporophylls are born on

A Gametophytes

B Sporophytes

C Prothallus

D Rhizoids

Question No. - 27

In heterosporous species, the female gametophyte remains on the parent sporophytes for variable periods and development of zygote into young embryo within the female gametophyte is precursor to the

A Heterospory

B Seed habit

C Development of prothallus

D Fruit formation

Question No. - 28

In some pteridophytes, the spore germinate to form prothallus, which is

A Inconspicuous and unicellular

B Multicellular and green in colour

C Thalloid and photosynthetic

D Both (B) and (C)

Question No. - 29

Vascular archegoniates include

A All embryophytes

B All spermatophytes

C Pteridophytes and gymnosperms

D Gymnosperms and angiosperm

Question No. - 30

The giant red wood tree is

A Sequoia, a gymnosperm

B Ficus, an angiosperm

C Wolfia, an angiosperm

D Selaginella, a pteridophyte

Question No. - 31

In gymnosperms the male gametophyte is highly reduced, known as

A Endosperm

B Embryo sac

C Nucellus

D Pollen grain

Question No. - 32

Pteridophytes differ from gymnosperms as the former

A Have embryo

B Contains vessels in their xylem

C Do not form seeds

D Produce non-motile male gametes

Question No. - 33

The event of pollination is seen in which of the given plant groups?

A Algae

B Gymnosperm

C Bryophytes

D Pteridophytes

Question No. - 34

In flowering plants, male and female gametophytes are called respectively

A Pollen grain and endosperm

B Pollen grain and embryo-sac

C Stamen and carpel

D Anther and ovule

Question No. - 35

What is the ploidy level of primary endosperm nucleus (PEN) in a typical flowering plant?

A 3 N

B N

C 2 N

D 4 N

Question No. - 36

Select the incorrect match

A. First embryophytes — Bryophytes

B. First tracheophytes — Pteridophytes

C. Archegoniate spermatophytes — Gymnosperms

D. Seed plants without ovary—Angiosperms

Question No. - 37

Floridean starch is stored food in which of the given algae?

A Volvox

B Fucus

C Gelidium

D Eudorina

Question No. - 38

Which of the given is bryophyte?

A Laminaria

B Marchantia

C Lycopodium

D Ginkgo

Question No. - 39

Egg apparatus in the embryo sac of angiosperm is

A 3-celled

B 2-celled

C 7-celled

D 8-celled

Question No. - 40

In chemical constituents of the plant are used to resolve confusions

A Classical taxonomy

B Cytotaxonomy

C Karyotaxonomy

D Chemotaxonomy

Thank You