

PART A
BIODIVERSITY

1. Basic unit of classification is
 - a. genus **b. species**
 - c. family d. taxon
2. Unicellular plants in oceans and freshwater
 - a. algae b. zooplanktons
 - c. phytoplanktons** d. epiphytes
3. Carolus Linnaeus proposed
 - a. Phylogenetic **b. Two kingdoms**
 - c. Five Kingdoms d. Natural
4. Systema Naturae was written by
 - a. Hippocrates b. Pliny the Elder
 - c. Linnaeus** d. Aristotle
5. The father of medicine is
 - a. Linnaeus **b. Hippocrates**
 - c. R. H. Whittaker d. Aristotle
6. The term species was introduced first time by ..
 - a. Linnaeus **b. John Ray**
 - c. Aristotle d. Theophrastus
7. The word Taxonomy was coined by .
 - a. Hippocrates b. Aristotle
 - c. De Candolle** d. Linnaeus
8. T.M.V symmetry.
 - a. Cubical **b. helical**
 - c. atypical d. square
9. The infective nature of virus is due to
 - a. protein coat **b. nucleic acid**
 - c. envelope d. tail fibres.
10. Developing vaccine for SARS is difficult because
 - a. it spreads by infectious materials
 - b. it is an enveloped virus
 - c. it is constantly changing it's form**
 - d. it has ssRNA
11. The virus was isolated in crystalline form by
 - a. Iwanowsky **b. W. M. Stanley**
 - c. Mayer d. Beijerinck
12. virus shows complex symmetry.
 - a. Pox** b. Influenza
 - c. HIV d. Adeno
13. Single stranded RNA is seen in ..
 - a. HIV b. SV 40
- c. SARS** d. Bacteriophage
14. Chlorophyll pigment in green sulphur bacteria
 - a. bacteriochlorophyll **b. bacterioviridin**
 - c. phycocyanin d. phycoerythrin
15. Cell which keeps changing it's shape is called
 - a. Spirilla **b. Pleomorphic**
 - c. Symbiont d. Gram negative
16. The germ theory of disease was proposed by
 - a. Ehrenberg **b. Pasteur**
 - c. Leeuwenhock d. Hooke
17. The term bacterium was first used by ..
 - a. Stanley b. Pasteur
 - c. Hooke **d. Ehrenberg**
18. Bacteria with flagella at both poles of the cell
 - a. Monotrichous b. Lophotrichous
 - c. Amphitrichous** d. Atrichous
19. An example of a chemoautotrophic bacteria is ..
 - a. Chlorobium b. Escherichia
 - c. Rhizobium **d. Nitrosomonas**
20. Not evolved during bacterial photosynthesis.
 - a. Oxygen** b. Carbon dioxide
 - c. Hydrogen d. H₂S
21. Vinegar is got by the activity of
 - a. Lactobacillus b. Clostridium
 - c. Acetobactor** d. Streptococcus
22. Study of Fungi
 - a. phycology b. plant pathology
 - c. systematics **d. mycology**
23. Fungal cell wall
 - a. chitin** b. cellulose
 - c. pectin d. peptidoglycan
24. Class Zygomycotina includes
 - a. bread moulds** b. mushroom
 - c. agaricus d. yeast
25. is called hallucinogenic fungus.
 - a. Aspergillus **b. Claviceps**
 - c. Agaricus d. Penicillium
26. plays a role in biochemical genetics.
 - a. Volvariella **b. Neurospora**
 - c. Agaricus d. Penicillium
27. Phycology is the study
 - a. plants b. virus
 - c. Algae** d. bacteria

PLANT MORPHOLOGY

1. The type of phyllotaxy found in Calotropis is
 - a. alternate **b. opposite decussate**
 - c. opposite superposed d. ternate
2. Respiratory roots are seen in
 - a. Carrot b. Radish
 - c. Beet root **d. Avicennia**
3. Type of root in turmeric is
 - a. Tuberous b. Fasciculated
 - c. Nodulose** d. Storage
4. Example of parasitic root.
 - a. Tinospora b. Vanda
 - c. Maize **d. Cuscuta**
5. is not a subaerial modification of stem.
 - a. Phyllode** b. Runner
 - c. Stolon d. Offset
6. In Lathyrus . is modified into tendril.
 - a. leaf tip **b. entire leaf**
 - c. stipule d. petiole
7. Spike is a type of
 - a. Racemose inflorescence**
 - b. Cymose inflorescence
 - c. Mixed inflorescence
 - d. Special inflorescence
8. Dorstenia an example for
 - a. raceme b. panicle
 - c. spadix **d. coenanthium**
9. This is a homogamous head with ray florets
 - a. Vernonia b. Tridax
 - c. Launaea** d. Helianthus
10. Musa in an example for
 - a. spadix b. mixed spadix
 - c. compound spadix** d. none of the a
11. Flowers are unisexual in
 - a. cyathium** b. thyrus
 - c. verticillaster d. cyme
12. Scape is seen in
 - a. lotus b. vernonia
 - c. crotalaria d. sunflower
13. Not seen in Racemose inflorescence
 - a. unlimited growth **b. centrifugal**
 - c. acropetal succession d. pedicels
14. Compound head inflorescence is seen in ..
 - a. Tridax b. Launaea
 - c. Lagasca** d. Onion
15. Type of mixed inflorescence.
 - a. Spike b. Umbel
 - c. Thyrsus** d. Cyathium
16. Conspicuous characteristic structure of angiosperm
 - a. Flower** b. Seeds
 - c. Fruits d. leaves
17. No. of whorls present in a bisexual flower is
 - a. One b. Three
 - c. Two **d. Four**
18. A flower is said to be complete when it has
 - a. One whorl b. Three whorls
 - c. Two whorls **d. Four Whorls**
19. Timorous Flowers are common among
 - a. Dicots b. Xerophytes
 - c. Monocots** d. Gymnosperms
20. In deciduous type of calyx, the sepals fall off
 - a. As soon as flower opens**
 - b. After fertilization
 - c. In the bud condition d. All the above
21. When anthers have two chambers, they are
 - a. Dioecious **b. Dithecous**
 - c. Diadelphous d. Dimorphic
22. Gynoecium with united carpels is termed as
 - a. Apocarpous b. Multicarpellary
 - c. Syncarpous** d. None of the above.
23. Type of placentation seen in cucumber is
 - a. Basal **b. Parietal**
 - c. Axile d. Marginal
24. Seeds are produced from the
 - a. Ovary b. Carpels
 - c. Ovules** d. Locules
25. Seedless Grapes are the
 - a. Simple Dry fruits b. Multiple fruits
 - c. Aggregate fruits **d. Parthenocarpic Fruits**
26. Edible portion in berry
 - a. Epicarp b. Endocarp
 - c. Mesocarp **d. All the above**
27. Coconut belongs to
 - a. Drupe** b. Syconus
 - c. Baccate d. Aggregate

28. Type of fruit seen in Jack is
 a. Multiple fruit b. Syconus
 c. **Sorosis** d. Aggregate
29. Androphore is seen in
 a. Capparis b. **Passiflora**
 c. Onion d. Calotropis

GENETICS

1. Moist vapour theory was given by
 a. Aristotle b. **Pythagoras**
 c. Delepatius d. Darwin
2. Blending theory replaced by particulate theory of
 a. Kolreuter b. Gaertner
 c. **Mendel** d. Darwin
3. Grand children may exhibit a feature of an earlier generation not seen in parents.
 a. Homunculus b. Pangenesis
 c. **Atavism** d. Blending
4. Fluid theory was proposed by
 a. Pythagoras b. **Aristotle**
 c. Maupertius d. Mendel
5. The village where Mendel was born is
 a. Heizendorfs b. **Silisian**
 c. Brunn d. Austria
6. Sex has no influence on inheritance is proved by
 a. Back cross b. Test cross
 c. **Reciprocal cross** d. Monohybrid cross
7. Recessive state for seed coat colour is
 a. Green b. Grey
 c. Yellow d. **White**
8. Smallest unit of gene which codes for amino acid
 a. Cistron b. Muton
 c. Recon d. **Codon**
9. Functional unit of a gene which can synthesize one polypeptide is called
 a. Codon b. **Cistron**
 c. Muton d. Recon
10. Gene present at specific position on chromosome
 a. **Locus** b. Nucleotide
 c. Nucleoside d. Allele
11. Chromosomal basis of inheritance was given by
 a. Schleiden & Schwann b. **Sutton & Boveri**
 c. Singer & Nicholson d. Morgan & Bridges
12. Incomplete dominance is also called

- a. Intermediate inheritance b. Blending inheritance
 c. Partial dominance d. **All the above**
13. Intermediate inheritance Phenomenon observed in
 a. Lathyrus b. **Antirrhinum**
 c. Cucurbita d. Maize
14. Phenotypic ratio of incomplete dominance is
 a. **1:2:1** b. 3:1
 c. 9:3:3:1 d. 1:1
15. Inheritance of flower colour in Lathyrus was studied by
 a. Morgan & Bridges b. **Bateson & Punnett**
 c. Sutton & Boveri d. Schleiden & Schwann
16. Inheritance of fruit colour in Cucurbita pepo ratio
 a. 13:3 b. **12:3:1**
 c. 9:7 d. 9:3:4
17. A ratio of 15:1 is observed in
 a. Sweet pea b. Cucurbita pepo
 c. **Rice** d. Sorghum

PLANT PHYSIOLOGY

1. Protoplasm considered as polyphase colloid
 a. Altmann b. Hemming
 c. Wilson Fisher d. **Butschli**
2. Movement of water into and out of cells is controlled by
 a. **Water potential** b. Endosmosis
 c. Exosmosis d. Plasmolysis
3. Flow of matter from a region of higher concentration to a region of lower concentration
 a. Imbibition b. Osmosis
 c. **Diffusion** d. Plasmolysis
4. The principle used in pickling is
 a. Imbibition b. Endosmosis
 c. **Plasmolysis** d. None of the above
5. Turgor pressure or hydrostatic pressure developed inside cell on cell wall is due to
 a. **Endosmosis** b. Exosmosis
 c. Osmosis d. Plasmolysis
6. The matric potential is denoted as
 a. ψ_m b. ψ_s
 c. ψ_p d. ψ_w
7. Organelle connected with cell secretion in plants
 a. **Golgi body** b. Dictyosome
 c. Chloroplast d. Mitochondria

8. Type of water readily absorbed by root hairs
 a. Rain water b. Gravitational water
 c. Hygroscopic water **d. Capillary water.**
9. Large amount of transpirational water loss occurs through
- a. cuticle b. hydathode
 c. lenticel **d. stomata**
10. Cell wall absorbs water by
- a. Osmosis **b. Imbibition**
 c. Diffusion d. Plasmolysis
11. During the day the guard cells experience
- a. exosmosis **b. endosmosis**
 c. fall in turgor d. loss of water
12. Starch sugar interconversion theory was given by
- a. Steward **b. Scarth**
 c. Levitt d. Raschke
13. The relay pump theory was put forward by
- a. Godlewski** b. J.C.Bose
 c. Stocking d. Dixon.
14. J.C. Bose gave the
- a. relay pump theory b. root pressure theory
c. pulsation theory d. cohesion tension theory.
15. Lignin and cellulose have affinity for water.
- a. adhesion b. cohesion
 c. root pressure **d. none of the above**
16. Transpiration pull theory was supported by
- a. Renner b. Curtis
 c. Clark **d. All the above**
17. Hydroponics is otherwise called
- a soilless agriculture b tank farming
 c chemical gardening **d all the above**
18. This element is a constituent of chlorophyll
- a Manganese **b Magnesium**
 c Potassium d Zinc
19. Passive absorption of mineral salts theory
- a. Ion exchange** b. Carrier Concept
 c. Cytochrome pump d. None of the above
20. Contact exchange theory was put forward by :
- a. Jenny and Overstreet** b. Hylmo and Kramer
 c. Bennet and Clark d. De Vries and Curtis
- REPRODUCTION BIOLOGY**
1. In hibiscus vegetative reproduction takes place by
- a. Stem** b. Bud
 c. Rhizome d. Leaf.
2. Plant which propagate with the help of its leaves
- a. Onion b. Cactus
 c. Potato **d. Bryophyllum**
3. Adventitious buds develop on the roots of
- a. carrot b. Onion
c. Guava d. Yam
4. Offset is known as
- a. Runner **b. Condensed runner**
 c. Bulbil d. Turion
5. Special type of fleshy buds that develop in aquatic plants are called
- a. Bulbils b. Tunicate Buds
 c. Scaly bulbs **d. Turions**
6. Fragment flowers with welldeveloped nectaries are an adaptation for
- a. Zoophily **b. Entomophily**
 c. anemophily d. Hydrophily
7. Hydrophily occurs
- a. Vallisneria **b. Ceratophyllum**
 c. Hydrilla d. All the above
8. Myrmecophily is a beneficial association between some flowering plants and
- . Bats b. Birds
c. Ants d. Bees
9. Pollination by bat is called
- . Autogamy **b. Chiropterophily**
 c. Homogamy d. Dichogamy
10. If pollen and stigma at different time it is called
- . Autogamy b. Cleistogamy
 c. Homogamy **d. Dichogamy**
11. Flowers are pollinated by birds in
- . Yucca **b. Bombax**
 c. Mango d. Litchi
12. Plants in which pollination takes place inside the bud is
- a. Rice** b. Oxalis
 c. Papaya d. Bajra
13. Cross pollination is known as
- a. Dichogmay b. Protogamy
 c. Protandry **d. Xenogamy**
14. Embryo sac in typical dicot during fertilization

- a. 8 celled
c. 7 celled
15. Process of fusion between male and egg nuclei
a. Syngamy
- c. Double fertilization d. Triple fusion
16. Micropyle occurs in
a. Ovary b. Seeds
c. Ovule **d. Both a. and c.**
17. The Micropyle in a seed helps in the entry of
a. Water b. Male gamete
c. Pollen tube d. None of these
18. Single cotyledon of a monocot seed is
a. Plumule b. Epicotyl
c. Scutellum d. Coleorrhiza
19. Hypogeal germination of albuminous seed is in
a. Maize b. Castor
c. Gram d. Bean
20. Vivipary is a characteristic feature of
a. Mesophytes **b. Halophytes**
c. Xerophytes d. Hydrophytes.
21. Germination of the seed is promoted by
a. Green light b. Red light
c. Blue light **d. Infra red light**
22. Which generally increases during senescence?
a. Protein b. Chlorophyll
c. Photosynthesis **d. None of these**
23. Senescence of detached leaves can be delayed by
a. Auxin b. Gibberellin
c. Cytokinin d. Ethylene
24. Yellowing and shedding of leaves in autumn
a. Over all senescence **b. Deciduous senescence**
c. Top senescence d. Progressive Senescence

ENVIRONMENTAL BIOLOGY

1. Finely dissected leaves are common in
a. Submerged plants b. amphibious plants
c. Free floating plants d. Rooted floating plants
2. Root pockets are present instead of root caps in
a. Utricularia **b. Eichhornia**
c. Hydrilla d. Limnophylla
3. Deforestation may reduce the chances of
a. Rainfall b. Landslides
c. Soil erosion d. Frequent cyclones

4. Soil erosion can be checked by
a. Wind screen alone b. Restricted human activity
c. Checking movement of animals
d. Good plant cover
5. Common sources of energy in Indian villages is
a. Electricity b. Sun
c. Coal **d. Wood, animal dung**
6. Which of the following is non renewable?
a. Water **b. Coal**
c. Forests d. Wild life

CREATED USING FILL UPS & MATCH

BIO-DIVERSITY

1. Father of Ayurveda.
Charaka
2. First attempt to classify organisms.
Aristotle and Theophrastus
3. First artificial system of classification
Pliny the Elder
4. Pliny book,
'Historia Naturalis'.
5. Binomial System of Nomenclature.
Carolus Linnaeus
6. Species Plantarum
Carolus Linnaeus
7. Five kingdom System
Whittaker
8. Fossil records
Phylogenetic studies
9. mostly predatory.
Zooplanktons
10. Cuscuta is a
parasite.
11. Insectivorous plants
Nepenthes and Drosera
12. Study of virus
virology.
13. Virus that infects bacteria
bacteriophage
14. Integrated phage nucleic acid is
prophage.
15. Bacterium that carries prophage within genome
Lysogenic bacterium.
16. Disease caused by Banana bunchy top virus.
Bunchy top of banana
17. HIV belongs to
retroviruses.

18. Used to increase life span of AIDS patients
Azidothymidine
19. Severe Acute Respiratory Syndrome (SARS) is a **respiratory disease.**
20. Prions are unique because **they contain no genetic materials.(DNA/ RNA)**
21. Important components of viruses
Nucleic acid and Protein coat
22. All fungal viruses have **ds.RNA.**
23. Viruses that cause diseases in fungi
Mycophage
24. SARS is a **Corona virus**
25. Bacteria requiring CO₂ for growth .
Capnophilic
26. Algae are autotrophic organisms as they have **chlorophyll.**
27. Most algae have filamentous thallus. Eg:
Spirogyra.
28. Organs of locomotion in alga
Flagella or cilia
29. Increase soil fertility by fixing nitrogen.
Blue green algae
30. Species attached to the bottom of shallow water
Benthic
31. Species live on another plant or another alga
Epiphyte
32. Growing attached to rocks
Lithophyte
33. Red colour pigment found in algae.
Phycocerythrin
34. Blue colour pigment found in algae.
Phycocyanin
35. Lack motile cells.
Red algae and Blue green
36. Blue green algae
Cyanophage
37. Alkaloid obtained from Ephedra, is used in curing asthma and respiratory problems.
Ephedrine
38. Algae having filamentous thallus
Spirogyra
39. Simplest group of land plants.
Bryophyta
40. Psilotum, Lycopodium, Selaginella, Isoetes, Equisetum etc are examples of

microphyllous pteridophytes

41. Nephrolepis, Ophioglossum, Osmunda, Pteris, Adiantum, Marsilea, Azolla, Salvinia are **ferns**
42. Most successful and advanced land plants are **spermatophytes (sperma – seed).**
43. Primitive group of seed bearing plants
Gymnosperms (Spermatophytes).
44. In Gymnosperms pollination is mostly by **wind (anemophilous).**
45. Cell movement response to chemical signals
Chemotaxis
46. Storage products of fungi
glycogen and oil.
47. Evolution of seed habit is associated with
Heterophory
48. Dominant phase changed from Gametophyte to Sporophyte as in all
Pteridophytes, Gymnosperm and Angiosperms
49. All seed plants are
Heterosporous
50. Most extreme reduction of gametophyte is in
Angiosperms
51. Equivalent structure to a mega sporangium
Ovule
52. Equivalent structure to a microsporangium,
Pollen sac

CELL BIOLOGY

1. Structural and functional unit of living organisms
Cell
2. Studied structure of bacteria, protozoa etc.
Anton van Leewenhoek
3. coined the word cell for the first time.
Robert Hooke
4. Cell theory was again rewritten
Rudolf Virchow
5. Discovered presence of nucleus in cells.
Robert Brown
6. Protoplasm coined
Prukinje
7. Plastids is in
Plant cell
8. Plastids are absent in
Animal cells
9. All plants are made up of cells proposed by
Schleiden
10. All animals are also composed of cells proposed

- Theodor Schwann in 1839.**
11. Without nuclei.
RBC and sieve tube cells
 12. Incipient nucleus known as
nucleoid.
 13. Extra chromosomal DNA found in E.Coli.
Plasmid
 14. SEM has a lower resolving power than
TEM.
 15. Gives definite shape to the cell.
Cell wall
 16. All the biological (Plasma) membranes are
Selectively permeable
 17. Discovered microbial world by Microscope.
Anton Van Leeuwenhoek
 18. The decrease value of D, the better will be
resolution.
 19. Resolution of a microscope lens is equivalent to
Resolution power .
 20. Compound microscope uses Optical lenses to
magnify the objects.
 21. Fluid mosaic model was proposed by
Singer and Nicholson
 22. DNA is organized into linear structures called
chromosomes
 23. Ribosomes that exist in groups are called
Polysomes or. Polyribosomes
 24. Responsible for Protein in a cell
Endoplasmic reticulum
 25. Carrier molecules In the plasma membrane
permeases or translocases present.
 26. Passive transport of molecules takes place
Along the concentration gradient
 27. sites of photosynthesis.
Chloroplasts
 28. form about 75% of the plant cell.
Vacuoles
 29. Ribosomes are found in all cells except in
mature sperm cells and RBCs.
 30. Microbodies are spherical organelles bound by a
single membrane.
 31. Largest organelle in eukaryotic cells.
Nucleus
 32. Physical basis of heredity.
Chromosomes
 33. Chemical basis of heredity.
Genes

34. Power house of the cell.
Mitochondria
 35. Site of protein synthesis.
Ribosomes
 36. A string of ribosomes
polysome.
 37. 3 kinds of Cell division in living things
1. Amitosis, 2. Mitosis, 3. Meiosis.
 38. 4 substages Mitosis
Prophase, Metaphase, Anaphase, Telophase.
 39. Helps in regeneration of lost or damaged tissue
Mitosis
 40. known as reduction division.
Meiosis
 41. Meiosis takes place only in
Reproductive cells.
 42. Heterotypic division is a
Meiosis- I division.
 43. Homotypic division is a
Meiosis - II division.
 44. Homologous chromosomes coming together
pairing or synapsis.
 45. Crossing over takes place in
Pachytene.
- PLANT MORPHOLOGY**
1. Branch of biology that deals with form, size and structure of various organs of living organisms.
Morphology
 2. Flowering plants are otherwise known as
Angiosperms.
 3. Has a stem, a system of branches and leaves.
shoot system
 4. Root, stem and leaves together constitute
vegetative organs
 5. Flowering plants on attaining maturity produce flowers, fruits and seeds. These are called
reproductive organs
 6. Do not have nodes and internodes.
Roots
 7. Taproot system develops from
radicle of the embryo.
 8. Breathing roots are called
pneumatophores.
 9. Breathing pores are called
pneumatodes.
 10. Epiphytic roots are adventitious roots found in
orchids.

11. Special sponge like tissue in the aerial roots.

Velamen

12. Has photosynthetic roots or assimilatory roots.

Tinospora

13. Cuscuta has parasitic roots called

haustoria.

14. Grows into the stem which forms the main axis of the plant.

Plumule of the embryo

15. Phylloclade is found in

Opuntia.

16. Asparagus possess

cladode.

17. Sucker is a modified

runner.

18. Three leaflets become stiff, claw like hooks in

Bignonia unguiscati

19. Tuberous roots which have no definite shape in

Sweet potato

20. A special leaf at whose axil the flower develops

Bract

21. Thalamus is otherwise called

Receptacle or. torus

22. Flower having uniform number of all floral parts

Homomerous

23. Microsporangia are otherwise called

Pollen sac

24. After fertilization, the ovary becomes

Fruit

25. Characteristic fruit of Fabaceae Family.

Legume

26. Edible part of the Jack fruit is

Perianth

27. Horizontal, thick, stout underground stem.

Rhizome

28. Small depressions on potato are called the

eye of the potato.

29. Green, thin flattened lateral outgrowths of stem.

Leaves

30. Borne at the nodes of the stem.

Leaves

31. Chief organs of photosynthesis.

Leaves

32. Lateral appendages of the leaf.

Stipules

33. Leaf blade is also known as

lamina.

34. Arrangement of veins in the leaf blade or lamina.

Venation

35. Pinnately type in Moringa

Tripinnate

36. Palmately type in lemon

Unifoliate

37. Leaf modification type in acasia

Phyllode

38. Bladder leaf modification

Utricularia

39. Anthers united, filaments free

Syngenesious

40. Stamens attached to petals

Epipetalous

41. Basal Placentation

Asteraceae

42. Caryopsis

Paddy

43. Unfertilized Ovary

Parthenocarpic Fruit

44. Ovary Wall

Pericarp

45. Fertilized Ovary

True Fruit

46. Apocarpous Ovary

Aggregate fruit

GENETICS

1. Deals with mechanisms responsible for inheritance similarities -differences in a species.

Genetics

2. Occurrence of extra fingers or toes.

Polydactyly

3. Observed human sperms for the first time.

Anton von Leewenhoek

4. Propounded Particulate theory.

Maupertius

5. proposed Pangenesis Theory.

Aristotle

6. Deals with mixture of characters of both parents.

Blending Theory

7. Group of ramets is called a

clone.

8. 'Father of Genetics'.

Mendel

9. Mendel started his famous experiments on

Garden peaplant (Pisum sativum).

10. The phenotypic ratio of Dihybrid cross is

9 : 3 : 3 : 1.

11. Monohybrid Test cross ratio is

1 : 1.

12. Dihybrid Test cross ratio is

1 : 1 : 1 : 1.

13. Introduced the gene concept.

Sutton

14. Smallest portion of gene undergo crossing over.

Recon

15. Incomplete dominance was observed by

Correns in *Mirabilis jalapa*.

16. Suppression of gene on one locus of a chromosome by the gene present at some other locus.

Epistasis

17. Dominant Epistasis was observed in

***Cucurbita pepo*.**

18. Dominant Epistasis ratio is

12 : 3 : 1.

19. Recessive epistasis ratio is

9 : 3 : 4.

20. Dominant recessive epistasis ratio is

13 : 3.

PLANT PHYSIOLOGY

1. Provides shape and rigidity to the cell.

Cell wall

2. Principal seat of metabolic events.

Cell

3. Most important among cell organelles

chloroplast

4. Source of food for life on earth.

Photosynthesis

5. Cell Organelle involved in cellular respiration

mitochondrion.

6. During respiration, energy releases in the form of

A.T.P. (Adenosine Tri Phosphate).

7. Proteins Synthesis and transport is carried out by

Ribosomes and endoplasmic reticulum.

8. Referred as the *dictyosome* in plants.

Golgi bodies

9. Living component of the plant cell.

Protoplasm

10. Physical and chemical basis of life.

Protoplasm

11. Absorption of water occurs in plants through

roots.

12. Special type of diffusion of liquids.

Osmosis

13. Helps to understand the living nature of a cell.

Plasmolysis

14. Pressure exerted by diffusing particles is called **diffusion pressure.**

15. Particles of colloid carry

a uniform electric charge.

16. Cohesion - Tension theory was put forward by

Dixon and Joly.

17. Mutual attraction between water molecules.

Cohesion

18. Openings on epidermis of leaves and stems.

Stomata

19. Modified epidermal cell showing a prominent nucleus, cytoplasm and plastids.

Guard cell

20. Causes opening of stomata.

Accumulation of Potassium Chloride

21. Stimulates closure of stomata.

Abscissic acid (ABA)

22. Major elements are called

macronutrients.

23. Trace elements are called

micronutrients.

24. Constituent of chlorophyll molecule.

Magnesium

25. require Boron for uptake and utilisation of Ca⁺⁺

Leaves and seeds

26. causes brown heart-rot disease in beetroots.

Boron deficiency

27. Manganese deficiency causes greyspot disease in **oat.**

28. Copper deficiency causes die back of shoots in

citrus

29. Sulphur containing amino acids is

Cystine and cysteine

30. Occurs between male gamete & Secondary nucleus

Triple fusion

31. causes whiptail disease in cauliflowers

Molybdenum deficiency

32. Yellow spot disease of citrus.

Molybdenum deficiency

33. H.Lundegardh proposed

Cytochrome Pump Theory.

34. Soluble food materials in phloem show mass flow.

Munch Theory

35. Causes cycling of ammonia from amino acids, purines and pyrimidines.

Death and decay of organic systems

36. Maintain constant amount of nitrogen in atmosphere, by physical and biological processes

Nitrogen cycle.

37. Blue-green algae like Nostoc establish symbiotic relationships in the coralloid roots of

Cycas..

38. The nitrifying bacteria are .

Nitrosomonas and Nitrobacteria

39. Smmonifying bacteria

Bacillus ramosus

40. Yeast which fix nitrogen.

Rhodotorula

41. Bacterium in symbiotic nitrogen fixation

Rhizobium

42. Translocation of Carbohydrate

Boron

43. Stomatal Movements

Potassium

44. Infects roots of leguminous plants and forms the root nodules.

Rhizobium**REPRODUCTION BIOLOGY**

1. Angiosperms propagate by producing seeds, which is the result of **sexual reproduction.**

2. Modified stems perform 3 distinct functions -

1. Perennation,**2. Vegetative Propagation,****3. Storage of food.**

3. The various types of underground stems are

1. Rhizome, 2. Tuber,**3. Bulb, 4. Corm.**

4. More or less a condensed form of rhizome.

Corm

5. Offsets are known as

condensed runners.

6. Ability to reproduce by leaves.

Bryophyllum

7. Potato tuber can form a new plant if it has

Buds or. Eye spot

8. Micropropagation is done in

Potato, Bananas and Begonias.

9. Transfer and deposition of pollen grains from another to stigmatic surface of the flower **pollination.**

10. Cross pollination is also called

Xenogamy or Allogamy.

11. Herkogamy is found in

Hibiscus.

12. Protogamy is seen in

Bajra

13. Protandry is seen in

Maize.

14. Heterostyly is found in

Linum.

15. A single flower of Cannabis produces

5,00,000 pollen grains.

16. Hydrophily occurs only in

aquatic plants.

17. Pollen sacs are called

pollen baskets.

18. flowers are protandrous in

Salvia

19. Mode of pollination performed by birds.

Ornithophily

20. Mode of pollination performed by bats.

Chiropterophily

21. Fusion of the male and female gametes is called **fertilization.**

22. Fertilization process was first discovered by

Strasburger in Monotropa.

23. Process of gametic fusion.

Syngamy

24. Triple fusion is also called

Vegetative fertilization.

25. Double fertilization is universal occurrence among

angiosperms.

26. Ripened ovule with embryo or mini plant body

Seed

27. Outer coat of seed is called

Testa

28. Every seed has an outer covering called

seed coat.

29. Cotyledons remain below soil due to rapid elongation of epicotyl.

In hypogeal germination

30. Germination of seeds inside fruit itself

vivipary

31. Vivipary occurs in **mangrove plant.**
32. Essential for aerobic respiration to release energy for the metabolic activities.
Oxygen
33. Abscission is controlled by **Abscisic Acid (ABA).**
34. Delays ageing of plant organs.
Cytokinins
35. Leaf fall starts, when the amount of RNA, Starch, Amino acids or. Chlorophyll **decreases.**
36. Recognized 4 types of senescence patterns.
Leopold
37. Apparent in evergreen plants (Eucalyptus, Pinus)
Sequential senescence
38. Shed leaves in autumn and develop new leaves **synchronous.**

ENVIRONMENTAL BIOLOGY

1. Ecology was first introduced by **Reiter.**
2. Factor of great physiological importance.
Light
3. Photoperiod is an important factor in **flowering of plants.**
4. Protoplasm of a cell contains **80-90% of water.**
5. Plants of aquatic habitats (growing in water) **hydrophytes.**
6. Essential for growth of root and micro-organisms.
Soil air
7. Contact is close and permanent and obligatory.
mutualism
8. Examples for mutualism
Lichens
9. Common in moist tropical climate dense forests
Lianes
10. Plants growing perched on other plants.
Epiphytes
11. Green algae grow on the long, grooved hairs of **sloth.**
12. Rafflesia is found on roots of **vitis.**
13. Classified the plants into three ecological groups on the basis of water requirement.
Warming
14. three ecological groups

- 1. Hydrophytes, 2. Xerophytes, 3. Mesophytes.**
15. Hydrophytes are grouped into **four categories.**
16. Eichhornia, Pistia, Lemna are the examples for **free floating hydrophytes.**
17. Victoria regia, Nymphaea, Nelumbium and Marsilea are the examples for **'Floating but rooted hydrophytes'.**
18. Examples for Submerged hydrophytes (floating).
Ceratophyllum and Utricularia
19. Examples for Submerged hydrophytes (Rooted).
Hydrilla, Vallisneria, Potamogeton
20. Grow in shallow waters adapted to both aquatic and terrestrial
Amphibious hydrophytes
21. Eg for Amphibious hydrophytes modes of life
Sagittaria, Typha.
22. In Jussiaea repens two types of roots develop
Normal and floating roots.
23. In Nymphaea and Nelumbium the stem is **rhizome.**
24. Give mechanical support to the plants.
Asterosclereids
25. Drought resisting plants are **true xerophytes.**
26. Casuarina, Nerium are **xerophytes**
27. Light is necessary for plants to do
Photosynthesis
28. Soil provides water and
Minerals Salts and Anchorages to plants
29. Common land plants, which grow in situations that are neither too wet nor too dry.
Mesophytes
30. Lives in nature and depends on nature.
Man
31. Used in Biogas plant to produce odourless gas.
Cattle dung
32. Forest Research Institute is situated at
Dehradun.
33. Main source for rivers, lakes and underground water.
Rainwater
34. Understanding importance of rainwater and using in all the catchment areas without wasting.
Rainwater Harvest

2 AND 3 MARK Q & A

BIODIVERSITY

1. Define: Biodiversity.

- living organisms found in the earth differ in their structure, habit, habitat, mode of nutrition and physiology.
- This is called biodiversity.

2. What are the aims of classification?

- Grouping organisms in a convenient way makes it easy to study their characters.
- Classification helps to understand diversity in a better way.

3. Define: Taxonomy.

Branch of biology that deals with

- Identification and nomenclature of living organisms
- Classification on basis of similarities and differences.

4. Define: species.

Group of individuals which

- resemble in morphological and reproductive characters
- interbreed among themselves and produce fertile offsprings.

5. Write the hierarchy of units of classification

1. Kingdom
2. Phylum or Division
3. Class
4. Order
5. Family
6. Genus
7. Species

6. Define : phylogeny.

Evolutionary history of particular taxon like species

7. What is meant by phylogenetic classification?

Classification based on the basis of evolution

8. Why is phylogenetic classification n't possible

- There are several gaps in the fossil records
- Evolution is never unidirectional.

9. What is artificial system of classification?

- It is based on few characters of organisms
- It has lot of demerits.

10. What are Archaeobacteria?

Monerans like Archaeobacteria can live in

Extreme environmental conditions like

- absence of oxygen (anaerobic),
- high salt condition,
- high temperature above 80°C
- highly acidic soils

11. Name three domains proposed by C.Woese, O.Kandler and M.C.Wheelis.

Eucarya (All eukaryotes)

Bacteria (Familiar prokaryotes)

Archaea (prokaryotes in extreme environments)

12. Define: Systematics.

- Systematic placing of organisms into groups or taxa
- on certain relationships basis.

13. Justify: Viruses are biologists' puzzle.

They show both living and non-living characters.

14. Define: Virus.

Ultramicroscopic, disease causing intra-cellular, obligate parasites.

15. List any two living characteristics of virus.

1. Ability to multiply inside host cell.
2. Ability to cause diseases.

16. List any two non-living characteristics of virus.

1. They don't show metabolic activity
2. They can be crystallized

17. Viruses undergo mutation

What does this signify?

Living characteristics

18. Viruses can be crystallized.

What does this signify

Non living characteristics

19. What are the three main symmetry of viruses?

Cubic symmetry: polyhedral or spherical

eg. Adeno virus, HIV

Helical symmetry:

eg. TMV, Influenza virus.

Complex or atypical

eg. Bacteriophage, Pox virus.

20. What is the principle used in sedimentation by ultra centrifugation method of measuring size of a virus?

- Relation between size and shape of particle
- Its rate of sedimentation

21. What are enveloped viruses?

- Some viruses have outer covering called envelope.
- They are called enveloped viruses.
eg. HIV

22. Define : Nucleocapsid.

- capsid is the outer protein coat.
- capsid is in close contact with nucleic acid
- Hence known as nucleocapsid

23. Name two plant diseases caused by viruses?

- TMV
- Bunchy top of banana

24. Name two human diseases caused by viruses?

- common cold
- AIDS

25. Name two Animal diseases caused by viruses?

- FMD in cattle
- rabies

26. Define: virion

- An intact, infective virus particle
- which is non-replicating outside a host cell

27. Define: Viroids

- Circular molecule of ss RNA without capsid

28. Define: Prions

- Proteinaceous infectious particles

29. What are oncogenic viruses?

- Cancer causing viruses
- E.g Simian virus (SV-40)

30. What are interferons?

- Host coded proteins of cytokine family
- Inhibit viral replication
- Body's 1st defense against viral infection

31. What are commensals?

- Organisms that live in association with others
- They don't cause harm to the host
- They benefit from the host
E.g. E.Coli in human intestine

32. What are Chemoautotrophs?

- Some bacteria can synthesize their food
- They obtain energy as ATP
- by oxidising inorganic or organic compounds
- This energy reduces CO₂ to organic matter
E.g Nitrobacter.

33. What is transduction/ transformation.

- It is form of sexual reproduction in Bacteria
- Donor DNA is carried in a phage coat
- It is transferred into recipient by mechanism.

34. What is transformation.

- It is form of sexual reproduction in Bacteria
- Direct uptake of donor DNA by recipient cell

35. Name four plant diseases caused by bacteria?

- Citrus Canker
- Bacterial blight
- Fire blight
- Soft rot

36. Name human diseases caused by bacteria

- Cholera
- Typhoid
- Tuberculosis

37. Give reason:

Bacteria are also known as nature's scavengers.

- Saprotrophic bacteria cause decay and decomposition of dead bodies of plants and animals
- Release gases and salts to atmosphere and soil
- Hence these bacteria are nature's scavengers.

38. Name some antibiotics obtained from bacteria

- bacitracin
- polymyxin
- Streptomycin

39. What is a coenocytic mycelium?

- Fungi is made up thread like structure *hyphae*
- forming a mass called *mycelium*.
- Hyphae may lack cross walls
- Protoplasm is continuous with many nuclei.
- This is called coenocytic mycelium.

40. What is meant by septate hypha?

- Hyphae are not divided into true cells.
- Protoplasm is continuous or is interrupted at intervals by cross walls called septa.
- These are called septate hypha

41. Distinguish: obligate and facultative parasites

<i>obligate</i>	<i>facultative</i>
grow only in living cells	infect their host and bring about its death
Also called Biotrophs	Also called necrotrophs
Possess Haustoria	Rarely has Haustoria
Survive on live cell	live saprotrophically

42. Name some fungal diseases of plants.

- Wilt cotton
- Tikka (Leaf spot) ground nut
- Red rot sugarcane

43. Name some edible fungi.

- Agaricus Bisporus
- Agaricus arvensis
- Volvariella volvacea
- Volvariella discolor

44. What are haustoria?

- Obligate parasites possess specialised penetration and absorption devices
- It is called haustoria
- It is used to get food from host.

45. Justify the statement by Pasteur:

Without fungi even death will be incomplete.

- Dead cellulosic vegetation decomposed into carbon and minerals by saprotrophic fungi
- These are returned to same environment.
- Without fungi even death will be incomplete.

46. Which fungus is hallucinogenic fungus. why?

- *Claviceps purpurea*
- LSD is produced from fungus ergot,
- produces hallucinations.

47. Define: thallus

- Algae body shows no differentiation into root, stem, leaf
- They do not have vascular tissues.
- Such a plant body is called thallus.

48. What is a Lichen?

- Algae - fungi Symbiotic association
- Algae produce food by photosynthesis
- Fungi absorb water and minerals

49. Name photosynthetic pigments in algae?

- a) Chlorophylls
- b) Carotenoids
- c) Biliproteins

50. Differentiate: Whiplash and tinsel flagellum.

Whiplash Flagellum : It has a smooth surface.

Tinsel Flagellum : It has fine minute hairs along the axis.

51. What are pyrenoids?

- Few spherical bodies called pyrenoids are present in each algae chloroplast

- They are centres of starch formation.

52. Differentiate isokont & heterokont flagella**Isokont**

Both flagella are equal length and appearance

Heterokont

Dissimilar flagella with reference to length

53. Define : Isogamy

- Fusion of two morphologically and physiologically similar gametes.

Eg: Spirogyra.

54. Define : Heterogamy.

- Fusion of dissimilar gametes
- Types : 1) Anisogamy
2) Oogamy.

55. Define : Anisogamy

- Fusion of two morphologically dissimilar
- but physiologically similar gametes

56. Define : Oogamy

- Fusion morphologically and physiologically dissimilar gametes

57. What is agar-agar?

- Culture medium while growing bacteria and fungi in the laboratory.
- Obtained from red algae (*Gelidium* and *Gracillaria*)

58. What is diatomite?

- Rock-like deposit formed on silicon walls of diatoms (algae of Chrysophyceae).
- When they die, they sediment
- form extensive deposits on the seabed
- Resulting is 'diatomaceous earth'
- It is rich in silica

59. Write any two uses of diatomite.

- as a fire proof material
- as an absorbent.

60. How are the algae used in space travel?

- *Chlorella pyrenoidosa* is used in space travel
- It multiplies rapidly and utilizes CO₂
- It liberate O₂ during photosynthesis.
- It decomposes human urine and faeces to get N₂ for protein synthesis.

61. What is SCP?

- SCP - Single cell protein

- Rich protein and amino acid content of chlorella and Spirulina is used for single cell protein production.
- 62. How are algae used in sewage disposal?**
- Chlorella are grown in sewage tanks.
 - It produce O₂ by rapid photosynthesis.
 - Aerobic bacteria use these oxygen
 - Decompose organic matter
 - Thus the sewage gets purified.
- 63. What is algal bloom. How does it affect lakes?**
- *Algae blooms* is dense mass material
 - Formed due to high nutrient availability, by sewage fertilizers
 - Sudden explosive growth algae deplete water of oxygen.
 - Th leads to death of aquatic life.
 - Increase of nutrients which starts off the entire process is called *eutrophication*
- 64. Algae are not associated with diseases unlike many fungi and bacteria. Why?**
- Algae are autotrophs
 - They prepare their own food
 - Don't live as parasite and cause diseases
- 65. Bryophytes are amphibians of plant kingdom. Why?**
- Terrestrial non-vascular plants
 - Require moist environment to complete their life-cycle.
 - Hence these are called amphibians of plant kingdom.
- 66. Name the three main classes of Bryophyta.**
- Hepaticae
 - Anthocerotae
 - Musci
- 67. What is peat?**
- Valuable fuel like coal
 - Mosses like Sphagnum got compacted and fossilized over past thousands of years have become peat.
- 68. How is Sphagnum used in nursery?**
- Sphagum absorbs large amount of water.
 - It is used by gardeners to keep and cut plant parts moist during propagation
- 69. What is meant by Tracheophyta?**
- Division includes plants with vascular tissues
- i.e., xylem and phloem.
- Includes Pteridophytes & Spermatophytes
- 70. Justify: vascular tissue of pteridophyte is primitive compared with flowering plants.**
- Pteridophytes xylem contains only tracheids rather than vessels
 - Phloem contains sieve cells rather than sieve tubes
 - Sovascular tissue of Pteridophyte is primitive compared with flowering plants
- 71. What are the functions of vascular tissue?**
- It forms a transport system
 - Conducting water and food around the multicellular body
 - leading to development of complex bodies.
 - Xylem supports these large bodies
 - It contains lignified cells of great strength and rigidity.
- 72. What are the advantages of seed development in Phaenerogams?**
- Seed contains embryo or baby plant
 - It provides nutrition to it.
 - Seeds tide over unfavourable conditions
 - Help in growth of embryo.
- 73. Name any two economically important products of Pteridophytes.**
- Rhizomes of fern *Dryopteris* yield a vermifuge drug.
 - Sporocarps of *Marsilea* used as food by certain tribal people.
- 74. Name the three important developments that have been made by the seed plants.**
- Development of heterospory
 - Development of seed
 - Development of non swimming male gametes
- 75. Define heterospory.**
- All seed bearing plants produce two types of spores - microspores and megaspores.
 - It is called heterospory
- 76. Seed is a complex structure containing cells from three generations. Justify**
- First Generation - Megaspore from parents
 - Second Generation - Fertilized zygotes
 - Third Generation - Haploid endosperm
- 77. Seeds of gymnosperms as naked. Why?**

- Ovules are exposed not covered by ovary.
- Borne directly on open megasporophylls
- Hence they are naked
- Develop into naked seeds after fertilization

78. Name two classes of Gymnospermae.

- Class Cycadophyta
- Class Coniferophyta

CELL BIOLOGY

1. Define : Cell Cycle

- Most eukaryotic cells live according to an internal clock
- They proceed through a sequence of phases, called cell cycle.
- Cell cycle follows regular timing mechanism
- DNA is duplicated during synthesis (S) Phase
- Copies are distributed to daughter cells during mitotic (M) phase.

2. What is meant by cell differentiation?

- When cell changes to carry out a specialized function, it is called differentiation.
- It involves changes in the morphology of a cell based on the function it is to perform.

3. Explain: "form follows function".

- Differentiation process involves changes in the morphology of a cell based on function it is to perform.
- This highlights the biological principle that "form follows function".

4. What is PCD?

- PCD - Programmed Cell Death
- Plays a very important role
- By balancing cell growth and multiplication.
- Eliminates unnecessary cells.

5. Name steps involved in scientific methodology.

- Observation
- Hypothesis
- Formulation of theory
- Modification of theory

6. State cell theory of by Schleiden and Schwann

- All living organisms are made up of minute units, the cells which are the smallest entities that can be called living.
- Function of an organism is the sum total of activities and interaction of constituent cells.

7. Name any two exceptions to cell theory.

- Viruses are biologists' puzzle.
They lack protoplasm, essential part of cell.
- Bacteria and cyanobacteria lack well organized nucleus.

8. What is meant by incipient nucleus?

- Bacterial chromosome is a single circular molecule of naked DNA
- Tightly coiled within the nucleoid
- Lacks a nuclear membrane.
- This is called incipient nucleus.

9. What are the uses of plasmid?

- Antibiotic resistance in some bacteria.
- Used in genetic engineering.

10. Define: Resolving power of a microscope

Capacity to perceive two adjacent parts of image as separate from each other

11. Name important components of plant cell wall.

1. Middle lamella
2. Primary wall
3. Secondary wall.

12. What is middle lamella?

- Thin amorphous cement like isotropic layer between two adjacent cells.
- First layer deposited at the time of cytokinesis.
- Made up of calcium and magnesium pectates.

13. What is meant by growth by intussusception?

- Primary wall grows by addition of more wall material within the existing one.
- Such a growth is termed as intussusception.

14. What are micellae?

- Concept of micellae was put forth by Nageli.
- Cellulose molecules consist of long chains of linked glucose residues.
- Chain molecules are arranged in bundles
- They are generally termed micellae.

15. Name continuous interpenetrating systems in secondary wall.

1. cellulose micro fibrils
2. microcapillary spaces

16. What is a pit membrane?

1. Pits are areas on cell wall on which secondary wall is not laid down.
2. Each pit has pit chamber and a pit membrane.
3. Pit membrane consists of middle lamella and primary wall.
many minute pores and they are permeable

17. What are bordered pits?

- Pits are of two types.
 1. Simple pits
width of pit chamber is uniform
 2. Bordered pits.
secondary wall partly overhangs the pit.
- 18. Define: Symplast.**
 - Cell wall is interrupted by narrow pores with strands of cytoplasm,
 - They are called plasmodesmata.
 - They form protoplasmic continuum-*symplast*
- 19. What is desmotubule?**
 - Plasmodesmata consists of canal, lined by plasma membrane.
 - It has a simple or branched tubule known as desmotubule.
- 20. Define Biological membrane.**
 - Plasma membrane
 - sub-cellular membranes
 - together known as biological membranes.
- 21. What are amphipathic molecules?**
 - They have hydrophilic and hydrophobic part.
 - Lipid bilayer of the cell membrane is formed of a double layer of phospholipid molecules.
- 22. What are extrinsic proteins?**
 - Peripheral proteins are superficially attached to either face of lipid bimolecular membrane
 - Easily removable by physical methods
- 23. What are intrinsic proteins?**
 - Integral proteins penetrate lipid wholly
 - They are tightly held by strong bonds.
 - Removed only by disruption of membrane.
- 24. Define Osmosis**
 - Diffusion of Water or solvent
 - through selectively permeable membrane
 - from high solvent concentration region
 - to low solvent concentration region
- 25. What is the role of osmosis in plants?**
 - Absorption of water from soil by root hairs.
 - Cell to cell movement of water.
 - Osmosis helps to develop turgor pressure
 - It helps in opening and closing of stomata.
- 26. Name any two factors on which permeability of a membrane depends on.**
 - Size of pores in Plasma membrane.
 - Size of the substance molecules
 - Charge on substance molecules
- 27. Define: semi- permeable membrane.**

Membrane allows some substances pass through
Does not allow all substances to pass through it
- 28. Define: Passive transport**

requires no energy by the cell
It is unaided by transport proteins
- 29. Define : Active transport**

Energy dependent transport of molecules or ions across a semi permeable membrane against the concentration gradient.
- 30. What is meant by facilitated transport?**
 - Plasma membrane contains several uniporters
 - They enable amino acids, nucleosides, sugars and small molecules to enter and leave cells
 - They accelerate thermodynamically favoured reaction.
 - This movement is called facilitated transport
- 31. Distinguish:**

uniport transport & passive diffusion

 - Rate of transport is far higher than predicted
 - Transport is specific
 - Transport occurs via limited number of transporter proteins
- 32. Define: Phagocytosis: (cell eating)-**
 - Substances are taken up in solid form.
 - Cells in this process are phagocytes
 - It is said to be phagocytic.
- 33. Define: Pinocytosis(cell drinking)-**
 - Substances are taken up in liquid form.
 - Very small Vesicles formed during intake.
 - Occurs in Amoeboid protozoans,
Certain kidney cells in fluid exchange.
Plant cells.
- 34. Define: Exocytosis**
 - Reverse of endocytosis
 - Undigested remains from food vacuoles are removed from cells
- 35. What are the main functions of a nucleus?**
 - It controls all metabolic activities of cell by controlling synthesis of enzymes required.
 - It controls inheritance of characters from parents to offspring.
 - It controls cell division.

36. Give reasons:

Mitochondria are semi autonomous organelles.

- Arise new by existing mitochondria division
- Regarded as intra cellular parasitic prokaryotes
- Established symbiotic relationship with cell.
- Mitochondrial matrix contains DNA molecules, RNA, enzymes for mitochondrial genes functioning

37. Name the three kinds of plastids.

- Chloroplasts
- Chromoplasts
- Leucoplasts

38. Name common properties shared by chloroplasts and mitochondria

- Both migrate from place to place within cells
- Contain their own DNA code for some of the key organellar protein

39. What is a polysome?

- During protein synthesis many ribosomes line up and join an mRNA chain to synthesise many copies of a particular polypeptide.
- Such a string of ribosomes is called polysome

40. Define: crossing over

- In chiasmata, non-sister chromatids of homologous chromosomes are exchanged
- This process is called crossing over

41. What is a tetrad?

- Two sister chromatids of each homologous chromosome become clearly visible.
- Bivalent becomes tetrad with 4 chromatids.
- This is known as tetrad stage in meiosis

42. What is a bivalent?

- During zygotene homologous chromosomes come together
- Lie side by side throughout their length.
- This is called pairing or synapsis.
- Paired chromosomes are called bivalent

PLANT MORPHOLOGY**1. What is meant by exogenous origin?**

- Lateral branches of stem are exogenous in origin if
- They arise from main axis periphery /cortex

2. What is meant by endogenous origin?

- Lateral branches of the roots are endogenous in origin if

- They arise from pericycle of primary root

3. Name vegetative organs of a flowering plant.

- Root
- Stem
- Leaves

4. Name reproductive organs of flowering plant.

- Flowers
- Fruits
- Seeds

5. Write any two characteristic features of root

- positively geotropic
- negatively phototropic
- Non-green in colour
- since they do not have chlorophyll pigments

6. Write any two characteristic features of shoot.

- Negatively geotropic
- positively phototropic.
- Well developed nodes and internodes

7. Define: adventitious roots

- Root developing from any part of the plant other than the radicle

8. Define: Root cap

- It is a cap like structure that covers the apex of the root.
- Function of root cap is to protect root apex.

9. Define: Pulvinus

- Leaf has a swollen leaf base.
- It is known as pulvinus

10. Define: Meristematic or Zone of cell division:

- This is the growing tip of the root.
- It lies a little beyond the root cap.
- Actively dividing and increase in number.

11. Define: Buds

- Young shoot, yet to develop.
- They have compressed axis
- Inter nodes are not elongated
- Young leaves are closed and crowded

12. What is an epiphyllous bud?

- Adventitious buds arising on leaves.
- These are called epiphyllous buds.
- E.g Bryophyllum*

13. What are the advantages of rhizome?

- Stores food
 - Means of perennation.
- 14. What are pneumatophores?**
- Plants like Avicennia grow in marshy places
 - Ordinary roots lie buried in saline water
 - Erect roots arise from it.
 - These erect roots are called pneumatophores.
- 15. Define : Ligulate floret**
- Ray florets radiate outwards from margins of the thalamus in the head inflorescence.
- 16. Define : Hypanthodium**
- Receptacle is concave and cup shaped.
 - Upper end has an opening called *ostiole*
 - It is protected by scales.
 - Inside receptacle 3 types of flowers are present
Male flowers - in the upper part,
Female flowers - base
 - Neutral flowers - between male and female
- 17. Define : Corymb**
- It is a type of racemose.
 - Main axis is not elongated .
 - Pedicels are of unequal length.
 - Older flowers have long and short pedicels.
 - So all flowers appear at the same level.
- 18. Define : Involucre**
- Head inflorescence is surrounded by green coloured bracts called Involucre of bracts.
 - They protect young flowers and fruits
- 19. Define : Umbellet**
- Involucre of bracts give rise to branches called rays from their axils.
 - Each ray produces an involucre of bracts at its tip from axils
 - Flowers arise having pedicels of equal length in acropetal order.
 - Each umbel is called an umbellet.
- 20. What are monoecious plants?**
- Male - female flowers develop in same plant
- 21. Define aestivation.**
- Mode of arrangement of either sepals or petals of a flower in bud condition
- 22. What is a bisexual flower?**
- Flower having both
male sex organ (Androecium)

female sex organ (gynoecium)

23. What is a zygomorphic flower? Give Example.

- A flower with bilateral symmetry,
- Parts of one or more whorls are dissimilar.
- The flower can be divided into two equal halves in only one vertical plane

eg. Pisum

24. Distinguish: monothealous -dithealous anthers.

Monothealous	Dithealous
One lobe	Two lobes
two pollen sacs (microsporangia).	Four pollen sacs (microsporangia)

25. What is meant by monadelphous stamens?

- All the stamens of a flower are united
- in one bundle by fusion of filaments only.

26. Distinguish apocarpous and syncarpous ovary

Apocarpous	syncarpous ovary
Gynoecium made up of two or more carpels which are free	Gynoecium consists of two or more carpels which are fused

27. Define fruit.

A fertilized and developed ovary

28. What are the three groups of fruits?

- Simple
- aggregate
- multiple or composite fruits.

29. Define simple fruit.

- Single fruit develops from single ovary of single flower
- Ovary may be monocarpellary or multicarpellary, syncarpous

30. What are dry dehiscent fruits?

- Simple fruits having dry pericarp
- They split automatically on ripening
- Discharge their seeds

31. What are the two processes necessary for the development of fruits?

- Pollination
- fertilization

32. Define aggregate fruits.

- Aggregate fruit develops from
single flower, multicarpellary, apocarpous, superior ovaries
- Each develops into simple fruitlets.

33. What is legume? Give an example.

- A dehiscent dry fruit produced from a monocarpellary, superior ovary,
- Dehisces from both sutures into two valves
eg. Pea

34. How does fleshy fruit differ from dry fruit?**Fleshy fruit**

- Either entire pericarp or part of pericarp is succulent and juicy when fully ripe.
- They are indehiscent

Dry Fruits

- These fruits have dry pericarp
- Not distinguished into three layers.
- They may be indehiscent or dehiscent

GENETICS**1. Define : Heredity**

- Transmission of characters, resemblances, differences from one generation to next.

2. Define : Variation

- Differences shown by individuals of same species
- Also by offsprings (siblings) of same parents.

3. Define : Homunculus

- Miniature form of entire organism contained in sex cells like sperm or egg.
- This is called preformation theory

4. Define : Parthenogenesis

- Development of fruit without fertilization and seed formation

5. Define : Pangenesis

- Theory of Pangenesis proposed by Aristotle,
- Animal body produces minute bodies called gemmules or pangenes
- Carried by blood to reproductive organs.
- Pangenes of both parents blend to give rise to a new individual.

6. Name scientists who rediscovered Mendel

- Carl Correns Germany
- Hugo de Vries Holland
- Tshermak Austria

7. Define: true breeding

- Produce same type of offsprings for any number of generations when selfed

8. Define : Monohybrid test cross

- F_1 hybrid is crossed with recessive parent
- Both dominant and recessive phenotype will appear in equal proportion (1:1).

9. Define : Back cross

- F_1 hybrid crossed to any pure breeding parents

10. Define : Alleles

- Alternative forms of same gene
- That controls pair of contrasting character

11. Define : Law of purity of gametes

- Pair of contrasting factors or genes or allelomorphs are brought together in a heterozygote or hybrid,
- Two members of allelic pair remain together without mixing
- When gametes are formed the two separate out, so that only one enters each gamete

12. Define : Dihybrid test cross

- In a dihybrid test cross four types of phenotypes are obtained in equal proportions.
- Test cross is used to determine
 1. whether segregation of alleles taken place
 2. if hybrid is homozygous or heterozygous.

13. Define : Exon

- In Eukaryotes, genes on DNA strand have coding regions called exons

14. Define : Intron

- Interrupted by non-coding DNA segments
- do not carry genetic information called introns.

15. Define : Splicing

- Genes while producing m-RNA will first form a primary transcript
- It will then cut off introns to form functional m-RNA This is called splicing.

16. Define : Codon

- Sequence of three nucleotides
- That code for an amino acid

17. Define : Incomplete dominance

- F_1 hybrid does not resemble either of parents.
- Hybrid exhibited an intermediate character
- Both genes of allelomorphic pair showed partial expression.

18. Define : Gene interaction.

- It is a condition

- One pair of genes reverses or inhibits effect of another pair of genes
- By causing modification of normal phenotype

19. Define : Epistasis.

- Epistasis means “standing over”.
- Suppression of gene on one locus of chromosome by gene present at other locus
- Suppressed gene - hypostatic
- Other gene - epistatic

PLANT PHYSIOLOGY**1. Define : Tyndall effect**

- Scattering of light beam by colloid particles
- This is a property of protoplasm

2. Define : Brownian movement.

- Random motion caused by uneven bombardment of particles
- Protoplasm shows this zig-zag movement.

3. Define : Imbibition.

- Uptake of water or other solvents
- By nonliving substances (gum, starch, wood)
- causing swelling of these substances.
- Such substances are called imbibants.

4. Define : Diffusion.

- Flow of solids, liquids and gases
- from a region of higher concentration
- to a region of lower concentration
- until equilibrium is attained.
- *Examples: smell of perfume.*

5. Define : DPD.

- Amount by which diffusion pressure of a solution is lower than that of its pure solvent

6. Define : Wall pressure.

- As a result of turgor pressure on the cell wall, the rigid cell wall exerts an equal pressure in the opposite direction called wall pressure.

7. Define : Water potential.

Difference between

- free energy of water molecules in water to
- free energy of water in any other system.

8. Define : Permeability.

- Entry and exit of water into out of plant cells
- It is due to permeability phenomenon of plasma membrane.

9. Define : Stomata

- Minute opening on leaves & stems epidermis
- Most of water loss by transpiration (about 95%) takes place through stomata

10. Define : Transpiration

- Loss of water in the form of vapour from aerial parts of plant

11. Define : Starch - sugar interconversion

- During day enzyme phosphorylase converts starch to sugar
- Thus increasing osmotic potential of guard cells causing entry of water.
- Reverse reaction at night brings about closure.

12. Define : Transpiration pull

- Transpiration through leaves causes negative pressure or tension in xylem sap
- It is transmitted to root.
- This is called transpiration pull
- It is responsible for upward water movement.

13. Define : Cohesion

- Mutual attraction between water molecules

14. Define : Vital theories

- Pumping of upward water due to vital activity of xylem parenchyma and xylem rays.

15. Define : Hydroponics

- Growth of plants in water and sand culture.
- Also be referred to as
 1. soil-less agriculture,
 2. test-tube farming,
 3. tank farming
 4. chemical gardening

16. Define : Exanthema

- It is a copper deficiency disease
- It causes the yield of gums on bark

17. Define : Reclamation

- It is a Copper deficiency disease
- Caused in plants on newly reclaimed soil
- where seed formation is affected.

18. Define : Translocation of solutes

- Synthesized food from leaves is translocated to different plant parts
- depending on their requirement

19. Define : Ammonification

- Conversion of organic nitrogen to ammonium ions by microbes present in the soil.
- Sources of organic nitrogen in soil are

- animal excreta dead and decaying plant and animal remains
- Acted upon by ammonifying saprotrophic bacteria certain soil fungi and actinomycetes.

20. Define : Denitrification

- Conversion of nitrate and nitrite into ammonia, nitrogen gas and nitrous oxide
- Gaseous nitrogen is released into atmosphere
- *Denitrifiers involved in this process*
Pseudomonas denitrificans,
Bacillus subtilis, Thiobacillus Denitrificans

21. Define : Donnan Equilibrium

- Proposed by F.G. Donnan
- When a cell having fixed anions is immersed in salt solution
- Equal number of anions move into cell.
- To balance negative charges of fixed ions additional cations move into cell
- Cell sap cation concentration becomes higher than external medium.

REPRODUCTION BIOLOGY

1. What is grafting?

- Common method of vegetative propagation.
- Part of two plants are joined in such a way that they grow as one plant.
- Grafting is done between two closely related dicotyledonous plants having vascular cambium.
- Rooted supporting portion of one plant, called stock is joined with twig of another plant called scion.

2. What is a bulbil?

- Spherical multicellular fleshy buds
- Produced in axil of foliage leaves in place of axillary buds
- They grow to form new plants, when shed and fall on the ground.

Eg: Oxalis and Pine apple.

3. Differentiate between stolon and sucker.

Stolons	Sucker
Grow horizontally outwards bear nodes and internodes.	Laterally developed branches grow obliquely upwards.
Branches originate from stem base	branches originate laterally

4. Why grafting not possible in monocot plants?

- Grafting is possible in plants having vascular cambium.
- It is absent in monocots.

5. Define totipotency.

- Ability of every living plant cell to produce the entire plant is called totipotency

6. What is Micropropagation

- Rapid method of vegetative multiplication of valuable plant material
- For agriculture, horticulture and forestry.
- A large number of plantlets are produced from a small mass of explanted plant tissue.

7. Double triple fusion. What is the product of this process?

- During fertilization in angiosperm,
 1. 2nd male gamete moves further central cell
 2. Fuses with two haploid polar nuclei or diploid secondary nucleus
 3. Forms a triploid primary endosperm nucleus.
- This process involving fusion of three nuclei is called triple fusion.

8. What is double fertilization?

- Whole phenomenon of fertilization involving fusion of one male gamete with egg.
- together with fusion of second male gamete with polar nuclei

9. What is meant by tegmen?

- tegmen is thin and membranous

10. What is cotyledon?

- Seed leaves are called cotyledons
- It may be one or two in number

11. What is funicle?

- Stalk by which ovule is attached to placenta

12. What is hypocotyl?

- Portion of axis between radicle and the point of attachment of the cotyledons to axis

13. Define epicotyle.

- Portion between plumule and cotyledons
- Axis along with cotyledon constitute embryo

14. Define senescence in plants.

- Period between reproductive maturity and death of a plant or a part of it.
- Characterized by a collective, progressive and deteriorative developmental process

- Ultimately leads to complete loss of organization and function of plant /parts of it.
- Study of senescence is phytoogerontology.

15. What are the four kinds of senescence?

- Whole plant senescence
- Shoot Senescence
- Sequential senescence of Organ senescence
- Simultaneous senescence

16. What is the significance of senescence in the life of a plant?

- It sheds off senescent & dead parts of plants.
- It sheds off ripe fruits
- It helps in dispersal and life cycle of plant.
- In lower plants, shedding gemmae or plantlets helps in vegetative propagation.

17. What is abscission?

- Separation of leaves, flowers, fruits from plant.

ENVIRONMENTAL BIOLOGY

1. Write short note on soil water.

- Soil water very important in plant physiology
- It occurs in various forms, such as gravitational, capillary, hygroscopic combined water.
- Rain is the principal source of water for soil.

2. What is symbiosis?

- Symbiosis means 'living together'.
- It is a kind of relationship or interaction between two organisms
- One or both the members are benefited in food, shelter, transport etc

3. What are Mycorrhizae?

- Symbiotic association between a fungus and a root of higher plant
- It is of two types:
 1. Ectotrophic
 2. Endotrophic.

4. What are lichens?

- Contact is close, permanent and obligatory.
- Their body is made up of a matrix
- Formed by a fungus
- within its cells of alga is embedded.

5. What is competition?

- Negative Interactions
- Competition occurs when individuals attempt to obtain a resource

- That is inadequate to support all individuals seeking it
- Even if resource is adequate, individuals harm one another in trying to obtain it.

6. What are hydrophytes?

- Plants growing in plenty watersupply regions
- Pond, pool, lake, river, marshes or wet soils.

7. What are three ecological groups of plants?

- Hydrophytes
- Xerophytes
- Mesophytes

8. Define : Xerophytes

- Plants growing in dry habitats
- Or xeric conditions

9. Define conservation?

- Man exploits natural resources indiscriminately
- The world is facing ecological crisis
- Several methods are adapted to save resources
 1. To reduce wastages
 2. using energy efficient devices
 3. So that natural resources will last long.

- It is called conservation of natural resources

10. How do forests protect the environment?

- Keeps atmospheric balance by consuming CO₂
- Release O₂, essential for animal life.
- Removal forest would disturb composition of natural air.
- An acre forest absorbs 4 ton of CO₂ gas
- Recycles 8tonnes of oxygen into environment.

11. What is meant by resources?

- Source of supply/ support generally in reserve.
- Materials and sources of energy needed for survival and comforts of man

12. What are main sources of energy today?

- *Major energy sources*
 1. fuel wood
 2. fossil fuels (coal, petroleum, natural gas)
- *Direct energy resources*
 1. sunlight
 2. hydroelectric
 3. Wind power
 4. tidal
 5. Geothermal
 6. Nuclear energy.

5 MARK Q & A
BIO DIVERSITY

1. List differences between plants and animals.

Plants	Animals
Plants have branches, asymmetrical body with green leaves.	They have definite shape of the body and absence of branches.
Non motile and fixed in a place.	Ability to move from place to place.
Autotrophic mode of Nutrition.	Heterotrophic mode of nutrition
Excretory system and nervous system absent.	Excretory system and nervous system are well developed.
Reserve food material is starch.	Reserve food material is glycogen.
Cells have cell wall.	Cell lacks cell wall.

2. Justify a separate kingdom status for fungi?

1. Either unicellular or multi-cellular organisms.
2. Mode of nutrition is heterotrophic since they lack the green pigment chlorophyll.
3. Some fungi are parasites (e.g Puccinia) Others are saprotrophs feed on dead organic matter. (e.g. Rhizopus)
4. Body is made up of filamentous structures called *hyphae*.
5. Cell wall is made up of chitin.

3. What are difficulties in classifying Euglena?

1. Some species have *chlorophyll* Hence autotrophic like plants.
2. Like animals they dependent on an external supply of vitamin B and vitamin B12 which they cannot synthesize by themselves.
3. Few species lack chloroplasts Hence colourless and non-photosynthetic.
4. They have a saprotrophic mode of nutrition Hence carry out extra-cellular digestion.
5. Colourless forms ingest small food particles Carry out intracellular digestion (holozoic nutrition).

4. Discuss the methods used to measure virus size

1. Direct observation using electron microscope:
2. Filtration through graded porosity membranes

3. Sedimentation by ultra centrifugation :

4. Comparative measurements:

- a. Staphylococcus diameter of 1000 nm.
- b. Bacteriophage size from 10-100 nm.

5. Write a note on: Significance of viruses.

i. *Viruses are puzzle to biologists*

They show characteristics of living and non-living things

ii. *Viruses are used as biological research tools*

They have simple structure & multiply rapidly Hence used in molecular biology, genetic engineering, medicine etc.

iii. *Viruses are used in Biological Control*

Used in eradicating harmful pests like insects.

iv. *Plant viruses are of pathogenic nature*

Bacteriophages attack N₂ fixing bacteria Responsible for reducing the fertility of soil.

v. *Viruses are used in industry*

To prepare sera and vaccines.

6. What are different shapes in bacteria? Give examples

i. **Spherical (Cocci)**

A. *Diplococci:*

Cells divide in one plane remain attached in pairs.

B. *Streptococci:*

cells divide in one plane remain attached to form chains.

C. *Tetrads:* Cells

divide in two planes form group of four cells.

D. *Staphylococci:*

cells divide in 3 planes, in irregular pattern, producing bunches of cocci.

E. *Sarcinae:*

cells divide in 3 planes, in regular pattern, producing a cuboidal arrangement of cells.

ii. **straight rods (Bacilli)**

diplobacilli occur singly streptobacilli. in pairs or form chains

iii. **helically curved rods (spirilla),**

iv. **some bacterial cells are pleomorphic**

They exhibit variety shapes eg. *Arthro bacter*

7. Describe flagellation found in bacteria.

Flagella vary both in number and arrangement according to two general patterns.

1. Polar arrangement

Flagella are attached at one or both cell end.

a. *monotrichous* – with a single flagellum

b. *lophotrichous*

with small bunches of flagella from one end

c. *amphitrichous*

with flagella at both poles of the cell

2. Peritrichous arrangement

flagella are dispersed randomly over cell.

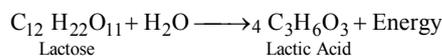
3. lack flagellum.

Atrichous bacteria

8. Discuss the role of bacteria in industry?**1. Dairy Industry**

Streptococcus lactis

convert milk sugar lactose into lactic acid.



Lactobacillus bulgaricus

convert milk into curd, yoghurt

Lactobacillus acidophobus

convert milk into cheese

2. Vinegar

Acetobactor aceti oxidizes ethyl alcohol obtained from molasses by fermentation to acetic acid or vinegar.

3. Alcohols and Acetone

Butyl alcohol, methyl alcohol and acetone are prepared from molasses by fermentation activity of *Clostridium acetobutylicum*.

4. Curing of tobacco,tea and coffee

Leaves of tea, tobacco, beans of coffee are fermented by activity of certain bacteria to impart the characteristic flavour.

5. Retting of fibres

Fibres from fibre yielding plants are separated by action *Clostridium* species.

9. Discuss the role of bacteria in soil fertility.**1. Ammonifying bacteria**

E.g *Bacillus ramosus*, *B. mycoides*

convert complex proteins in dead bodies of plants and animals into ammonia later converted into ammonium salts.

2. The nitrifying bacteria

E.g *Nitrobacter*, *Nitrosomonas*

convert ammonium salt into nitrite and nitrate

3. Nitrogen fixing bacteria

E.g *Azotobacter*, *Clostridium*

Rhizobium (a symbiotic bacterium)

convert atmospheric nitrogen into organic nitrogen

10. Write about symbiotic nutrition in fungi.

- Symbiosis means 'living together'.
 - Kind of relationship between two organisms
 - Members are benefited in food, transport etc
- Mycorrhizae**
- Symbiotic association between a fungus and a root of higher plant
 - Fungus receives carbohydrates and vitamins from tree
 - Break down soil humus proteins to amino acid
 - It is absorbed and utilized by plant

Lichens

- Contact is close, permanent and obligatory.
- Alga contributes food by photosynthesis
- Fungus absorbs water and mineral salts

11. Give salient features of Ascomycotina

- Septate Hyphae, haplophase vegetative body
- Includes yeasts, moulds, cup fungi
- Asexual reproduction by non-motile spores such as zoospores, chlamydospores and conidia.
- Sexual reproduction by Gametangial copulation (yeasts). gametangial contact (*Penicillium*) somatogamy (*Morchella*).
- Characterized by development of ascospores.
- Ascospores are enclosed in sac like ascus
- Asci is aggregated to fruit bodies (*ascocarps*)

12. Give salient features of Basidiomycotina

- Septate hyphae dikaryophase vegetative body
- Highly evolved club shaped fungi
- Basidium bears four basidiospores at its tip.
- Common examples
- mushroom, toadstool, puff ball, bracket fungi

- Mycelia are of two types.
- Primary multiplies by pycnidiospores.
- Fusion occurs between two basidiospores
- Or two hyphal cells of primary mycelia.
- Fruiting bodies are called basidiocarps.

13. Give salient features of Zygomycotina

- Haplophase vegetative body.
- Non-motile asexual spores
- Sexual reproduction by fusion of two multi-nucleate gametangia producing a zygospore.
- Also known as conjugation fungi.
- Cell wall is made up of chitin and chitosan.
- Includes two classes: *Rhizopus* and *Mucor*

14. What is eutrophication? Write its significance?

- *Algae blooms* is dense mass material
- Formed due to high nutrient availability, by sewage fertilizers
- Sudden explosive growth algae deplete water of oxygen.
- This leads to death of aquatic life.
- Increase of nutrients which starts off the entire process is called *eutrophication*
- Toxins by algal bloom lead to mortality.
- This is a serious problem in lakes and oceans.
- Toxins is stored by shellfish feeding on algae
- It may be passed on to man causing paralytic shellfish poisoning

15. Write notes on:

Nutrition and reserved food materials in algae.

- i.* Algae are autotrophic in nutrition mode
- ii.* Carbohydrate reserves are various forms of starch in different classes of Algae.
- iii.* Chlorophyceae - starch
Rhodophyceae - Floridean starch
Phaeophyceae - laminarian starch
Euglenophyceae - paramylon.
- iv.* Phaeophyceae - mannitol & carbohydrate
Xanthophyceae and
Bacillariophyceae - fats, oils and lipids.
- v.* Nature of reserve food material is important criterion used in classification

16. Write about the pigmentation in algae.

- i.* 3 types of Photosynthetic pigments in algae.

1. Chlorophylls

- Chlorophyll *a* is universal in all algal class
- chlorophyll *b, c, d, e* restricted to some algae

2. Carotenoids

- Yellow, orange or red coloured pigments
- Includes carotenes and Xanthophylls.

3. Biliproteins.

- Water soluble biliproteins called phycoerythrin (red) and phycocyanin (blue)
- occur in Rhodophyceae and Cyanophyceae (cyanobacteria)

ii. Pigments absorb sunlight at in blue and red range and help in photosynthesis.

iii. Pigmentation is important classification criteria

iv. Algae colour is due to dominance of pigment
In red algae (*Rhodophyceae*) red pigment *phycoerythrin* is dominant over others.

v. Pigments are in chloroplast membranes.
Few spherical bodies called pyrenoids are present in each algae chloroplast
They are centres of starch formation.

17. What is heterospory? What is its significance?

1. Heterosporous plants produce 2 types of spores :
 - large megaspores
 - small microspores.
2. Megaspores give rise to female prothalli
It bears female sex organs *archegonia*.
3. Microspores give rise to male Prothalli.
It bears male sex organs *antheridia*.
4. Sperms (*antherozoids*) produced by antheridia travel to archegonium
5. Both male and female gametophytes remain protected inside their respective spores.
6. Large number of Microspores produced
They are dispersed by wind
7. Evolution of heterospory is an important step towards the evolution of seed bearing plants.

18. What are the salient features of Pteridophytes?

1. Heteromorphic alternation of generation
2. Plant body of Sporophyte is dominant phase.
3. Sporophyte differentiated into root, stem, leaf
4. Vascular tissue are present.

5. Xylem lacks vessels but tracheids present.
6. In phloem sieve tubes, companion cells absent
7. Asexual reproduction takes place by spores.
8. Most pteridophytes are homosporous i.e they produce one type of spores.
9. A few show heterospory i.e they produce two types of spores microspores and megaspores.
10. Male sex organ antheridium
Female sex organ archegonium.

19. Discuss the advantages of seed habit.

1. All reproduction process are completed i.e spore production, fertilization etc.
2. Seed is borne on parent plant and is nourished
3. Seed contains embryo or future plant
4. Seed protected it from adverse weather
5. Nourishes it and allows to germinate on favourable condition
6. Thus, Seed enables plant to survive on land

20. Differentiate: Gymnosperm - Angiosperm

Gymnospermae	Angiospermae
No vessels in xylem, only tracheids (except Gnetales)	xylem has vessels,
No companion cells in phloem.	Companion cells are in phloem
sporangia and spores develop on cones	sporangia and spores develop in flowers
Naked & exposed Seeds Not enclosed in ovary.	Seeds are enclosed in ovary.
No fruit because no ovary	After fertilization ovary develops into fruit.
Eg: Cycads, Conifers, Ginkgos	Flowering plants

21. Write the salient features of Gymnosperms.

1. Intermediate between pteridophyte & angiosperm
2. No vessels in xylem, only tracheids (except Gnetales)
3. No companion cells in phloem.
4. Sporangia and spores develop on cones
5. Naked & exposed Seeds
6. Seeds are not enclosed in ovary.
7. No fruit because no ovary
8. Pollination is mostly by wind (anemophilous).
9. Spores are grouped into compact cones or strobili
10. Heteromorphic alternation of generations.

22. Write economic importance of gymnosperms.

1. **Paper Manufacture**
eg. *Pinus Woods*.
2. **Source of soft wood**
for construction, packing, ply wood industry
eg. *Cedrus*,
3. **Agathis Turpentine**
Obtained from *Pinus* resin.
Used as solvent in paint and polishes.
Used medicinally for pain, bronchitis etc.
4. **Ephedrine**
Alkaloid obtained from *Ephedra*.
Used to cure asthma and respiratory problems
5. **Saw dust of conifers**
used in making linoleum and plastics.
6. **Rosin Resin**
Pinus species yields
used in water proofing and sealing joints.
7. ***Pinus gerardiana*** seeds are edible.
8. ***Araucaria*** ornamental plant.

CELL BIOLOGY

1. Differentiate: plant and animal cell.

Plant cell	Animal cell.
contains plastids	Plastids are absent
larger than animal cell	small in size
Centrosome is only in lower plant cell.	All animal cells have Centrosomes
Fewer , larger Vacuoles	either absent or very small
outer rigid cell wall, made up of cellulose	Cell wall is absent.
distinct, definite shape	Not so definite
Lysosomes only in eukaryotic plant cells.	Found in all cells.

2. State the important features of cell doctrine

1. All organisms are made up of cells.
2. New cells are produced from pre existing cells
3. Cell is a structural and functional unit of all living organisms.
4. Cell contains hereditary information passed on from cell to cell during cell division.
5. All cells are basically same in chemical composition and metabolic activities.

6. Structure and function are controlled by DNA.
 7. Some times dead cells may remain functional as tracheids and vessels in plants and horny cells in animals.
- 3. Describe the ultra structure of prokaryotic cell**
1. Bacterium is surrounded by two definite membranes separated by *periplasmic space*.
 2. Outer layer is designated as *cell wall*. It contains peptidoglycan, polysaccharides, lipid and protein molecules.
 3. *Plasma membrane* is a lipoprotein structure. It controls entry and exit of molecules and ions. Enzymes of metabolites and photosynthesis, present in plasma membrane.
 4. *Chromosome* is naked DNA tightly coiled within nucleoid.
 5. Bacteria contains an extra- chromosomal circular DNA called *plasmid*. It is responsible for antibiotic resistance.
 6. *Ribosomes* are composed of RNA and proteins sites of protein synthesis.
 7. Ribosomes groups are called *polyribosomes* or *polysomes*.
 8. Motile bacteria have thin hair like *flagella*. Flagella are used for locomotion.
- 4. What is plasmodesmata? Explain**
1. Cell wall is not totally complete around cell.
 2. Cell wall is interrupted by narrow pores with strands of cytoplasm,
 3. They are called *plasmodesmata*.
 4. They form protoplasmic continuum called symplast.
 5. Plasmodesmata consists of canal, lined by plasma membrane.
 6. It has a simple or branched tubule known as *desmotubule*.
 7. Desmotubule is extension of endoplasmic reticulum.
 8. Plasmodesmata serves as a passage for many substances to pass through.
 9. They may have a role in the relay of stimuli
- 5. What are pits? Explain their types.**
4. Pits are areas on cell wall on which secondary wall is not laid down.
 5. Adjacent cell Pits are opposite to each other.
 6. Such pits form a morphological and functional unit called the *pit pair*.
 7. Each pit has pit chamber and a pit membrane.
 8. Pit membrane consists of middle lamella and primary wall. many minute pores and they are permeable
 9. Pits are of two types.
 1. Simple pits
width of the pit chamber is uniform
 2. Bordered pits.
secondary wall partly overhangs the pit.
 10. Pits help in the translocation of substances between two adjacent cells.
- 6. Discuss the functions of cell wall.**
1. Gives definite shape to the cell.
 2. Protects internal protoplasm against injury.
 3. Gives rigidity to the cell
 4. Prevents plant cell bursting due to endosmosis.
 5. Walls of xylem vessels, tracheids and sieve tubes specialized for long distance transport.
 6. Takes part in offense and defense.
- 7. List the functions of plasma membrane.**
1. Intercellular and intra cellular transport
 - Transporting nutrients into and metabolic wastes out of cell
 - preventing unwanted materials from entering cell.
 - Plasma membrane contains specific transport proteins
 - That permit passage of certain small molecule but not others.
 2. Plasma membrane maintains proper ionic composition pH (~7.2) and osmotic pressure of cytosol.
 3. Enzymes bound to plasma membrane catalyze reactions that would occur with difficulty in an aqueous environment.
 4. Plasma membranes of eukaryotic cells contain receptor proteins that bind specific signaling molecules like hormones, growth factors, neurotransmitters etc. leading to various cellular responses.

8. Define diffusion.**Discuss factors that affect diffusion rate.****Diffusion**

Flow of solids, liquids and gases from a region of higher concentration to a region of lower concentration until equilibrium is attained.

The rate of diffusion is directly proportional to

1. substance concentration
2. medium temperature
3. diffusion pathway area

The diffusion is inversely proportional to

1. size of substance molecules
2. molecular weight of substance molecule
3. distance over which molecules have to diffuse

9. Describe Uniporter Catalyzed transport.

1. Plasma membrane contains several uniporters
2. They enable amino acids, nucleosides, sugars and small molecules to enter and leave cells
3. They accelerate thermodynamically favoured reaction.

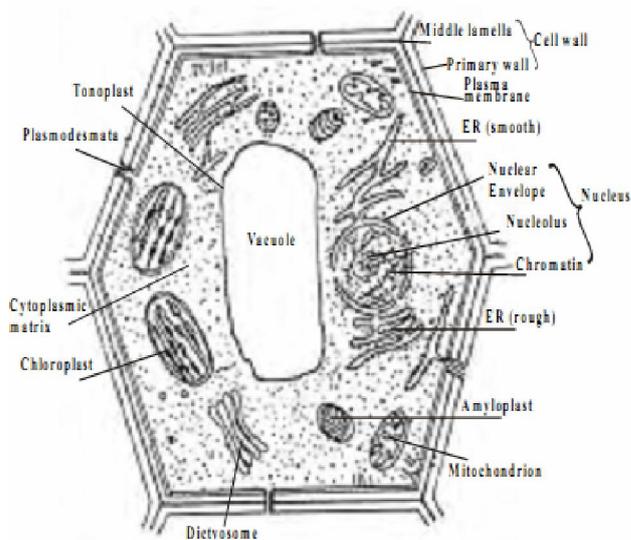
4. This movement is called *facilitated transport uniport transport over passive diffusion*

1. Rate of transport is far higher than predicted
2. Transport is specific
3. Transport occurs *via* limited number of transporter proteins

10. Describe Active Transport across membranes.

1. Active transport is Energy dependent transport of molecules or ions across a semi permeable membrane against the concentration gradient.
2. Takes place with the help of carrier proteins in plasma membrane.
3. For each type of solute molecule there is a specific carrier molecule or permeases or translocases
4. It has got two binding sites; one for transportant other for ATP molecule.
5. Carrier proteins bind transportant molecule outside plasma membrane.
6. ATP molecule binds itself to other binding site of carrier protein and hydrolysed to form ADP

7. Releases energy brings conformational change in the carrier-transportant- complex
8. Transportant is carried through the channel on the other side of the membrane.
9. Carrier molecule regains its original form and repeats the process.

11. Draw a plant cell and label its parts.**12. Explain the ultrastructure of chloroplast.**

1. Chloroplasts vary in size and shape surrounded by an outer and inner membrane.
2. Chloroplasts contain internal system of extensive inter connected membrane- limited sacs called *thylakoids*
3. These are grouped in stacks of 20-50 thylakoids to form *grana* and embedded in a matrix called *stroma*.
4. *Stroma*, a semi fluid, colourless, colloidal complex contain DNA, RNA ribosomes and several enzymes.
5. DNA of chloroplast is circular. Ribosomes are 70s type. Higher plant's may have starch
6. Many membranous tubules called *stroma lamellae* inter connect thylakoids
7. Thylakoid membrane contains green pigments (Chlorophylls) and other pigments and enzymes that absorb light and generate ATP during photosynthesis

13. Explain cell cycle

1. Most eukaryotic cells live according to an internal clock

2. They proceed through a sequence of phases called cell cycle.
3. Cell cycle follows regular timing mechanism
4. DNA is duplicated during synthesis (S)Phase
5. Copies are distributed to daughter cells during mitotic (M) phase.
6. Growing plant and animal cells take 10-20 hours to double in number and some duplicate at a much slower rate.
7. A multi cellular organism starts its life as a single cell (zygote).
8. Multiplication of single cell and its descendants determine growth and development of organism and this is achieved by cell division.
9. Cell division is a complex process by which cellular material is equally divided between daughter cells.
10. Cell division in living things are three kinds.
 1. Amitosis
 2. Mitosis
 3. Meiosis.

14. Write the significance of mitosis

1. Two daughter cells identical to each other and identical to the mother cell are formed.
2. Ensures that daughter cells possess a genetical identity both quantitatively and qualitatively.
3. Forms the basis of continuation of organisms.
4. Asexual reproduction of lower plants is possible only by mitosis.
5. Vegetative reproduction in higher plants are consequence of mitosis.
6. Helps growth and development of multi cellular organism
7. Helps in the regeneration of lost or damaged tissue and in wound healing.
8. Chromosomal number is maintained constant by mitosis for each species

15. Write the significance of Meiosis

1. Helps to maintain chromosome number constant in each plant and animal species.
2. Four haploid daughter cells are formed from a single diploid cell.
3. This is very important in sexual reproduction during the formation of gametes.
4. Occurrence of crossing over results in recombination of genes.

5. Recombination of genes results in genetic variation.
6. Genetic variations form raw materials for evolution.

PLANT MORPHOLOGY

1. Describe the parts of a typical root.

1. Root Cap:

Cap like structure that covers root apex
Root cap protects root apex.

2. Meristematic Zone (Zone of cell division):

Growing tip lying beyond root cap.
actively dividing and increasing Cells.

3. Zone of elongation:

Lies just above meristematic zone.
Cells increase in size.
Helps in the growth in length of the plant root.

4. Zone of cell differentiation : (

Lies above elongation zone.
Cells differentiate into different types.
Form epidermis, cortex and vascular bundles.
Root hairs are responsible for absorbing water and minerals from soil.

2. Describe the types of root system

1. Tap root system

- Develops from embryo radicle
- Radicle grows in to primary or *tap root*.
- It produces branches called *secondary roots*.
- These branch to produce *tertiary roots*.
- Further branch to produce fine *rootlets*.
- Tap root and branches are tap root system.
- Tap root system is the characteristic feature of most of the dicot plants

2. Adventitious root system

3. Root developing from any part of plant other than the radicle is called *adventitious root*.
4. It may develop from stem base or nodes or internodes.
5. Adventitious roots of a plant along with their branches constitute adventitious root system.

3. Write about the functions of roots?

Primary functions

1. Absorption:

Absorption of water and minerals from soil with the help of root hairs.

2. Anchorage:

Roots help to fix plant firmly in the soil.

Secondary functions

1. Storage of food
2. Additional support
3. Haustorial function
4. Assimilation
5. Respiration
6. Symbiosis

4. Describe phyllode

1. Petiole or any part of rachis becomes flattened or winged taking leaf shape and turning green in colour.
2. This flattened or winged petiole or rachis is known as the phyllode.
3. Pinnately compound normal leaf develops in the young stage, but soon falls off.
4. Phyllode performs all functions of leaf.
5. Wing develops in the vertical direction so that sunlight cannot fall on its surface; this reduces evaporation of water.

e.g. Acacia

5. Describe phylloclade

1. Green, flattened or cylindrical stems with nodes and internodes.
2. Leaves are reduced to spines to reduce water loss by transpiration since these plants grow in xeric conditions.
3. Stem becomes flat like a leaf and performs photosynthesis.
4. Stem performing the function of leaf becomes succulent due to storage of water and food

eg. Opuntia

6. Describe the pitcher plant.

1. Leaf becomes modified into a pitcher.
2. A slender stalk coiled like a tendril holds vertical pitcher
3. Basal portion is flattened like a leaf.
4. Pitcher provided with lid covers mouth.
5. Pitcher captures and digests insects.
6. Lamina is modified into pitcher.

7. Pitcher rim is beautifully coloured and provided with nectar glands
8. Inner wall is provided fluid secreting glands
9. Hairs pointed downwards below the rim to escape of insects.
10. Insects drowned in the fluid and digested by enzymes secreted by the glands.
11. Thus the plant is able to get nitrogenous food.

e.g. Nepenthes

7. Distinguish a simple leaf from a compound leaf.

Simple Leaf	Compound Leaf
Axillary bud is in axil of a simple leaf	Axillary bud is in the axil of a leaf. But the leaflets of a compound have them.
Stipules are present at the base simple leaves.	Stipules are not present at the base of Leaflets
Incisions are not deep enough to divide blade into leaflets.	leaves are divided into distinct <i>leaflets</i> .

8. Describe mixed inflorescence with examples.

Axis starts as a racemose inflorescence and shows branching in a cymose fashion. Types:-

Thyrsum

Main axis shows simple dichasial cymes arranged in a racemose manner

eg. Ocimum.

Verticillaster

A pair of dichasial cymes arise from axils of opposite flowers.

Later grow as monochasial scorpioid cymes

eg. Leucas.

Mixed Spadix

Cymose clusters arranged on swollen inflorescence axis from base to apex.

Each cymose cluster is surrounded by a large bract called spathe.

e.g. Musa

9. Give an account of head inflorescence

Main axis is flattened and assumes various shapes. On flattened axis flowers are arranged.

Types : 1. head or capitulum 2. compound head.

I. Head or Capitulum

1. Flattened Main axis and functions as thalamus.
2. This bears numerous florets in acropetal order.
3. Inflorescence is surrounded by green involucre of bracts protect young flowers and fruits.
4. Sessile Florets are of two types.
 1. Disc florets
 2. Ray florets.
5. Based on florets type, head inflorescence is two types

i. *Homogamous Head*

Only Single kind florets, ray or disc florets

eg. *Vernonia disc florets*

Launaea ray florets.

ii. *Heterogamous Head*

Both ray and disc type.

Disc florets - in the centre of thalamus

Ray florets - radiate outwards from thalamus

eg. *Helianthus, Tridax.*

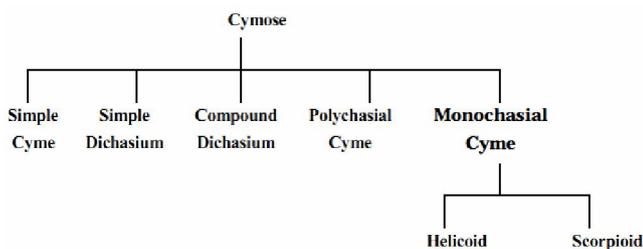
II. Compound Head

inflorescence axis is branched

each branch bears a head inflorescence.

eg. *Lagascia mollis*

10. Classify cymose inflorescence. Explain any two



Simple Cyme

1. Stem type or leaf show a single flower a joint on pedicel.
2. Such flowers are referred to as terminal solitary and axillary solitary cyme

eg. *Papaver* - Terminal solitary cyme,

Hibiscus - Axillary solitary cyme

Simple Dichasium

1. It is a group of three flowers.
2. Inflorescence axis ends in a flower.
3. Two lateral bracts at the flower base give rise to branches ending in a flower.
4. Hence three flowers in the inflorescence
5. Central flower is the oldest

eg. *Jasminum.*

11. Explain special types of inflorescence

Inflorescence cannot be included in racemose or cymose type

Cyathium

1. Inflorescence looks like a single flower.
2. Bracts are united to form a cup - like structure enclosing a convex receptacle.
3. Reduced unisexual flowers on receptacle.
4. Naked single female flower in the receptacle centre represented by gynoecium borne on long stalk.
5. Around female flower five groups of naked male flowers represented by a single stamen arising in a bract axil.

6. Beautiful nectaries are at inflorescence top

eg. *Euphorbia cyathophora.*

Hypanthodium

1. Concave, cup shaped receptacle
2. Upper opening ostiole is protected by scales.
3. Inside receptacle there are three types of flowers are present.
4. Male flowers - in the upper part, female flower - towards base neutral flower- between male -female flowers.

eg. *Ficus.*

Coenanthium

1. Fleshy, circular disc like receptacle structure.
 2. Disc centre contains female flowers
- Around these male flowers present

eg. *Dorstenia.*

12. Explain hypogynous and epigynous flowers

Hypogyny

- Thalamus is convex or elongated, carpel occupies top most position on it.
- Other floral members sepals, petals, and stamens are placed below them.
- This mode of arrangement is called hypogyny. Flower is described as hypogynous.
- Ovary is known as superior.

eg. *Malvaceae, Annonaceae etc.*

Epigyny

- Thalamus is cup shaped,

lower part of ovary is at the bottom of cup fused with inner wall of thalamus.

- Other floral members inserted upon the ovary.
- This mode of arrangement is called epigyny. Flower is said to be epigynous.
- The ovary is said to be inferior.

eg. Asteraceae, Cucurbitaceae, Rubiaceae etc.

13. Explain the different types of calyx.

- Calyx is the outermost whorl of flower composed of sepals.
- It protects the inner parts of flower
- After opening of flower, calyx usually falls off but it may persist in some cases.
- According to its duration, it is described as

1. Caducous or Fugacious:

Calyx falls off, before flowers are opened

eg. Papaver, Magnolia etc.

2. Deciduous :

Calyx falls off after opening of flower

eg Nelumbo

3. Persistent :

Calyx persists even after fruit formation

4. Accrescent:

Calyx not only persistent but also grows along with development of the fruit.

eg. Physalis

14. How the symmetry of a flower is determined?

Describe the types of symmetry seen in flower.

Symmetry of a flower

- Shape, size, arrangement of floral appendages (i.e. Calyx, corolla, androecium and gynoecium) around axis of flower is *floral symmetry*.
- Mother axis - Axis to which flower attached
- Posterior - flower side towards mother axis
- Anterior - Side away from it.

Types of Symmetry

i. Actinomorphic:

- Flower with radial symmetry,
- Parts of whorl similar in size and shape.
- Flower is divided into two equal halves along more than one median longitudinal plane

eg. Hibiscus, Solanum, etc.

ii. Zygomorphic:

- Flower with bilateral symmetry,
- Parts of one or more whorls are dissimilar.
- Flower can be divided into two equal halves in only one vertical plane,

eg. Pisum

iii. Asymmetric.

Flower cannot be divided into two equal halves along any vertical plane,

eg. Canna

15. Describe aggregate fruit

- Develops from single flower, with multi carpellary, apocarpous, superior ovary
- Each of them develops into simple fruitlets.
- Aggregate fruit has collection of simple fruits

e.g Polyalthia.

- Carpels unite and give rise to a single fruit

e.g Annona squamosa.

16. Describe multiple fruit with a suitable example.

1. Multiple or composite fruit is formed by all flowers of whole inflorescence grouped together to give a single big fruit.
2. Multiple fruits are false fruits.
3. Jack is sorosis a sorosis type multiple fruit.
4. Rachis and all floral parts of female inflorescence fuse together as composite fruit.
5. Inflorescence axis and flowers become fleshy.
6. In the centre of fruit, club shaped, thick, fleshy central axis, is the inflorescence axis.
7. Edible part is fleshy and juicy perianth.
8. Pericarp is bag like and contains one seed.
9. Spines on tough rind are stigmas of carpel.
10. Sterile or unfertilized flowers, occur in the form of numerous, elongated, whitish, flat structures in between the edible flakes.

17. Bring out difference in dicot and monocot seed

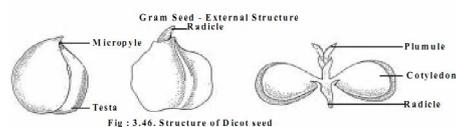


Fig : 3.46. Structure of Dicot seed

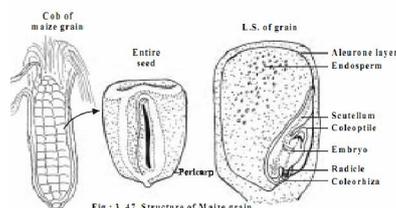


Fig : 3.47. Structure of Maize grain

GENETICS

1. Give the early views of heredity

i. Moist Vapour Theory

Each organ of animal body produced vapours
New organism formed by combining organs.

ii. Fluid Theory

Both male and female produced semen
When these mix embryo formed
male semen gave form and vitality to embryo.

iii. Preformation Theories

sex cells contained within itself entire
organism in a miniature form "*homunculus*".

iv. Particulate Theory

Body of each parent gave rise to minute
particles for reproduction to form offspring.

v. Pangenesis

Animal body produces minute bodies called
gemmules or pangenes which were carried by
blood to reproductive organs.

2. What are basic features of inheritance

i. Every trait has two alternative forms.

ii. One alternative form is more commonly
expressed than other.

iii. Any alternative form can remain unexpressed
for many years.

iv. Hidden character reappear in original form.

v. Characters or traits are expressed due to
discrete particulate matter and so do not get
blended or modified.

3. Describe the Monohybrid cross.

i. Parental Generation :

Mendel selected a pure breeding tall plant and
a pure breeding dwarf plant as parents

ii. F1 Generation :

He crossed parents.
Raised first filial generation.
Plants were all tall and called monohybrids.

iii. F2 Generation:

- Mendel allowed selfing of F1 monohybrids
- Obtained Tall and dwarf plants in 3:1 ratio.
- It is called Phenotypic ratio
- Based on external appearance of offsprings.

iv. F3 Generation:

By selfing F2 offsprings he found that

- F2 dwarf plants bred true generation after
generation whether self or cross pollinated.
 - Of F2 tall plants 1/3 bred true for tallness.
 - Rest 2/3 produced tall and dwarf in 3:1.
 - F2 generation consisted of 3 types of plants.
 - i. Tall homozygous (pure) - 25%
 - ii. Tall heterozygous - 50%
 - iii. Dwarf homozygous (pure) - 25%
- Monohybrid cross is 1:2:1

It is called the genotypic ratio.

4. Explain the molecular structure of a gene

Gene may be subdivided into different units

Recon

undergoes crossing over and recombination and as
small as a single nucleotide pair.

Muton

Smallest unit of a gene that undergo mutation and
can involve a pair of nucleotides.

Cistron

Functional unit and synthesize one polypeptide

Operon

Group of genes having operator, structural gene
and other genes which all function as a unit.

5. Give the postulates of the chromosome theory

- i. Factors described by Mendel are genes which
are actual physical units of heredity.
- ii. Genes present on chromosomes in linear order
- iii. Each organism has fixed No. of chromosomes
which occur in two sets referred to as diploid
(2n). Pair of similar chromosomes constitute
the homologous pair.
- iv. One set is received from male parent
(paternal) other from female parent(maternal)
- v. Maternal and paternal chromosomes are contri-
buted by egg and sperm during zygote form
- vi. Chromosomes and genes segregate & assort
independently during gamete formation

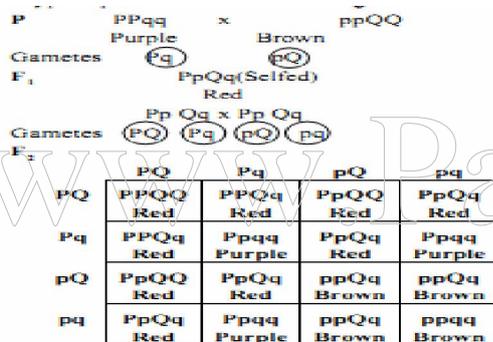
6. Why is intermediate dominance also called blending inheritance?

- Both the characters of parental plants are
mixed to give an intermediate character which
is different from that of the parents.

- But only the characters are mixed with each other and not the alleles.
- In *Mirabilis r1r1* produces red coloured flowers *r2r2* produces white coloured flowers,
- When they are combined, intermediate colour pink is produced.
- Because of this it is called as blending inheritance

7. Describe glume colour Inheritance in Sorghum

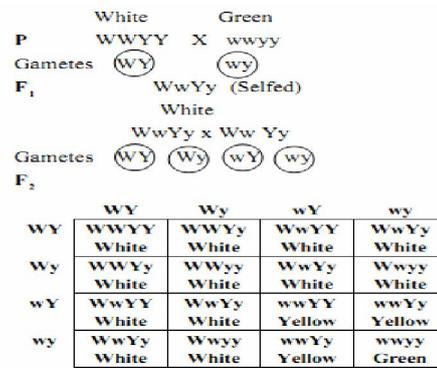
- i.* In Sorghum dominant gene (P) is responsible for purple colour over brown (q).
- ii.* When both dominant genes (P and Q) are brought together purple colour changed to red.
- iii.* A cross between purple (PPqq) and brown (ppQQ) results in plants with red colour in F₁
- iv.* F₁ heterozygotes are selfed
- v.* Three kinds of phenotypic classes are produced in of 9:3:4



Red: Purple : Brown
9 : 3 : 4

8. Explain fruit colour inheritance in Cucurbita

- i.* In *Cucurbita pepo* there are three common fruit colours white, yellow and green.
- ii.* White colour is produced due to the presence of dominant gene W.
- iii.* In the absence of W, dominant gene Y produces yellow fruit colour and the double recessive is green.
- iv.* Effect of dominant gene 'Y' is masked by dominant gene 'W' which is the epistatic gene so this is called dominant epistasis.
- v.* When pure breeding white fruited variety is crossed with the double recessive green variety, the F₁ hybrids are all white.
- vi.* When the hybrids are selfed, white, yellow and green fruited plants arise respectively in the ratio of 12:3:1



White : Yellow : Green 12:3:1

9. Differentiate between dominance and epistasis.

Epistasis	Dominance
Gene interaction involves two non- allelic pairs of genes.	No interaction since only one pair of genes is involved
One pair of genes masks effect of another pair of genes	An allele masks the effect of another allele of the same gene pair
Expression of both dominant and recessive alleles may be suppressed by the epistatic gene	Expression of a recessive allele is masked by the dominant allele
Number of phenotypes in F ₂ generation are reduced	No reduction

PLANT PHYSIOLOGY

1. Why is the cell called a physiological unit?

- i.* Plant cell has the capabilities of carrying out physiological functions as a single entity. It can be referred to as a physiological unit
- ii.* Cell wall provides shape and rigidity to cell.
- iii.* Plasma membrane involved in the absorption of water by osmosis, and other substances like ions and low molecular weight biomolecules.
- iv.* Protoplasm cytoplasm, nucleus and cellular organelles are involved various physiological phenomena taking place within the cell.
- v.* Vacuole functions as osmo-regulatory organelle
- vi.* Cell is the principal seat of metabolic events.

2. Explain the physical nature of protoplasm.

Many theories have been put forth to explain the physical nature of the protoplasm.

Alveolar foam Theory -Butschili

Protoplasm is a semi-transparent, viscous and slimy substance, essentially a liquid possessing a foaming or alveolar structure.

Colloidal Theory - Wilson Fischer

Considered protoplasm as a polyphase colloidal system.

Protoplasm exhibit the properties of colloids.

This theory is a widely accepted one

3. Describe the properties of protoplasm.

i. Colloidal System

- Protoplasm forms colloid system composed of water phase, protein phase, fat phase etc.
- It is said to be a polyphase colloidal system.

ii. Solution and Gelation

- Protoplasm exists mostly as a *sol* (semi-liquid) sometimes it is rigid and viewed as a *gel* (semi-solid)

iii. Brownian Movement

- Particles of protoplasm show an erratic zig-zag movement.
- Random motion, by uneven bombardment of particles is called *Brownian Movement*

iv. Tyndall Effect

- Scattering light beam by colloid particles is termed tyndall effect.
- This is a property of the protoplasm also.

v. Ultrafiltration

- Particles of protoplasm can be filtered through ultrafilters such as millipore filters only.

vi. Electrical Properties

- Colloid Particles carry uniform electric charge

vii. Flocculation or Co-agulation

- When colloid particles lose their charges they tend to aggregate and increase in size.
- As a result they fall out and get precipitated.
- Protoplasm also loses its living property.

4. Explain the components of water potential.

When plant cell is placed in a pure water medium, there are number of factors which determine water potential of cell sap.

i. Matric Potential

- 'matric' is surfaces which absorb water
- such as cell walls, protoplast and soil particles.

- influenced by presence of matric
- possesses negative value
- denoted as Ψ_m .

ii. Solute Potential

- It is also called Osmotic potential
- It represents amount of solute present
- denoted as Ψ_s .
- Ψ_s of pure water is zero
- and so Ψ_s values are negative.

iii. Pressure Potential

- Cell wall exerts pressure on cellular contents inwards called wall pressure
- causing a hydrostatic pressure to be exerted in vacuole called turgor pressure
- It is equal and opposite to wall pressure.
- Pressure potential is denoted as Ψ_p
- It is equivalent to either wall pressure or turgor pressure.
- Water potential $\Psi = \Psi_m + \Psi_s + \Psi_p$

5. Explain plasmolysis. Bring out its significance.

i. plasmolysis.

- When a plant cell is placed in hypertonic solution, the process of exosmosis starts
- Water from cell sap diffuses out into solution of external medium. of protoplasm due to continuous loss of water.
- Protoplasm becomes round due to contraction
- Such a cell is said to be plasmolysed and phenomenon is referred to as plasmolysis.

ii. incipient plasmolysis

- Initial stage of plasmolysis where protoplasm just starts leaving cell wall is called *incipient plasmolysis*.

iii. deplasmolysis.

- When a plasmolysed cell is placed in hypotonic solution, endosmosis takes place
- Protoplasm regains its original state and shape.
- This phenomenon is the reverse of plasmolysis and is called deplasmolysis.

iv. Significance of Plasmolysis

1. Helps to understand the living nature of a cell.
2. Helps to preserve meat, jellies

3. used in pickling as salting kills bacteria by plasmolysis.
4. Used to prove permeability of cell wall and selectively permeable nature of plasma membrane.

6. Differentiate between DPD and water potential.

Diffusion Pressure Deficit	Water Potential
originally called suction pressure.	called ψ_w chemical potential of water equivalent to DPD with a negative sign.
Measured in atmospheres	Measured in bars.
Difference between diffusion pressure of solution and pure solvent.	Difference between free energy of water molecules in pure water and solution.
DPD = OP - TP OP = Osmotic pressure TP = Turgor pressure.	$\psi_w = \psi_m + \psi_s + \psi_p$ ψ_m = Matric potential ψ_s = Solute potential ψ_p = Pressure potential
Water moves from lower DPD to higher DPD.	Water moves from higher water potential to lower water potential.

7. Explain mechanism of stomatal opening and closing.

- Opening and closing of stomata takes place due to changes in turgor of guard cells.
- Stomata open during day and close at night.
- Turgor changes in guard cells are due to entry and exit of water into and out of guard cells.
- During day, water from subsidiary cells enters guard cells making the guard cells fully turgid.
- Thin elastic convex outer walls are bulged out causing thick and rigid concave inner walls to curve away causing stoma to open
- During night time, water from guard cells enters subsidiary cells and guard cells become flaccid due to decrease in turgor pressure.
- This causes the inner concave walls to straighten up and the stoma closes.

8. Describe Proton potassium pump hypothesis.

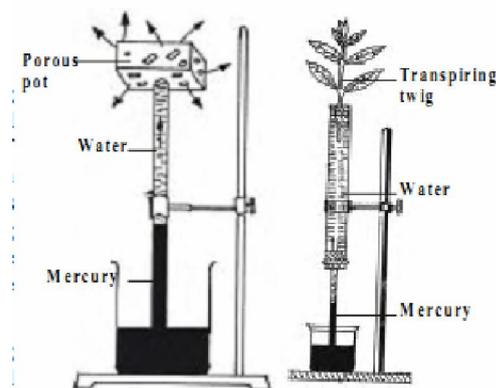
According to this hypothesis K^+ ions are transported into the guard cells in the presence of light.

The sequence of events taking place are

- i. Under the influence of light, protons formed by dissociation of malic acid move from cytoplasm in to the chloroplasts of guard cells.
- ii. To counter exit of protons, K^+ ions enter guard cells from surrounding mesophyll cells.
- iii. K^+ ions react with the malate ions present in guard cells to form potassium malate.
- iv. Potassium malate causes increase in osmotic potential of guard cells causing entry of water into guard cells as a result of which stomata opens.
- v. At night the dissociation of potassium malate takes place and K^+ ions exit out of guard cells causing loss of water from guard cells and so the stomata closes.

9. Give an experiment to demonstrate cohesion - tension theory.

- A young transpiring twig is fixed to a glass tube filled with water.
- Lower end of the tube is kept dipping in a dish containing mercury.
- As transpiration occurs in the twig the level of mercury rises in the tube due to the suction force created.
- Instead of transpiring twig, if a porous dry pot filled with water is used, same results are got.
- Thus the cohesion - tension or transpiration pull theory best explains the ascent of sap



10. Give an account of the inherent properties of the leaf which affect the rate of transpiration.

Leaf Structure

- In xerophytes, rate of transpiration is reduced due to structural modifications
- In *Opuntia* and *Asparagus* leaf is modified into thorns and stem becomes flattened and green to perform the function of the leaf.
- Such a structure is called a Cladode.

Root - Shoot Ratio

- Transpiration shows a direct relation with amount of water absorbed by roots and water lost through leaves.
- Increase in root- shoot ratio will increase rate of transpiration.

Age of Plants

- Germinating seeds generally show a slow rate of transpiration.
- It increases with age and becomes maximum at maturity.
- But rate of transpiration decreases during senescence.

11. Give advantages disadvantages of Hydroponic**Advantages of Hydroponics**

- Possible to give desired nutrient environment
- Acid-base balance can be easily maintained.
- Mulching, changing of soil and weeding are eliminated.
- Proper aeration of nutrient solution is possible.
- Labour for watering of plants can be avoided.
- Tilling is not necessary.

Disadvantages of Hydroponics

- Limited production compare to field condition
- Technical skill required to design equipment.
- If a disease appears all plants in the container will be affected.

12. Describe the technique of hydroponics

- Hydroponics is used for growth of plants in water and sand culture.
- Also referred to as soil-less agriculture, test-tube farming, tank farming or chemical gardening.
- Maintained in large shallow concrete, cement, wood or metal tanks in which gravel and nutrient solutions are taken.

- Tanks are provided with pumps and empty auxiliary tanks to pump out and circulate the growth solution and to maintain proper aeration of the nutrient solution.

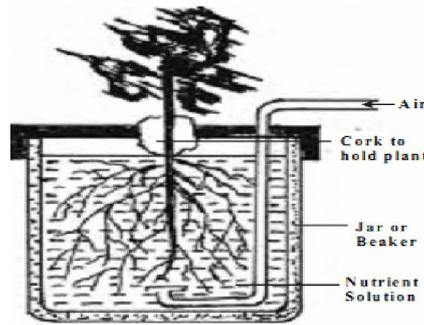


Fig : 5.7. Hydroponics

- Employed to know which mineral element is essential for growth and development of plant.
- Hydroponics involve production of horticultural and floricultural crops.
- Used to increase yield of ornamentals such as gladioli, snapdragon, roses and
- vegetables such as carrot, radish, potatoes, tomatoes and lettuce.

13. Describe the criteria for essentiality of element

- Normal growth and reproduction must be dependent on particular mineral elements.
- An essential element must have direct influence on the plant.
- Essential elements must be indispensable and their substitution by other elements must be impossible.
- Some elements are required in very low quantities and the status of essentiality or non essentiality is doubtful. For example silicon.

14. Explain Munch's mass flow hypothesis.**Munch hypothesis**

- Soluble food materials in phloem show mass flow.
- Sugars synthesized by mesophyll cells of leaves increase the osmotic pressure of these cells causing entry of water into mesophyll due to absorption of water by xylem cells
- Turgor pressure gradient exists through phloem, between the source mesophyll cell and regions of requirement (sink).
- As a result, turgor pressure of mesophyll cells increases on upper side which forces solutes

dissolved in water to flow en masse into phloem of stem and finally into the roots.

Explanation

1. A physical system consists of a glass tube bent at right angles.
2. At the two ends differentially permeable membranes are tied.
Thus there are two osmometers x and y.
3. Osmometer x has concentrated sugar solution while y has dilute sugar solution.
4. Two osmometers are kept in two separate water containers connected through a tube.
5. Osmosis takes place. Water entering x is more
6. As a result of turgor pressure developed, water will move out of x and will enter y.
7. Solute molecules are carried to y en masse with flow of water

15. Explain Active transport of mineral salt theory

Absorption of ions against the concentration gradient with the expenditure of metabolic energy is called active absorption.

Carrier Concept

1. Cell shows presence of carriers or transporters which are highly specific for a particular ion.
2. Carrier picks up an ion from external medium to form a carrier-ion complex
3. Undergoes rotation at 180° , moves across membrane and releases ions on the inner side of membrane, returns to pick up another ion.
4. Carrier may be an enzyme or a protein. Metabolic energy is expended in this process.
5. Carrier concept is explained by two theories:
 - i) Protein-Lecithin as carrier
 - ii) Goldacre's theory

16. Describe transports of mineral by ion exchange

i) Contact exchange theory

1. Ions are transferred from soil particles to root or vice versa without passing into solution.
2. Ions are electrostatically adsorbed to surface of root cells or clay particles and held tightly.
3. These ions oscillate within a small volume of space called oscillation volume.

4. When oscillation volume of two ions of same charge overlap, one is exchanged for the other.

ii) Carbonic acid exchange theory

1. According to this theory soil solution plays an important role in exchange of ions by providing a medium.
2. CO_2 released during respiration combines with water to form carbonic acid (H_2CO_3)
3. It dissociates as H^+ (Hydrogen ions) and HCO_3^- (bicarbonate ions).
4. A cation adsorbed on clay micelle may be exchanged with H^+ of soil solution
5. This cation diffuses into root in exchange for H^+ ion.

17. Write notes on cytochrome-pump hypothesis

H. Lundegardh suggested

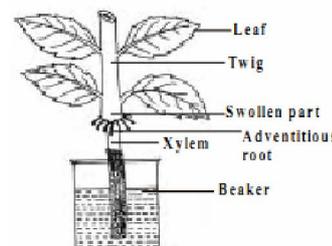
Anions could be transported across membranes by cytochrome system utilising energy released by direct oxidation of respiratory intermediates.

Important postulates are:

- i. Only anions can be actively transported.
- ii. Cytochromes act as carriers in absorbing
- iii. Oxygen gradient helps in oxidation at outer surface and reduction at the inner surface.
- iv. Transport of cations can be along electrical gradient created by ion accumulation.
- v. Selectivity in ion absorption can't be explained
- vi. This is absent in anaerobic plants

18. Describe the ringing experiment

1. Take a plant. Remove tissues outer to xylem. Pith in the form of ring at any place on stem.
2. Tissues removed portion is sealed with wax.
3. After 7-8 days epidermis and cortex of upper portion of ring become swollen
4. From this part adventitious roots emerge out.
5. Because food material translocated from leaves does not pass through the ring and is stored in the upper portion.



REPRODUCTION BIOLOGY

1. What is vegetative propagation?

1. Angiosperms propagate by producing seeds as a result of sexual reproduction.
2. They resort to other methods of reproduction, viz vegetative propagation.
3. Plants propagate by body part other than seed
4. Structural unit employed in place of seed is called *propagule*.
5. Lower plants reproduce vegetatively through budding, fission, fragmentation, gemmae, resting buds, spores etc.
6. Vegetative propagation is divided into
 - A) Natural vegetative propagation and
 - B) Artificial vegetative propagation

2. Discuss significance of vegetative propagation

1. More rapid, easier and a less expensive method of multiplying plants with poor viability or prolonged seed dormancy.
2. Introduce plants in areas where seed germination fails due to change in the soil and environmental conditions.
3. Bermuda grass or doob grass produce only a small quantity of seeds.
They are propagated vegetatively.
4. Vegetative propagation is the only method of multiplication in some plants
e.g banana, seedless grapes and oranges, rose and jasmine
5. Grafting permits physical and physiological joining of separate individuals for the best economic advantage
6. The good qualities of a race or variety can be preserved indefinitely.
7. All plants produced will have same characters and hereditary potential as the parent plants.

3. Describe various types of senescence

1. Whole plant senescence

- Found in monocarpic plants producing flower and fruit only once in their life cycle.
- Plants may be
 - Annual (*e.g. rice, wheat, gram, mustard*)
 - Biennials (*e.g. cabbage, henbane*)

perennials (*e.g. certain bamboos*).

- Plant dies after ripening of seeds.

2. Shoot senescence

- Found in perennial plants possessing underground perennating structures like rhizomes, bulbs, corm etc.
- Above ground part dies each year after flowering and fruiting,
- Underground part (stem and root) survives
- Puts out new shoots again next year.
E.g. banana, gladiolus, ginger etc.

3. Sequential Senescence

- Found in many perennial plants
- In which tips of main shoot and branches remaining a meristematic state and continue to produce new buds and leaves.
- Older leaves and lateral organs like branches show senescence and die.
- Apparent in evergreen plants.
e.g. Eucalyptus, Pinus etc.

4. Simultaneous or Synchronous senescence

- Found in temperate deciduous trees
- They shed their leaves in autumn develop new leaves in spring.
- Because of this falling of leaves, autumn season is also called fall.
- Such a senescence of leaves or plant organs is called synchronous.
e.g. elm and maple.

4. Differentiae: Epigeal and hypogeal germination.

Epigeal germination.	Hypogeal germination.
cotyledons are brought above the ground due to elongation of hypocotyl	cotyledons remain below the soil due to rapid elongation of epicotyl
seen in dicotyledon seeds	found in dicotyledon and monocotyledon seeds
hypocotyl grows actively and become curved	epicotyl elongates and become curved
It brings seed above soil	brings plumule above soil
seed coat falls down cotyledons become green.	Cotyledons remain under ground
E.g : Bean	Maize

ENVIRONMENTAL BIOLOGY**1. Describe effects of edaphic factors on organism****i. Soil**

- Upper weathered, humus containing earth layer
- Sustains plant life
- Contains living organisms and dead remains.
- Provides water, mineral salts and anchorage

ii. Mineral Matter

- Soil type is determined by soil particle.
- Loam soils are suited for plant growth because
 1. they possess porosity or aeration
 2. sufficient nutritive salts
 3. Water retaining capacity.

iii. Organic Matter

- Humus increases both aeration and hydration.
- Maintains structure of soil
- Provides inorganic salts
- Growth promoting substances to the soil.

iv. Soil Water

- Paramount importance in plants physiology
- Rain is the principal water source for soil.
- It occurs in various forms

v. Soil Air

- Essential for growth of root & micro organism
- A badly aerated or water-logged soil will have more CO₂ and lesser oxygen.

2. Give effect of light and temperature on plants**i) Light**

1. Affects structure, growth, activities of plants
2. Photosynthesis
Green plants synthesise their food using light on which rest of the living world depends.
3. Light regulated processes
 - Development of photosynthetic pigments
 - pigments for floral colour
 - red far red absorbs phytochrome pigment
 - induction and regulation of enzymes

4. Photoperiod

important factor in flowering of plants.

ii) Temperature

1. Living organisms survive in 5^o-35^oC range
2. Certain bacteria, cyanobacteria, seeds, spores and protozoans occur in hot springs or in very low temperature.

3. Organisms have developed physiological and behavioural adaptations to avoid extremes of temperature.
4. Temperature varies in earth according to latitude and altitude.
5. It is also influenced by plant cover, atmospheric humidity, water reservoirs, air current and snow.
6. According to change of temperature various vegetation zone are recognized.

3. List out the different kinds of hydrophytes**1. Free floating hydrophytes**

- Float freely on water surface not rooted in soil.
- Contact with both water and air
e.g. Eichhornia, Pistia, Wolffia, and Lemna

2. Floating but rooted hydrophytes

- Rooted in the mud
- leaves and flower shoots float on water
E.g. Victoria regia, Nymphaea, Nelumbium

3. Submerged hydrophytes (Free floating)

- Grow below water surface not in contact with atmosphere
E.g. Ceratophyllum, and Utricularia.

4. Submerged hydrophytes (Rooted)

- Completely immersed in water
- rooted in the mud.
E.g. Hydrilla, Vallisneria, Potamogeton etc.,

5. Amphibious Hydrophytes

- Grow in shallow waters.
- Roots, part of stems, leaves submerged
- Some flowering shoots above water surface.
- Adapted to aquatic and terrestrial life.
- Aerial parts show mesophytic characters,
- Submerged parts show hydrophytic character
e.g. Limnophylla heterophylla, Typha,

4. Explain the basis for xerophytes classification**1. Drought escaping plants**

- Also called as Drought evaders.
- Found in arid zones.
- Complete life cycles within a very short period
- Thus escape dryness
e.g. Solanum xanthocarpum,

Argemone mexicana, Cassia tora etc.

2. Drought Enduring Xerophytes

a. Succulents

- Suffer from dryness in external environment
- Succulent, fleshy organs (stems, leaves, roots) serve as water storage organs
- Accumulate large amount of water during brief raining season.

Agave, Aloe, Euphorbia, Opuntia Asparagus.

3. Drought resisting plants**(Non- succulent perennial)**

- True xerophytes.
- Possess morphological, anatomical and physiological characteristics
- Enable them to withstand dry condition.
- Suffer from dryness in internal and external environments.

e.g Calotropis, Acacia ,jujuba, Casuarina

5. What is the economic importance of forest?**1. Natural habitat for wild life.**

- Utilized by farmers for commercial and recreational purposes.
- Herbivores find shelter & carnivores prey.

2. Forest based industries:

- Bee-keeping, bamboo mat and basket making provides small-scale industry to tribal people.
- Sal is a source for timber industries.
- Raw materials for pulp and plywood industry.

3. Energy reservoir

- Forest traps energy from sunlight and storing it in the form of a biochemical product.
- Plants are primary producers of “food chain”.
- Food is stored in fruits, nuts, seeds, nectar and wood.

4. Keeping the atmospheric balance

- By consuming CO₂ and releasing O₂ essential for animal life.

6. What is a natural resource? Give an account of different types of natural resources?**Natural resources**

- ‘resource’ means a source of supply or support held in reserve.
- materials and sources of energy needed for survival and comforts of man

Types of natural resources**A. On the basis of chemical composition**

1. Inorganic Resources.

eg. air, water and minerals

2. Organic Resources

eg. plants, animals, microorganisms, fossil fuels

3. Mixture of Inorganic & Organic Resources,

eg. soil

B. Depending upon availability and abundance.**1. Inexhaustible Resources**

Not exhausted by man’s use.

e.g air, clay, sand, tidal energy

2. Exhaustible Resources

Likely to be exhausted by human use.

They are further of two types-

a. Renewable Resources

Capacity to reappear or replenish by quick recycling, reproduction and replacement within a reasonable time.

e.g Soil and living organisms

b. Non- Renewable Resources

Lack the ability for recycling and replacement.

Substances with a very long recycling time

e.g. fossil fuels and minerals.

7. Explain non conventional energy sources**i. Solar Energy**

- Inexhaustible, pollution free energy source
- Solar equipments developed to heat water, cook meals, light houses, run machines.

ii. Nuclear Energy

- Generated by fusion of Uranium -235 atom.
- Results in the release of enormous energy.
- 1 amu U – 235 can generate energy equivalent to 15 tons of coal or 14 barrels of crude oil.

iii. Wind Power

- Used for to run the wind-mills for grinding grains and pump water
- Used only in certain areas and on certain days.

iv. Dung Energy

- Cattle dung is used as fuel in rural areas
- Also used in Biogas or Gobar Gas Plant to produce an odourless, low pressure gas.
- This gas used for cooking and heating.

v. Other Energies

- Energy from house garbage
- Tidal Energy
- Geo-thermal Energy
- Hydro-electric Energy