

2. PLANT ANATOMY

Important One mark Points

1. Apical meristem is found at the tips of roots, stems and branches.
2. It is responsible for increase in length of plant.
3. Protoderm - - It gives epidermal tissue.
4. Procambium - - It gives Primary vascular tissues.
5. Ground meristem - - It gives Cortex and pith.
6. Intercalary meristem is present in the nodal region .
7. Intercalary meristem found in monocotyledons. Ex. Grasses.
8. Intercalary meristem Responsible for elongation of internodes.
9. Vascular cambium and cork cambium are the examples of lateral meristem .
10. Lateral meristem produces secondary permanent tissues.
11. Lateral meristem Responsible for thickening of stem and root.
12. Parenchyma Present in all organs of the plant.
13. Parenchyma constitutes the ground tissue.
14. Parenchyma is the Precursor of all the other tissues.
15. Parenchyma the Cell wall is made by cellulose.
16. Collenchyma occurs in hypodermis.
17. Collenchyma is absent in the roots of land plants.
18. Collenchyma gives strength to young organs.
19. Collenchyma the cell wall is made up of hemi cellulose and pectin.
20. Lamellar collenchymas.Ex. Hypodermis of Helianthus.
21. Angular collenchyma Ex. Hypodermis of Datura and Nicotiana.
22. Lacunate collenchyma Ex. Hypodermis of Ipomoea.
23. Sclerenchyma is a dead cells .
24. Brachy sclereids Ex. Pulp of Pyrus.
25. Macro sclereids Ex. Crotalaria.
27. Osteo sclereids Ex. Seed coat of pisum.
28. Sclerenchyma have lignified secondary walls.
29. The unicellular and multi cellular appendages that originate from the epidermis are called Trichomes
30. Short cells are called trichoblasts .
31. Root hairs are originated from trichoblasts .
32. The minute pores surrounded by two bean shaped guard cells.
33. The guard cells are bounded some special cells called subsidiary cells (or) accessory cells.
34. The guard cells contains chloroplasts .
35. Xylem(Greek word . Xylos- wood)
- 36 . Xylem Responsible for the conduction of water and mineral salts.
36. The xylem is derived from pro cambium is called primary xylem.
37. The xylem is derived from vascular cambium is called secondary xylem.
38. Earlier formed xylem elements are called proto xylem.
39. Later formed xylem elements are called meta xylem.
40. Tracheids functions: water and mineral conducting elements in gymnosperms and pteridophytes
41. Vessels contains Simple perforation plate. Ex. *Mangifera*.
42. Many pores are formed i.e Multiple perforation plate. Ex. *Liriodendron*.
43. Xylem fibres are also called libriform fibres.
44. Vessels are absent in pteridophytes and gymnosperms.
45. Vessels are chief water and mineral conducting elements in angiosperms
46. In C.S .Tracheids appear polygonal
47. Phleom responsible for the conduction of food materials.
48. Phloem is derived from procambium is called primary phloem.

49. Phloem is derived from vascular cambium is called secondary phloem.
50. Earlier formed xylem elements are called proto phloem.
51. Later formed xylem elements are called meta phloem.
52. In mature sieve tubes, nucleus is absent. It contains lining layer of cytoplasm.
53. Sieve cells occur in pteridophytes & Gymnosperms. . Sieve tube occurs in angiosperms.
54. In mature sieve elements ,the pore are blocked by a substances called callus.
55. Companion cells present only in angiosperm and absent in Pteridophytes & Gymnosperms.
56. Periderm is a another protective tissue that supplement the epidermis in roots and stem that undergo secondary growth.
57. Homogenous cortex is seen in Roots (Monocot & Dicot)
58. The innermost cortex is called Endodermis
59. casparian strips & passage cells are in Roots (Monocot & Dicot)
60. Exarch and polyarch xylem is seen in Monocot Root
61. Exarch and Tetarch xylem is seen in Dicotcot Root
62. The conjunctive tissue is sclerenchymatous tissue in Monocot Root
63. The conjunctive tissue is parerenchymatous tissue in Dicot Root
64. Function of pericycle is to originate lateral roots.(Endogenous origin).
65. Pith is absent in Dicot root.
66. Pith is present in Monocot root.
67. Suberin is present in casparian strips .
68. No secondary growth in Roots
69. Radial vascular Bundles are seen Roots .
70. No epidermal out growths in monocot stem .
71. Hypodermis is made up of sclerenchymatous cells in monocot stem .
72. Vascular bundles are scattered in monocot stem .
73. Bundle sheath by sclerenchymatous tissue in monocot stem .
74. Vascular bundles are conjoint, collateral, endarch & closed in monocot stem .
75. Vascular bundles are Skull shaped in monocot stem .
76. proto xylem lacuna in monocot stem .
77. Multi cellular hairs are present in epidermal cells of Dicot stem .
78. In Dicot stem ,the innermost layer of cortex is called endodermis. This layer also called starch sheath
79. Eustele is found in Dicot stem .
80. Bundle cap or Hard bast in Dicot stem.
81. Vascular bundles are wedge shaped in Dicot stem.
82. Vascular bundles are arranged in the form of Ring in Dicot stem.
83. In Dicot stem ,Each VB is conjoint, open and Endarch.
84. Primary pith rays or primary medullary rays found in Dicot stem.
85. Resin ducts are seen in Dicot stem..
86. Sclerenchyma patches of pericycle occurs in Dicot stem.
87. Vascular bundles are present in veins in dicot leaf .
88. Vascular bundles are conjoint, collateral & closed in dicot leaf.
89. Xylem is present to words the upper epidermis in dicot leaf
90. Phloem is present to words the lower epidermis in dicot leaf
- 91 .Bundle sheath (or) Boarded parenchyma found in dicot leaf

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3. CELL BIOLOGY AND GENETICS

ONE MARK POINTS

1. Similar structures of chromosome called chromatids.
2. Satellite - A short chromosomal segment
3. Telomere is the terminal part .
4. In the human ,44 chromosomes are autosomes two chromosomes are sex chromosomes.
5. B–chromosomes are also called supernumerary chromosomes.
6. Double minutes are unstable chromosome-no centromere - occur in cancer cells - resistance against drugs
7. Polytene chromosomes by C.G. Balbiani--present in the salivary glands of Drosophila.
8. Balbiani rings also known as chromosomal puff.
9. Lamp brush chromosomes first observed by Flemming . Observed in oocytes of an animal
10. Salamander and unicellular alga Acetabularia.
11. Coupling- Bateson and Punnett in sweet pea, Lathyrus odoratus. ratio is 7:1:1:7
12. Repulsion- ratio obtained is 1:7:7:1
13. Crossing over takes place in pachytene stage of prophase I of meiosis.
14. Deletion mutation. Ex.bacteriophages.
15. Physical mutagens -Electromagnetic radiation -- α , β and γ , ultraviolet rays, temperature, etc
16. Ionizing radiations : X-rays and gamma rays which induce mutation in seeds.
17. Nonionizing radiations : UV rays .
18. chemical mutagenic agents. Eg.Nitrous acid,Methyl methane sulphonate (MMS) and Ethyl methane sulphonate (EMS).
19. Mutations Ex. mutant strains of Penicillium produces more penicillin.
20. Induced mutants are reported in paddy, wheat, soyabeans, tomatoes, oats, and barley.
21. Cistron is an unit of function
22. Recon is the unit of recombination
23. Muton is the unit of mutation.
24. Terminal deletion Eg. Drosophila and Maize.
25. Duplicated reported in Drosophila, corn and peas
26. The17th human chromosome is acrocentric, In Chimpanzee the chromosome is metacentric.
27. Homozygous translocation - important role in species differentiation and causes hereditary disorders
28. Reciprocal translocation also called illegitimate crossingover.
29. Euploidy is increase or decrease of full set chromosome number
30. Addition of one or more haploid set of its own genome in an organism called autopolyploidy.
31. Autotriploids : Watermelon, grapes and banana .
32. Autotetraploid : Apple
33. Increase in one or more haploid set of chromosomes from two different species is called allopolyploidy.
34. Triticale is the first man made cereal.
35. 38.2% in biochemical activities like synthesis of immunological and structural proteins,
36. 23.2% in the maintenance of genome,
37. 21.1% in receiving and giving signals related to cellular activities
38. 17.5% in the general functions of the cell.
39. The functions of 30,000 to 40,000 human genes are known.
40. rRNA represents about 40 to 60 per cent of the total weight of the ribosomes.
41. 80 per cent of the total RNA of the cells.
42. 3 to 5 per cent of the RNA content of the cell.
43. Variation of one or two chromosomes within the diploid set of an organism aneuploidy
44. Monosomy $2n - 1$. is due to loss of a chromosome from the diploid set.
45. Nullisomy $2n - 2$. is a pair of homologous chromosomes is lost from the diploid set
46. Addition of one or two chromosomes to the diploid set of chromosome results in hyperploidy.

47. Trisomy $2n + 1$. addition of one chromosome to diploid set of chromosomes. Ex. Datura stramonium.
48. Tetrasomy $2n+2$ addition of two chromosomes to diploid set of chromosome. $2n+2$.
49. Tetraploid cabbages and tomatoes contain more ascorbic acid
50. Tetraploid corn contains more vitamin A.
51. Both euploidy and aneuploidy in man cause congenital diseases.
52. Polyploidy varieties like apple, pear, grape and watermelons
53. DNA is the genetic material by Frederick Griffith using Diplococcus pneumoniae. (1928)
54. Watson and Crick (1953) proposed double helix DNA model.
55. Photographs of DNA by Wilkins and Franklin.
56. Two hydrogen bonds between adenine and thymine ($A = T$) and
57. Three hydrogen bonds between guanine and cytosine ($G \equiv C$) pairing.
58. The width of DNA molecule is 20 \AA .
59. The strand completes a turn every 34 \AA along its length. There are ten nucleotides per turn.
60. The internucleotide distance is 3.4 \AA
61. Watson and Crick model of DNA is called B-form DNA.
62. Replication takes place during the interphase stage.
63. Watson and Crick suggested the semiconservative method of replication of DNA.
64. Proved by Messelson and Stahl's in Escherichia coli.
65. The replication in E. coli is completed in 40 minutes.
66. An enzyme helicase unwinds the two strands and fork is formed.
67. An enzyme called topoisomerase releases these supercoils.
68. DNA polymerase I, II and III are involved in this elongation.
69. Synthesis of new DNA, by RNA primer and the enzyme primase.
70. DNA is synthesized in small fragments called Okazaki fragments during replication
71. DNA fragments are linked by the enzyme called ligase.
72. The tRNA has a cloverleaf like structure.
73. R.W. Holley (1965) suggested the cloverleaf model of tRNA.
74. tRNA molecule consists of a single strand,
75. There are three folds in the clover leaf tRNA.
76. The tRNA molecules are made up of 73 to 93 ribonucleotides.
77. tRNA has four arms namely 1. anticodon arm, 2. D arm, 3. T ψ C arm 4. amino acid acceptor
78. The acceptor arm carries an amino acid.
79. The anticodon arm has three anticodon nucleotides.
80. The unit of genetic map is Morgan or centimorgan.
81. Then the map distance between the linked genes is one morgan

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4. BIO TECHNOLOGY

ONE MARK POINTS

1. The culture medium is closed with cotton plug/ or aluminium foil sheet .
2. The pH of the medium is adjusted to 5.8 (acidic range).
3. The culture medium can be sterilised by keeping temperature of 121°C for 15 minutes.
4. Flamed and cooled forceps are used for transfer of plant materials.
5. Incubated temperature 26 ± 2 C
6. Light intensity at 2000 to 4000 lux (unit of intensity of light) allowing photoperiod of 16 hour of light and 8 hours of darkness.
7. Due to activity of auxins and cytokinins, the explant is induced to form callus.
8. Auxin induce cell elongation and cytokinin induces cell division .
9. The development of shoot from the callus is called caulogenesis
10. Formation of root from the callus is called rhizogenesis.
11. Exposing the plantlets to the natural environment --hardening
Plant tissue culture methods are employed in plants by following methods.
12. Micropropagation
13. Bud proliferation and multiple shoot frair
14. Apical meristem culture eg. banana
15. Artificial synthetic seeds by somatic embryogenesis.
16. Production of secondary metabolites
17. Induction of haploidy in anther culture
18. Embryo culture technique somatic hybrids.
19. Hybrid cell was made to develop into a pomato plant.
20. *Agrobacterium tumefaciens* bacterium used in gene transfer to plants .
21. *Agrobacterium tumefaciens* - a soil inhabiting bacterium. It has Ti (tumor inducing) plasmid.
22. It causes crown gall disease to tomato, sunflower, brinjal and cotton.
23. Toxic protein called delta endotoxins (Bt_2) from *Bacillus thuringiensis* .
24. Ti plasmid mediated transformation of tobacco, cotton and tomato plants.
25. All bacteria produces restriction enzymes
26. The transgenic plants were resistant to the *Manducta sexta*, a pest of tobacco.
27. India had acquired this technology from U.S.A.
28. The high nucleic acid content 4 to 6 per cent in algae, 6 to 10 per cent in yeast
29. SCP production materials. alkanes, methane, methanol, cellulose, carbohydrates and waste materials.
30. *Spirulina* tablets are prescribed as enriched vitamin for most people.
31. SCP lowers blood sugar level due to the presence of gamma- linolenic acid and
32. prevents the accumulation of cholesterol in human body.
33. In tomato the enzyme polygalactronase leading to softening of the fruit during ripening.
34. Anand Mohan Chakrabarty, developed a strain of *Pseudomonas putida*.
35. A hybrid plasmid derived by combining parts of CAM and OCT. (camphor and octane)
36. German G.Haberlandt (German) successfully cultured individual plant cells,
37. Gauthret, White and Nobecourt discovery of auxins and vitamins.
38. in vitro culture of plant cells, tissues and organs was reasonably well developed by Prof. P.Maheshwari and Prof S. Narayanaswamy at the Department of Botany, University of Delhi.
39. The protoplasts are released and are kept in the isotonic solution to prevent damage
40. The isolated parent protoplasts are fused with a fusogenic agent like Polyethylene glycol (PEG)

5.PLANT PHYSIOLOGY

PHOTOSYNTHESIS .ONE MARKS POINTS

1. Over half a million chloroplasts are present in one square millimetre of a leaf.
2. Size of the chloroplast 4 to 6 micron.
3. The space enclosed by the envelope is filled with matrix called stroma.
4. In the stroma, many grana are embedded.
5. chloroplast contains 40 to 60 grana.
6. Magnesium is an essential component for the formation of chlorophyll.
7. Chlorophyll 'a' is a universal pigment or primary pigment.
8. Accessory pigments eg. chlorophyll 'b', carotenoids and xanthophyll,
9. Photosynthetic pigments occur in the granum.
10. 250 to 400 pigment molecules are present in a photosystem.
11. Process of ATP from ADP in the presence of light is photophosphorylation.
12. Splitting of water molecules is called photolysis of water.
13. Manganese, calcium and chloride ions play prominent roles in the photolysis of water.
14. In non cyclic electron ADP into ATP formed between plastoquinone and cytochrome f,
15. The noncyclic electron transport takes place in the form of 'Z'. so called Z-scheme.
16. During Cyclic , two ATP produce - one between ferredoxin and cytochrome b₆ and
17. the other between cytochrome b₆ and cytochrome f.
18. Fixation of a molecule of CO₂ to RuBP is catalyzed by the enzyme RuBP carboxylase.
19. Two PGA mol. are converted to 1,3 bisphosphoglyceric acids by the enzyme PGA kinase.
20. Two molecules of 1,3-bisphosphoglyceric acid are reduced to glyceraldehyde-3-phosphates by the enzyme glyceraldehyde-3-phosphate dehydrogenase
21. Two ATP and two NADPH₂ are consumed To reduce one molecule of CO₂
22. Three CO₂ molecules are fixed and the net gain is a 3C called DHAP
23. For every carbon fixation 3ATP and 2 NADPH₂ are consumed.
24. Hatch and Slack observed that 4C compounds such as oxaloacetic acid,
25. Malate and aspartate were the first formed compounds, of C₄ plant
26. Sugarcane is an example for C₄ plant
27. 3C compound called phosphoglyceric acid is formed.
28. Rice plant is an example for C₃ plant.
29. C₃ plants, photosynthesis occurs only in mesophyll cells.
30. In light reactions ATP and NADPH₂ are produced and oxygen is released
31. CO₂ is reduced to carbohydrates by dark reactions.
32. In C₃ plants both light reactions and dark reactions occur in mesophyll cells,
33. C₄ plants, two types of photosynthetic cells –mesophyll cells and bundle sheath cells.
34. C₄ plants have dimorphic chloroplasts i.e.chloroplasts in mesophyll cells are granal (with grana) whereas in bundle sheath chloroplasts are agranal (without grana).
35. Examples of C₄ plants are maize, sugarcane, Tribulus and Amaranthus
36. Optimum temperature of C₄ plants is 30 to 45
37. Examples of C₃ plants are rice, wheat and potato.
38. Optimum temperature of C₃ plants is 20 to 25
39. The first stable product is a 3C – 3 PGA
40. The first stable product is a 4C- OAA

41. The CO_2 molecule acceptor is RUBP in C_3
42. The CO_2 acceptor molecule is PEP
43. Photorespiration involves three organelles – chloroplasts, peroxisomes and mitochondria.
44. Oxidation of RuBP in the presence of high oxygen is the first reaction of photorespiration.
45. Oxidation of RuBP is catalysed by Rubisco* enzyme called carboxylase.
46. Photorespiration is also known as photosynthetic carbon oxidation cycle or C_2 cycle.
47. Blackmann who postulated Law of Limiting factor in 1905,
48. Light between the wavelength of 400nm to 700nm is most effective for photosynthesis
49. The current level of CO_2 is about 0.036 per cent or 360 ppm (parts per million),
50. Nitrogen has a direct relationship with photosynthesis.
51. Nitrogen is a basic constituent of chlorophyll and all enzymes involved in dark reactions,
52. Test tube funnel experiment demonstrates that oxygen is evolved during photosynthesis Hydrilla
53. Ganong's light screen experiment demonstrates that light is essential for photosynthesis
54. Clinging roots fix the epiphytes to the bark of the tree
55. The aerial roots hang, green and covered by a spongy tissue called velamen which absorbs the moisture in the air as well as rain water. eg. Vanda.
56. Many fungi and bacteria are saprophytes.
57. angiosperms like Monotropa lack chlorophyll and have mycorrhizal roots.
58. Parasitic plants these roots are called haustoria.
59. Total parasites. eg. Cuscuta.
60. Partial parasites. eg. Viscum.
61. Insectivorous plants. Eg. Drosera. leaves are modified. also known as sundew plant. contain proteolytic enzymes
62. Examples for chemosynthetic autotrophs are Nitrosomonas, Beggiatoa.
63. Nitrosomonas oxidizes ammonia into nitrite.
64. Beggiatoa oxidises H_2S to sulphur and water.
65. chemosynthetic heterotrophs are fungi, most bacteria, animals and man.

RESPIRATION --ONE MARK POINTS

1. Release of energy by oxidation of various organic molecules is known as respiration.
2. Carbohydrate is the common respiratory substrate.
3. Respiration is an exothermic reaction and the oxidation of glucose
4. ATP is described as energy currency of the cell.
5. ATP contains nucleotide consisting of adenine, ribose sugar and three phosphate groups.
6. ATP contains two high energy terminal bonds.
7. Four distinct stages of respiration – glycolysis, oxidative decarboxylation of pyruvic acid, Krebs cycle and Electron transport chain.
8. glucose (6C) is split into two molecules of pyruvic acid (3C) is called glycolysis.
9. German Microbiologists – Embden, Meyerhof and Parnas, first demonstrated
10. Glycolysis in yeast cell. EMP pathway. It occurs in cytoplasm.
11. Glycolysis is divided into two phases – hexose phase and triose phase.
12. Glyceraldehyde 3-phosphate and DHAP are the products of hexose phase
13. two molecules of pyruvic acid are the products of triose phase.
14. Removal of water molecule from the substrate is called enolation.
15. Oxidative decarboxylation of pyruvic acid takes place in mitochondria
16. Krebs cycle Sir Hans Adolf Krebs in mitochondria
17. Converting pyruvic acid to carbon dioxide and water in mitochondria is called Krebs cycle.
18. It is also known as citric acid cycle or tricarboxylic acid cycle – TCA cycle.

19. Krebs cycle involves with both anabolic and catabolic processes, it is also described as amphibolic process.
20. The electron transport components are arranged in the inner membrane of mitochondria.
21. The molecular oxygen forms the terminal constituent of the electron transport system.
22. Glycolysis $2 \text{ ATP}, 2 \text{ NADH}_2 = 8 \text{ ATP}$
23. Oxidative decarboxylation of pyruvic acid $2 \text{ NADH}_2 = 6 \text{ ATP}$
24. Krebs cycle $2 \text{ ATP}, 2 \text{ NADH}_2, 2 \text{ FADH}_2 = 24 \text{ ATP}$
25. Total $4 \text{ ATP}, 10 \text{ NADH}_2, 2 \text{ FADH}_2 = 38 \text{ ATP}$
26. The aim of Ganong's respiroscope experiment is to demonstrate liberation of carbon dioxide during respiration.
27. Dickens discovered Pentose phosphate pathway or hexose monophosphate pathway or direct oxidation pathway.
28. Pentose phosphate path way consist of Two phases - oxidative and nonoxidative phases.
29. Pentose phosphate pathway takes place in the cytoplasm only.
30. Anaerobiosis means life in the absence of oxygen. It occurs in yeast and some bacteria.
31. The pyruvic acid is further converted into either ethanol or organic acids like lactic acid.
32. Fermentation is a good example for anaerobic respiration.
33. Respiratory quotient "the ratio between the volume of carbondioxide given out and oxygen consumed during respiration"
34. Respiratory quotient of a carbohydrate (Glucose) = 1
35. Respiratory quotient of an organic acid (malic acid) = 1.33 more than one
36. Respiratory quotient of fatty acid (palmatic acid) = 0.36 less than one
37. Respiratory quotient for anaerobic respiration is infinity
38. The anaerobic breakdown of glucose to carbondioxide and ethanol is a form of respiration referred to fermentation.
39. yeast cells and accounts for the production of alcohol in alcoholic beverages.

PLANT GROWTH

1. Growth may be defined as an irreversible increase in mass, weight and size of a living organisms.
2. Growth in higher plants includes cell division, enlargement and differentiation.
3. Growth is generally divided into three phases viz., formation, elongation and maturation.
4. Initial stages and this phase is called lag phase.
5. Rapid growth phase called log phase.
6. Final phases, known as stationary phase or steady state phase.
7. 'S' shaped curve known as sigmoid growth curve
8. Growth regulator is a hormone like synthetic organic compound. eg. Naphthalene acetic acid (NAA).
9. Auxin was isolated initially from human urine.
10. Auxins such as IAA and phenyl acetic acid (PAA) are natural auxins.
11. Synthetic auxins. eg. Naphthalene acetic acid, 2,4 - Dichlorophenoxy acetic acid.
12. auxin -apical dominance.
13. Gibberellin was first discovered in Japan by Kurusowa. He observed in rice seedlings
14. internodal elongation -- 'bakanae' or 'foolish seedling' disease of rice. a fungus, Gibberella fujikuroi
15. gibberellin. This sudden elongation of stem followed by flowering is called bolting.
16. Gibberellin breaks dormancy in potato tubers.
17. Cytokinin is stimulates cell division. Isolated by Miller and Skoog in 1954 from Herring fish.
18. The cytokinin found in the zea mays is called zeatin. also found in the endosperm of coconut.
19. Application of cytokinin delays the process of ageing in plants are called Richmond Lang effect.
20. Ethylene is a simple gaseous hormone.
21. Abscisic acid causes closure of stomata.
22. Growth inhibitors. ABA

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6. BIOLOGY IN HUMAN WELFARE

ONE MARK POINTS

1. ICAR – Indian Council of Agricultural Research
2. wheat, oats --once wild plants -now been domesticated).
3. Fortified rice - iron rich rice and carotene rich rice
4. Clonal selection crops like sugarcane, potato, tea, banana and certain species of grasses
5. A mung Phaseolus mungo variety was introduced from China
6. No.1 mung variety is now being cultivated in Punjab.
7. Fusion of protoplasts from two different varieties enhanced by polyethylene glycol (PEG)
8. The superiority of the F_1 hybrid in performance over its parents is called heterosis or hybrid vigour.
9. Polyploidy can be induced by the use of colchicine
10. Seedless tomato, apple, watermelon and orange are autopolyploids.
11. Radiation induces mutation UV shortwave, X- ray, Alpha, Beta, Gamma waves
12. Chemicals mutagens eg. Caesium, ethyl methane sulfonate, nitromethyl urea
13. Atomita 2-rice - saline tolerance and pest resistance, groundnuts with thick shells are products of breeding methods through induced mutation.
14. E. coli is made to produce human insulin by introduction of human insulin producing gene into bacterial plasmid.
15. To release a newly created variety it takes nearly 12 years
16. Cyanobacteria --Anabaena, Calothrix, Gleocapsa, Lyngbya, Nostoc, Oscillatoria, Scytonema
17. Nitrogen fixing bacteria Azotobacter, Bacillus and Rhizobium
18. Leguminous plants like Crotalaria juncea, Cassia mimusoides, Glycine max, Indigofera linifolia, Sesbania rostrata, Acacia nilotica, Leucena, Lathyrus and Mucuna are used as green manures.
19. Azolla is an aquatic fern, contains an endophytic cyanobacterium Anabaena azollae in its leaves.
20. A. pinnata is widely employed as a successful biofertilizer in Indian rice fields.
21. Mycorrhiza is a root inhabiting fungus
22. VAM (Vesicular Arbuscular Mycorrhiza)
23. Ectotrophic mycorrhiza, found only outside of roots of plants. eg. Basidiomycetous fungi.
24. Endotrophic mycorrhiza, found inside the roots, (intra and intercellular) eg. VAM fungi.
25. Cyanobacteria secrete growth promoting hormones like indole 3-acetic acid, indole butyric acid, naphthalene acetic acid, aminoacids, protein and vitamins to soil.
26. Cyanobacteria are potent neutralizers, they help in the neutralization of soil Blue green algae play a vital role in this conversion.
27. Azotobacter and Azospirillum secrete antibiotics which act as biopesticides.
28. Rice - Oryza sativa a Deuteromycetes fungus- Pyricularia oryzae- Blast disease of rice.
29. Immersion of the seeds in 0.2 % solution of Kalimat B for 24 hours controlled the Blast disease . Seed protectants such as agrosan, cerasan and spergon of the Blast disease
30. Bordeaux mixture formula Copper sulphate 9 Kgs, Quick lime 9 Kgs, Water 250 litres.
31. The secondary host plants Digitaria marginata from paddy .
32. Groundnut Arachis hypogea Tikka disease by a fungus Deuteromycetes Cercospora personata.
33. Citrus canker disease by bacterium Xanthomonas citri. Bacillus and gram negative type
34. Streptocycline- an antibiotic – to control citrus canker disease
35. Rice Tungro virus, transmitted by a leafhopper.
36. Serin (carbaryl), a powerful pesticide kill more than 100 types of insects attacking 100 different crops. Bhopal Tragedy. methyl isocyanate (MIC) gas leaked from Union Carbide Factory at Bhopal on 2nd and 3rd December, 1984
37. Pyrethrum extracted from the inflorescence of Chrysanthemum belonging to Asteraceae.
38. Potrykus of Switzerland and Peter Beyer of Germany transferred genes that make carotene in daffodils into Oryza sativa.
39. Tomatoes with elevated sucrose and reduced starch produced using sucrose phosphate synthase gene.

40. Starch content in potatoes could be increased by 20 to 40 per cent by using a bacterial ADP glucose pyrophosphorylase gene (ADP GPPase).
41. Vaccines, antibodies and interferons can be consumed directly along with tomato, banana and cucumber
42. Acute watery diarrhoea is caused by *Escherichia coli* and *Vibrio cholerae*
43. Interferons are the substances made of proteins and are anti-viral in nature.
44. Most lethal agents are anthrax, plague, smallpox and Ebola viruses with viral diseases.
45. *Catharanthus roseus* (*Vinca rosea*) possess anticancerous properties
46. In U.S.A, patents are given for 17 years.
47. In India , patents are given for 5 years.
48. U.S.A the Government had granted a patent to cover the entire 'basmati' rice plant
49. *Pentadiplandra brazzeana*, of West Africa, produces a protein called brazzein. It is several 100 times as sweet as sugar. It as a low-calorie sweetener.
50. The animal 'oncomouse' was also patented.
51. An oil eating bacterium *Pseudomonas* by a non-resident Indian Scientist Dr.Chakrabarty
52. Winged bean which has high protein and oil.
53. Leaves of *Ilex paraguriensis*, a substitute for tea
54. Powdered seeds of *Cola nitida* instead of coffee.
55. Herbal drugs (Ginseng *Vinca*, Emetine from *Cephalis*)
56. Morphine, pain killer from Opium poppy - *Papaver somniferum*.
57. Quinine, antimalarial drug controls malarial fever from *Cinchona calisaya* and *C. officinalis*.
58. Digoxin, treat heart diseases from the plant *Digitalis*.
59. Ephedrine,treat cough from the plant *Ephedra sinica*.
60. Mental and physical stress relaxing drug from the plant ginseng – *Panax ginseng*.
61. *Acalypha indica* –*Euphorbiaceae* - kuppaimeni, poonamayakki -- catkin inflorescence-- Powdered leaves are used to cure bedsores and infected wounds.
62. Acalyphine and Triacetoneamine are extracted from *Acalypha indica* this plant.
63. *Aegle marmelos* – *Rutaceae*- vilvam- trade name is baer fruit- axillary panicles- Marmelosin, coumarin and triterpenoids are responsible for medicinal activity.
64. *Cissus quadrangularis* – *Vitaceae*- pirandai- trade name is 'Hadjor' – bone joiner-- Steroids like prescene and tetracyclic triterpenoids
65. *Mimosa pudica*—*Mimosaceae*- Thottal chinungi or Thottal surungi- axillary heads- Mimosine, an alkaloid is extracted from this plant.
66. *Solanum nigrum*-- manithakkali or manathakkali. -- trade name is black night shade- Flowers white borne on extra axillary cymes. treatment of liver disorders like cirrhosis of liver. solanin and saponin are extracted from this plant.
67. Penicillin- blue green mold *Penicillium notatum*-- against gram-positive bacteria like *Pneumonia bacteria*.
68. Streptomycin from bacterium, *Streptomyces griseus*, an actinomycetes. It cures urinary infections, tuberculosis, meningitis and pneumonia.
69. Aureomycin from *Streptomyces aureofaciens*, actinomycetes, It is used as a medicine in the osteomyelitis, whooping cough and eye infections.
70. Chloromycetin from *Streptomyces venezuelae*, actinomycete,. It kills bacillus form of bacteria and cures typhoid fever.
71. *Aspergillus fumigatus* produces antibiotic which is used against typhoid and dysentery.
72. Bacitracin is an antibiotic obtained from *Bacillus licheniformis* and it is used to treat syphilis.
73. Through genetic manipulation, human gene for insulin production, the bacterium *E. coli* is articulated to produce human insulin called "humulin".
74. *Oryza sativa*. It belongs to *Poaceae*
75. *Arachis hypogea*. It belongs to *Fabaceae*.
76. Cotton Many members of *Malvaceae*
77. *Tectona grandis*. It belongs to *Verbenaceae*

+2 Taxonomy of Angiosperms

1. Define Taxonomy

Taxonomy is concerned with laws governing the classification of plants. It includes classification, identification, description and naming of the plants. It is also called systematic botany.

The knowledge gained through taxonomy is useful in medicine, agriculture, forestry etc.,

2. Write the aims of taxonomy.

- 1) To arrange plants in an orderly sequence based upon their similarities.
- 2) To establish phylogenetic relationships among the different groups of plants.

3. Later System of classification gave more importance to floral characters. Why?

Later System of classification gave more importance to floral characters because floral characters are more stable & permanent.

4. Name the Type of classification

1. Artificial
2. Natural
3. Phylogenetic

5. What is Biosystematics?

The plants are classified based on other disciplines of science such as cytology, Genetics, Physiology, Ecology, Phytogeography, phytochemistry, Numerical taxonomy, molecular biology, Breeding systems and any available sources are called Biosystematics. It is also called Taxonomy of living populations.

6. Write the Aims of Biosystematics:

1. To delimit the naturally occurring biotic community of plant species.
2. To recognise the various groups as separate Biosystematic categories such as ecotype, ecospecies, cenospecies and cambarium.

7. Define Botanical nomenclature

The system of naming plants on a scientific basis is known as Botanical nomenclature.

8. What is Polynomial nomenclature ?

Naming of the plants by many words constituting more or less the description of the plant are called Polynomial nomenclature.

Ex. *Caryophyllum saxatilis folis gramineus umbellatis corymbis*.

Meaning – Caryophyllum growing on rocks, having grass like leaves with umbellate corymbose inflorescence.

9. Define Binomial nomenclature

Naming of the plants by two words are called Binomial nomenclature.

Ex. *Mangifera indica* (mango)

First word refers Genus and second word refers species.

The two words in combination comprise the name of the plant.

10. Describe ICBN- (International code of botanical nomenclature)

To frame the rules and regulations for naming plants .

In 1930 – fifth international botanical congress held at Cambridge , England.

In July 1975 – twelfth meeting held at Leningrad, USSR.

The current system of International code of botanical nomenclature was adopted from 1978.

11. Write Systematic position of Laurineae

Class : Dicotyledonae
 Sub class : Monochlamydeae
 Series : Daphanales
 Family : Laurineae

12. Write the Systematic position of Podostemaceae

Class : Dicotyledonae
 Sub class : Monochlamydeae
 Series : Multiovulate aquatica
 Family : Podostemaceae

13. Write the Systematic position of Caryophyllaceae

Class : Dicotyledonae
 Sub class : Polypetalae
 Series : Thalamiflorae
 Family : Caryophyllaceae

14. Define Monochlamydeae

The group plants having flowers with single whorl of perianth are called monochlamydeae.

Monochlamydeae includes 8 series and 36 family .

Euphorbiaceae family placed in this series.

15. What is Polygamous?

Staminate flowers, pistillate flowers and Bisexual flowers are present in the same plant is called polygamous . Ex. *Musa paradisisca*

16. What is Epicalyx ?

Bractioles forming a whorl outer to calyx is called epicalyx . Ex. *Hibiscus rosa-sinensis*.

17. What is Atropine ?

Roots of *Atropa belladonna* yield powerful alkaloid is called Atropine.

It is used for relieving muscular pain.

18. What is stramonium

Leaves and Flowers of *Datura stramonium* gives a drug called stramonium.

It is used to treat asthma and whooping cough.

19. What are the Alkaloids present in tobacco ?

Nicotine , Nornicotin and Anabasin.

20. What is Cladode ?

The stem is modified to perform photosynthesis is called Cladode. Ex. *E. truncalli* and *E. Antiquorum*.

21. What is Pseudostem?

The long ,stiff and sheathy leaf bases which are rolled around one another to form a stem like structure called Pseudostem. Ex. *Musa paradisiaca*

22. What are Spathes ?

The flowers are protected by large ,brightly coloured ,spirally arranged ,boat shaped bracts are called Spathes. When the flowers are open , the Spathes roll back and finally fall off.

Ex. *Musa paradisiaca*

23. What is Shaft ?

The central axis that is concealed at the bottom of the Pseudostem is called shaft.

At the time of flowering the shaft elongates,pierces through the Pseudostem and produce inflorescence terminally.

Ex. *Musa paradisiaca*

24. What is Abaca cloth?

The fibres obtained from sheathy leaf bases of *Musa textilis* are woven into a cloth is called Abaca cloth. It used for Cordage.

25 What is Manocarpic perennial ?

The plant produces flowers and fruits once during its life time is called Manocarpic perennial.

Ex. *Musa paradisiaca*

26. What is Type specimen ?

When new names given to any plant ,then the herbarium preparation of the same species with its original description is preserved in any recognised herbarium called Type specimen.

27. What is Author citation?

The person who giving a new name to a plant is considered as author.

Each binomial name should bear the author's abbreviated name at the end of the species .

This is called Author citation.

Ex. *Malva sylvestris* Linn. Linn abbreviated to Linnaeus.

28.. What is Nomen ambiguum?

Naming the plant is from the source of error is called Ambiguous name .

It also called nomen ambiguum.

It is completely ignored from from use.

29. What is Tautonym ?

The generic and specific names are the same is called Tautonym.

Ex. *Sassafras sassafras*.

Such names are not accepted in the system of nomenclature.

30.How to protect the Herbarium ?

The mounted specimens protected by sprayed with fungicide – 1% Mercuric Chloride.

Naphthalene and Carbon di sulphide can be used to protect from insects, pests .

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5 MARKS**1. Explain Artificial System of classification**

Based on one or few superficial characters.

Carolus Linnaeus (Sweden 1753) published in species plantarum.

7,300 species described into 24 classes.

This system also called sexual system of classification because this based on number, union, length and certain other characters of stamens.

Defects of Artificial system:

- 1) Unrelated plants are brought together in a single group and closely related plants are placed widely separated groups. Ex: Zingiberaceae (monocot)
Anacardiaceae (dicots)
are placed in monandria because presence of single stamen.
- 2) No importance was given to either natural / Phylogenetic relationships among different group of plants.

2.Explain Natural system & Phylogenetic system of classification**Natural system:**

Based on their Natural affinities

More number of characters are considered

Proposed by George Bentham and Sir Joseph Dalton (English botanist)

doesn't attempt to bring at evolutionary relationships among different plant groups of plants

Phylogenetic system

Based on evolutionary sequences and genetic relationships among different groups of plants.

Charles Darwin's concepts of Origin of species stimulus to create this system.

Adolf Engler and Karl Prantle (German) published in Die Natürlichen Pflanzenfamilien.

Single whorl or no perianth and unisexual flowers pollinated by wind –primitive characters.

Perianth with two whorls, unisexual flowers pollinated by insects -- advanced characters.

Asteraceae (dicots) and Orchedaceae (monocots) were highly advanced.

3. Write the salient features of ICBN.

1. The generic name is a singular noun. Generic name start with capital letter.
The species name is an adjective. species name start with small letter.
2. The name should be short, precise and easy to pronounce.
3. The binomials are printed in italics or underlined. Generic and species names are underlined separately. Ex. *Abutilon neilgherrense* or Abutilon neilgherrense
4. **Type specimen:**
When new names given to any plant, then the herbarium preparation of the same species with its original description is preserved in any recognised herbarium called Type specimen.
5. **Author citation.**
Each binomial name should bear the author's abbreviated name at the end of the species.
This is called Author citation.
Ex. *Malva sylvestris* Linn. Linn abbreviated to Linnaeus.
6. The original description of the plant should accompany the Latin translation.
7. **Nomen ambiguum:**
Naming the plant is from the source of error is called Ambiguous name.
It also called nomen ambiguum. It is completely ignored from use.
8. **Tautonym :**
The generic and specific names are the same is called Tautonym. Ex. *Sassafras sassafras*.
Such names are not accepted in the system of nomenclature.

4 Explain the steps of Herbarium preparation.

Herbarium is a collection of pressed ,dried plant specimens mounted on specified sheets ,identified and arranged in the order of an approval and well known system of classification.

Ex.Herbarium of Botanical Survey of India , Coimbatore.

Collection:

A twig with leaves ,inflorescence or flower is collected from shrub and Trees.

If herb collected plant contains both vegetative and reproductive parts.

Pressed and dried :

The plants are dried by keeping them between the fold of newspapers in Plant press.

The newspapers necessary to change at regular intervals until they dry.

Mounting:

The dried specimens are pasted on herbarium sheets of standard size 41cm X 29 cm .

This process is called mounting of specimens .

The heavy parts like seeds and fruits are kept in pockets and attached to the sheets

Protection :

The mounted specimens protected by sprayed with fungicide – 1% Mercuric Chloride.

Naphthalene and Carbon di sulphide can be used to protect from insects, pests .

Type specimen:

When new names given to any plant ,then the herbarium preparation of the same species with its original description is preserved in any recognised herbarium called Type specimen.

Specimen are most valuable so handled with special care and stored in fire proof cabinets .

Label:

The herbarium is always accompanied with label. It carries botanical name of the plant ,name of the family, habit, place and date of collection ,name of the person who collected the specimen.

5. Name Some important National and International Herbaria :

- | | |
|---|------------------------|
| 1. Herbarium of Royal botanical garden , Kew, London ,England | —more than 60,00,000 |
| 2. Herbarium of Indian botanical garden ,Kolkata , India. | -- more than 10,00,000 |
| 3. Botanical Survey of India , Coimbatore. | -- more than 1,90,000 |
| 4. Rapinat herbarium ,Trichy, Tamil Nadu | -- more than 12 ,000 |
| 5. Presidency College Herbarium, Chennai, Tamil Nadu | -- more than 10 ,000 |

6. Write the Importance of Herbarium

1. Source of knowledge about the flora of a region .
2. Data Store in which information of plants are available .
3. It provides materials for Taxonomic and Anatomical studies.
4. Type specimen helpful for correct identification.
5. Typical pollen characters remain unrelated even after storage upto nearly 200 years.
6. It is useful in the study of Cytology,structure of DNA etc.

7. What is Cyathium inflorescence

It is the characteristic inflorescence of *Euphorbia*.

A collection of unisexual flowers in cymose manner on a condensed axis .

These enclosed with in a cup shaped involucre.

Each cyathium has a single central female flower surrounded by many male flowers.

Male flowers is represented by a single stamen.

Female flowers is represented by a gynoecium..

Nectar glands located in the Cyathium.

8.Types inflorescence in *Euphorbiaceae*.

	Plant name	inflorescence
1	Ricinus communis	panicle
2	Croton sparsiflorus	simple raceme
3	Acalypha indica	Cactin
4	Phyllanthus amarus	Axillary and solitary.
5	<i>Euphorbia</i> sp.	Cyathium.

9.Differentiate *Musa* and *Ravenala*

		Musa	Ravenala
1	Habit	Perennial herb	Tree
2	Real stem	underground rhizome	The stem is aerial
3	Phyllotaxy	spiral	ditichous
4	Inflorescence	Branched spadix	Compound cyme
5	Stamens	5 stamens are fertile	6 stamens are fertile
6	Fruit	Berry	Capsule
7	Plant	Food plant	Ornamental plant

10.Merits of Benthem and Hoocker's system of classification.

1. It is most natural system based on the actual examination of specimen.
2. The discription of plants is quite accurate and reliable
3. It is easy to follow . used in key for identification in kew and several other herbaria of the world.
4. This system show affinity to modern concepts of evolution.

Ex. Ranals is the first order (ie)primitive in position in this system.

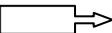
Recent taxonomist also indicate Ranals are most primitive.

- 5.The placement monocotyledonae after the dicotyledonae. It is accordance with evolutionary trends.

11. Demerits of Benthem and Hoocker's system of classification.

1. The placement of gymnosperm in between dicotyledonae and monocotyledonae is an error.
2. Several important floral characters are neglected.
3. Advanced family Orchediaceae wrongly placed in the beginning of the system.
4. Closely related families are placed under different groups.

Ex. Sub calss- Manochamydeae

Series - Curvembryeae families are related to 

Sub class- Polypetalae

Series - Thalamiflorae

Family - Caryophyllaceae

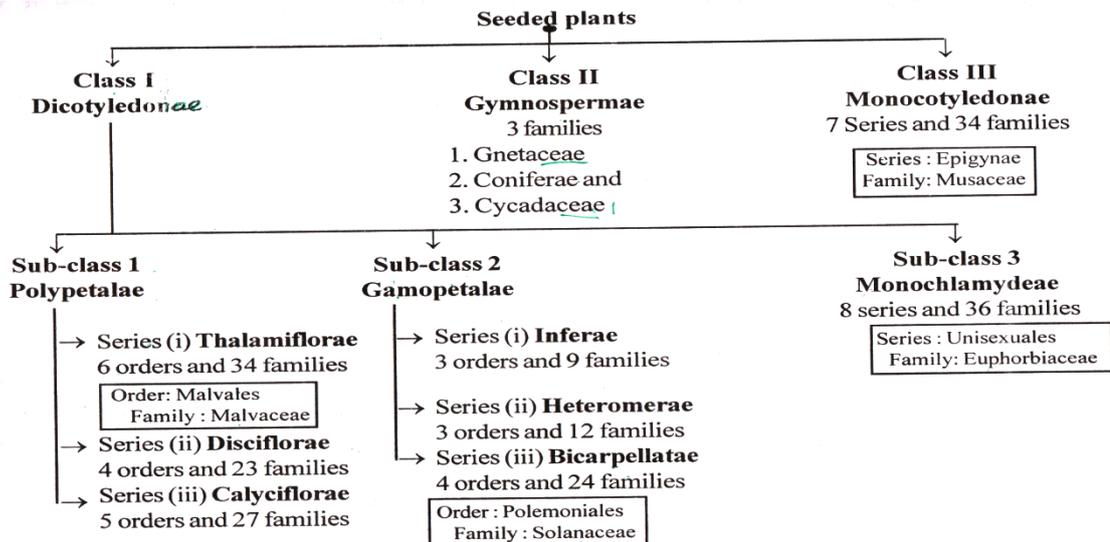
But they are separated.

5. unrelated families havebeen grouped nearer.

Ex.unrelated podostemaceae and Laurineae are grouped nearer.

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12. Bentham and Hooker's system of classification.



Bentham & hooker	Present day
Orders	Families
Cohorts	Orders

CLASS

Dicotyledonae	Gymnospermae	Monocotyledonae
Plants contain Two cotyledons. Leaves with reticulate venation. Flowers tetramerous/ pentamerous. Plans have Tap root system. Includes 3 Sub-class. 1).polypetalae. 2) Gamopetalae. 3).Monochlamydeae.	Plants have naked ovules /seeds Ovary absent. Includes 3 families 1)Cycadaceae 2).Coniferaceae 3).Gnetales.	Plants contain Single cotyledons. Leaves with Parallel venation. Flowers trimerous. Plans have Fibrous root system. Includes 7 series & 34 families Musaceae placed in the Epigynae.

SUB-CLASS

Polypetalae	Gamopetalae	Monochlamydeae
Flowers with free petals. Flowers distinct with calyx& corolla. Divided into 3 series 1).Thalamiflorae 2).Disciflorae 3).Calyciflorae	Flowers with petals are partially /completely fused. Flowers distinct with calyx& corolla. Divided into 3 series 1).Inferae 2).Heteromerae 3).Bicarpellatae	Single whorl of perianth. calyx& corolla not distinguished. Flowers are incomplete. Perianth contains tepals. Tepal arranged in 2 whorls Some time perianth is absent. Euphorbiaceae placed in Monochlamydeae.

SERIES

	Thalamiflorae	Disciflorae	Calyciflorae
Thallamus	Flowers with dome/conical shaped	Flowers with disc shaped	Flowers with Cup shaped
Ovary	Superior	Superior	Superior/ inferior
Order& family	6 & 36	4 & 23	5 & 27

SERIES

	Inferae	Heteromerae	Bicarpellatae
Flowers	epigynous	Hypogynous	Hypogynous
Ovary	inferior	superior	Superior
Carpels		more than two carpels	two carpelsb only
Order& family	3 & 9	3 & 12	4 & 12

Useful essence for one mark in general characters of familis

MALVACEAE

In world

82 Genera & 1500 species

In India

22 Genera & 125 species

Distribution:

Cosmopolitan, abundant in tropical & sub tropical

Habit:

Annual herb ..*Malva sylvestris*

Perennial shrubs ..*Hibiscus rosa - sinensis*

Tree-..*Thespesia populnea*

Stem:

Aerial ,Erect ..*Malva sylvestris*

Woody. .*Thespesia populnea*

Decumbent...*Malva rotundifolia*

Leaves:

Simple ...*Thespesia populnea*

Palmately lobed ..*Gassipium arboretum*

Inflorescence:

Solitary..Terminal .. *Malvastrum coramendelia*

Axillary .. *Thespesia populnea*

Axillary/ Terminal ..*Pavonia odorata*

Epi calyx:

3 in *Malva sylvestris*

5 to 8 in *Hibiscus rosa – sinensis*

10 to 12 in *Pavonia odorata*

Gynoecium:

5. Carpel .. *Hibiscus rosa – sinensis*

10 Carpel .. *Althaea*

15 to 20 .. *Abutilon indicum*

Friut:

Loculisedal capsule .. *abelmoschus esculentus*

Schizocarpic .. *Abutilon indicum*

SOLANACEAE

In world

90 Genera & 2800 species

In India

21 Genera & 70 species

Distribution:

Tropical & sub tropical

Habit:

Annual herb ..*Solanum melongena*

shrubs ..*Solanum torvum*

Tree-..*Solanum giganteum*

Stem:

Aerial ,Erect . *Solanum Xanthocarpum*

Woody. . *Petunia hybrida & N.alata*

Tuber ..*S.tuberosum*.

Leaves :

Simple ... *Petunia hybrid*

mid-rib contains yellow spines...*Solanum Xanthocarpum*

Inflorescence:

solitary Axillary.. *Datura stamonium*

extra axillary scorpiod cyme (*Rhipidium*)..*S.nigram*

helicoids cyme.. *S.tuberosum*

Umbellate cyme .. *Withania somnifera*

Flower:

Bracreate.. *Petunia hybrida*

Ebracteate .. *S.nigrum*.

Actinomorpic.. *Datura stamonium*

Zygomorpic.. *Schizanthus pinnatus*.

Calyx:

Valvate aestivation.. *Datura metal*

Imbricate aestivation.. *Petunia hybrida*

Bell shaped.. s. *Melongena*

Androecium:

Dihiscing apical pore.. .. *S.nigrum*.

2stamens fertile& 3 staminode.. *Schizanthus pinnatus*.

Gynoecium.

False septum.. *Datura species*.

Friut.

Berry.. *Lycopersicon esculentum*

Capsule.. *Datura & Petunia*

EUPHORBIACEAE**In world**

300 Genera & 7500 species

In India

70 Genera & 450 species

Distribution:

World wide.

More in Africa & south America.

Habit:**Annual herb** ..*Phyllanthus amarus***shrubs** ..*Ricinus communis***Tree-**..*Phyllanthus emblica***Cladode** *E.tirucalli* & *E. E. antiquorum***Stem:****Aerial ,Erect** ..*E.prostrata***Hallow** - *Ricinus communis***Milky latex**.. *E.tirucalli*.**Watery latex**.. *Jatroha curcas***Leaves:****Alternate**.. *Ricinus communis***Trioliately compound** ..*Hevea brasiliensis***Stipules to spines** .. *E. Splendens***Glandular hairs** .. *Jatroha curcas*.**Leaves reduced & absent**.. *Euphorbia species***Leaves beautifully coloured** .. *E.pulcherrima***Inflorescence:****Cyathium**.. *Euphorbia species***Panicle**.. *Ricinus communis***Simple raceme**.. *croton sparsiflorus***Cactin**.. *Acalypa indica*.**Aaxillary solitary**.. *Phyllanthus amarus***Flower:****Single stamen male flower**.. *Euphorbia***Perianth:****Male flowers 2 whorls****female flowers 1 whorl**.. .. *croton sparsiflorus***aphillus**.. *Euphorbia species***polyphillous**.. *Phyllanthus amarus***gamophillus**.. *Ricinus communis***Androecium:****Polyadelphous**.. *Ricinus communis***Friut:****Regma**.. *Ricinus communis***MUSACEAE****In world**

6 Genera & 150 species

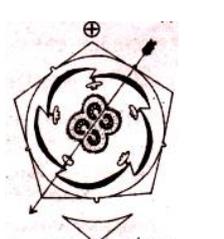
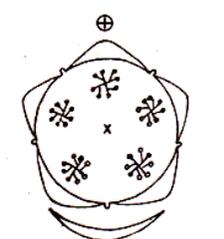
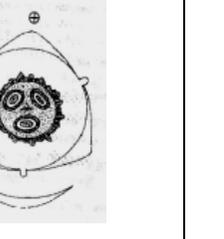
In India

2 Genera & 25 species

Widely in tropical

Habit:**Perennial herbs** ..*Musa paradisiaca***Tree**..*Ravenala madagascariensis***Stem:****Peuso stem**.. *Musa***Aerial woody**.. *Ravenala***Leaves:****Spiral phyllotaxy**.. .. *Musa***Distichous**.. *Ravenala***Inflorescence:****Branched spadix**.. .. *Musa***Compound cyme**.. *Ravenala***Androecium:****5 stamens fertile**.. *Musa***6 stamens fertile**.. *Ravenala***Friut:****Berry**.. *Musa***Capsule**.. *Ravenala*

	Hibiscus rosa-sinensis	Datura metal	Ricinus communis	Musa paradisiaca	
1.HABIT	Perennial Shrub	Stout herb	Perennial Shrub	Gigantic monocarpic Perennial herb	
2.ROOT	Tap root system	Branched Tap root system	Branched Tap root system	Fibrous root system	
3.STEM	Aerial,erect,woody,branched	Stem hallow, green,herbaceous	Stem hallow, green,herbaceous	Real stem is underground. Aerial stem is Pseudostem	
4.LEAF	Simple	Simple	Deeply palmately lobed,	Simple& strong petiole	
	Alternate	Alternate	Alternate ,	Spiral phyllotaxy	
	Stipulate	Exstipulate	Exstipulate ,	Exstipulate	
	Reticulate venation	Reticulate venation,	Palmately Reticulate venation,	Pinnately parallel venation	
5 INFLO	Solitary cyme and axillary	Solitary cyme and axillary	Compound receme (or) Panicle.	Branched spadix	
			Male Flower		Female Flower
6 FLOWER	Pedicellate	Pedicellate	Pedicellate	Pedicellate	Sessile
	Bracteate	Bracteate	Bracteate	Bracteate	Bracteate
	Bracteolate	Ebracteolate	Ebracteolate	Ebracteolate	Ebracteolate
	Dichlamydeous	Dichlamydeous	Manochlamydeous	Manochlamydeous	
	Bisexual	Bisexual	Unisexual	Unisexual	Unisexual/Bisexual
	Pentamerous	Pentamerous			Trimerous
	Actinomorphic	Actinomorphic	Actinomorphic	Actinomorphic	Zygomorphic
	Complete	Complete	Incomplete	Incomplete	Incomplete/ Incomplete
	Hyphogynous		-----	Hyphogynous	Epigynous
	Mucillage present.				
8.CALYX	5-8 Bracteoles outer to calyx	5 Sepals,Gamosepalous,	Perianth Tepals 5	Perianth Tepals 3	Perianth Tepals 6
	5 Sepals,Gamosepalous, Valvate aestivation	Persistant, Funnel shaped Valvate aestivation	Arranged Single whorl	Arranged Single whorl	Two whori of each 3
.CROLLA	5 Petals,Polypetalous fused	5 Petals,gamopetalous, Funnel shaped,	Gamophyllous	Gamophyllous	Gamophyllous
	Twisted aestivation	Twisted aestivation	Valvate aestivation	Valvate aestivation	Valvate aestivation

ANDROECIUM	Numerous Stamens	5 Stamens	Numerous Stamens	Absent but staminode is present	6 Stamens
	United	Free	Branched		Two whori of each 3, 5 stamens fertile 1 staminode Filament filiform. Anthers Dithecus
	Monadelphous		Polyadelphous		
	Attached to Staminal tube	Epipetalous	Filaments branched & united to form 5 branched		
	Anthers Monotheclus, Reniform	Anthers Dithecus	Anthers Dithecus		
	Dehisce transversely	Dehisce Longitudinally	Dehisce Longitudinally		
11.GYNOECIUM	Ovary superior	Ovary superior	Absent but pistillode is present	Ovary superior	Ovary inferior
	Pentacarpellary	Bicarpellary,		Tricarpellary,	Tricarpellary,
	Syncarpous	Syncarpous		Syncarpous	Syncarpous
	Pentalocular	Bilocular		Trilocular	Trilocular
	Axile placentation	Swollen axile placentation,		Axile placentation	Axile placentation
	Style simple ,Long	Style simple ,Long,filiform		Style 3, long	Style simple ,filiform
	Stigma 5 Capitate & coloured	Stigma two lobed		.Stigma Bifid feathery	
12.FRUIT	Mostly abortive	Spinescent capsule with persistent calyx	Regma	Berry	
13.SEED	-----	Endospermous	Endospermous	Non-Endospermous	
	$Br., Brl., \oplus, \odot, K_{(5)}, C_5, A_{(5)}, \underline{G}_{(5)}$	$Br., Ebrl., \oplus, \odot, K_{(5)}, C_{(5)}, A_5, \underline{G}_{(2)}$	$Br., Ebrl., \oplus, \odot, P_{(3)}, A_{(3)}, \underline{G}_{(3)}$	$Br., Ebrl., \oplus, \odot, P_{(3+2)+1}, A_{3+3}, \underline{G}_{(3)}$	
					

Economic importance: 1.Malvaceae

Name of the plant	Commam name	Useful parts	Uses
Fibre plants: 1. <i>Gassipium barbadens</i> 2. <i>G.hirsutum</i> 3. <i>G.herbaceum</i> 4. <i>Hibiscus cannabinus</i>	Egyption cotton American cotton Cotton Deccan hemp	Cotton fibre Bast fibre	Commercial value Making ropes.
Food plants : 1. <i>Abelmoschus esculentus</i> 2. <i>Hibiscus sabdariffa</i> 3. <i>Hibiscus cannabinus</i> & <i>Hibiscus sabdariffa</i>	Lady's finger Kind of Pullichai Pullichai keerai	Tender fruit Leaves and sepals Leaves and sepals	Used for Vegetables Making pickles,jam&jelly Prepare Delicious Chutney
Timber plant: 1. <i>Thespesia populnea</i>	Portia tree	Timber	Making boat,furnitures& agricultural implements.
Medicinal plants : 1. <i>Abutilon indicum</i> & <i>Malva sylvestris</i> 2. <i>Althaea rosea</i> & <i>Malva sylvestris</i>	<i>Thuthi</i> 	Roots & Leaves <i>Roots</i>	Used Against fever Used for treating whooping cough& dysentery
Ornamental plants: 1. <i>Althaea rosea</i> 2. <i>Hibiscus rosa – sinensis</i> 3. <i>Hibiscus schizopetalus</i>	<i>Holly hock</i> <i>Shoe plant</i> <i>Kind of Shoe flower with dissected petals.</i>		

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Economic importance: SOLANACEAE

Name of the plant	Commam name	Useful parts	Uses
Food plants : 1. <i>Solanum tuberosum</i> 2. <i>Solanum melongena</i> 3. <i>Lycopersicon esculentum</i>	Potato Brinjal Tomato	Tubers Tender fruit Ripended Fruit	Used for Vegetable Used for Vegetable Used for Delicious Vegetable
Medicinal plants : 1. <i>Atropa belladonna</i> 2. <i>Datura stamonium</i> 3. <i>Solanum trilobatum</i> 4. <i>Withania somnifera</i>	Atropine <i>stamonium</i> Thooduvalai Amukkara	<i>Roots –Alkaloid</i> Leaves and flowers Leaves and flowers Roots & Leaves	Relieving muscular pain Treat asthma & whooping cough Treat cough Treat nervous disorders& Diuretic
Tobacco: 1. <i>Nicotiana tobacum</i>	Tobacco	Alkaloids- Nicotin, Nor nicotin & Anabasin.	Cigarette, bidi & Hukkah Chewing & snuffing Sedative ,antiplasmodic& insecticide
Ornamental plants: 1. <i>Cestrum diurnum</i> 2. <i>C.nocturram</i> 3. <i>Petunia hybrida</i>	Day jasmine Night jasmine Pink flowers.		

Economic importance: EUPHORBIACEAE

Name of the plant	Commam name	Useful parts	Uses
Food plants : 1. <i>Manihot esculenta</i> 2. <i>Phyllanthus emblica</i>	Tapioca Goosberry	Tuberous root Fleshy fruit	Valuable food stuff Fruit edible & Pickled
Oil plants: 1. <i>Ricinus communis</i> 2. <i>Jatroha curcas</i>	Castor Kattumanakku	Oil from Seeds Oil from Seeds	Lubricant, Vegetable oil, purgative Purgative, to treat skin diseases & extract Bio-diesel.
Medicinal plants : 1. <i>Phyllanthus amarus</i> 2. <i>Jatroha gossypifolia</i>	Keezha nelli	Entiire shoot system Roots & Leaves	To treat Jundice To treat Leprosy & snake bite
Rubber plant : 1. <i>Hevea brasiliensis</i> 2. <i>Manihot glaziovii</i>	Para rubber Manicoba rubber	Coagulated latex Coagulated latex	98% in the world Natural rubber obtained.
Ornamental plants: 1. <i>Euphorbia pulcherrima</i> 2. <i>Codium variegatum</i> 3. <i>E.tirucally</i>	Palperukki tree Croton of garden Milk bush		

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Economic importance: MUSACEAE

Name of the plant	Commam name	Useful parts	Uses
Food plants : 1. <i>Musa paradisiacal</i>	Banana	Fruits Tender shaft & flower Leaves Sap from sheathy leaf base	Edible Eaten as a vegetable Plates on festive occasions An antidote for cobra bite
2. <i>Musa chinensis</i>	Dwarf Banana	Fruits	Edible
Fibre plants: 1. <i>Musa textilis</i>	Manila hemp	Fibres from sheathy leaf bases - Woven Abaca cloth	Cordage
Ornamental plants: 1. <i>Ravenala madagascariensis</i> (Travellers palm) 2. <i>Sterlitzia reginnae</i> (The bird of paradise) 3. <i>Heliconia sp.</i>			

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Comman Names & Botanical Names.**MALVACEAE**

Name of the plant	Comman name
<i>Abelmoschus esculentus</i>	Lady's finger
<i>Abutilon indicum</i>	Thuthi
<i>Althaea rosea</i>	Holly hock
<i>Gassipium herbaceum</i>	Cotton
<i>G.hirsutum</i>	American cotton
<i>Gassipium barbadens</i>	Egyption cotton
<i>Hibiscus cannabinus</i>	Deccan hemp
<i>Hibiscus cannabinus</i>	Pullichai keerai
<i>Hibiscus sabdariffa</i>	Kind of Pullichai
<i>Malva rotundifolia</i>	Thirukamalli
<i>Pavonia odorata</i>	Paramutti
<i>Sida cardifolia</i>	Nilathuthi
<i>Thespesia populnea</i>	Portia tree

SOLANACEAE

Name of the plant	Commam name
<i>Cestrum diurnum</i>	Day jasmine
<i>Cestrumnocturram</i>	Night jasmine
<i>Datura metal</i>	oomathai
<i>Lycopersicon esculentum</i>	Tomato
<i>Nicotiana tobacum</i>	Tobacco
<i>Solanum melongena</i>	Brinjal
<i>Solanum nigrum</i>	Manathakkaali
<i>Solanum tarvum</i>	Sundaikaai
<i>Solanum trilobatum</i>	Thooduvalai
<i>Solanum tuberosum</i>	Potato
<i>Solanum xanthocarpum</i>	Kandangkathiri
<i>Withania somnifera</i>	Amukkara

EUPHORBIACEAE

Name of the plant	Commam name
<i>Acalypa indica</i>	Kuppaimeni
<i>Codium variegatum</i>	Croton of garden
<i>croton sparsiflorus</i>	Eli amanakku
<i>E.antiquorum</i>	Sadhurakalli
<i>E.tirucally</i>	Milk bush
<i>Euphorbia pulcherrima</i>	Palperukki tree
<i>Hevea brasiliensis</i>	Para rubber
<i>Jatroha curcas</i>	Kattuamanakku
<i>Manihot esculenta</i>	Tapioca
<i>Manihot glaziovii</i>	Manicoba rubber
<i>Phyllanthus emblica</i>	Goosberry
<i>Phyllanthus amarus</i>	Keezha nelli
<i>Ricinus communis</i>	Castor

MUSACEAE

Name of the plant	Comman name
<i>Musa chinensis</i>	Dwarf Banana
<i>Musa paradisiacal</i>	Banana
<i>Musa textilis</i>	Manila hemp
<i>Ravenala madagascariensis</i>	Travellers palm
<i>Sterlitzia reginnae</i>	The bird of paradise

Hibiscus rosa-sinensis**1.HABIT :**

Perennial Shrub

2.ROOT :

Tap root system

3.STEM :

Aerial,
erect,
Cylindrical
woody,
branched

4.LEAF :

Simple
Alternate
Petiolate
Stipulate
Serrate
Reticulate venation

5.INFLORESCENCE:

axillary
Solitary cyme

6 FLOWER :

Pedicel jointed
Bracteate
Bracteolate
Dichlamydeous
Bisexual
Pentamerous
Actinomorphic
Complete
Hypogynous
Mucilage present.

7.EPI CALYX:

5-8 Bracteoles,free,
greenish

8.CALYX :

5 Sepals,
Gamosepalous,
Valvate aestivation
odd sepal is posterior

9.CROLLA:

5 Petals,
Polypetalous
fused at base
Twisted aestivation

10.ANDROECIUM:

Numerous Stamens United
Monadelphous
Attached to Staminal tube
Anthers Monotheclus,
Reniform,extrose
yellow
Dehisce transversely

Datura metal**1.HABIT :**

Stout herb

2.ROOT :

Branched
Tap root system

3.STEM :

Stem hallow,
green,
herbaceous
Strong odour

4.LEAF :

Simple
Alternate
Petiolate
entire
Exstipulate
Reticulate venation,

5.INFLORESCENCE:

axillary
Solitary cyme

6 FLOWER :

Pedicellate
Bracteate
Ebracteolate
Greenish white
Dichlamydeous
Bisexual
Pentamerous
Actinomorphic
Complete
Hypogynous

7.CALYX :

5 Sepals,
Gamosepalous,
Persistant,
Funnel shaped
Valvate aestivation
odd sepal is posterior

8.CROLLA:

5 Petals,
Greenish white
Gamopetalous,
plicate
Funnel shaped,
Twisted aestivation

9.ANDROECIUM:

5 Stamens Free
Epipetalous
Alternate to petal
Anthers Basifix
Ditheclus,introse
Dehisce Longitudinally

Ricinus communis**1.HABIT :**

Perennial Shrub

2.ROOT :

Branched
Tap root system

3.STEM :

Aerial,
Erect,
Herbaceous
but woody below
Stem hallow,
Covered with hairs
Latex present.

4.LEAF :

Petiolate
Exstipulate
Alternate,
Deeply palmately lobed,
Palmately Reticulate
venation,

5.INFLORESCENCE:

Compound receme
(or) Panicle.
Male flowers at lower
female flowers at apex

6-Male Flower

Bracteate
Ebracteolate
Pedicellate
Actinomorphic
Incomplete

7.Perianth

Tepals 5
Arranged Single whorl
Gamophyllous
Valvate aestivation
odd tepal is posterior

8.ANDROECIUM:

Numerous Stamens
Polyadelphous
Filaments branched &
united to form
5 branched
Anthers Dithecus
Globose
basifixed
introse
Dehisce Longitudinally

Musa paradisiaca**1.HABIT :**

Gigantic monocarpic
Perennial herb

2.ROOT :

Fibrous root system

3.STEM :

Real stem is
underground. Aerial
stem is Pseudostem

4.LEAF :

Simple & strong petiole
sheathy leaf base
Exstipulate
Pinnately parallel
venation
Spiral phyllotaxy

5.INFLORESCENCE:

Branched spadix
Protected by spathes

6.FLOWER :

Sessile
Bracteate
Ebracteolate
Unisexual/Bisexual
Trimerous
Zygomorphic
Epigynous

7.Perianth

Tepals 6
Two whorl of each 3
outer whorl and
two lateral tepals of
inner whorl are fused
Valvate aestivation
To form 5 toothed
tube like structure
inner posterior tepal
is alone free

8.ANDROECIUM:

6 Stamens
Two whori of each 3,
5 stamens fertile
1 staminode
Filament filiform.
Anthers Dithecus
Dehisce vertical slits

11.GYNOECIUM :

Ovary superior
Pentacarpellary
Syncarpous
Pentalocular axil
placentation

Style

simple,
long,
slender
Pass through
staminal
tube

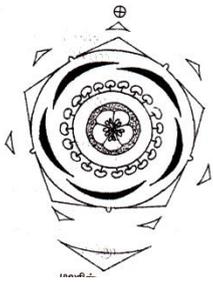
Stigma

5 lobed
capitates coloured.

12.FRUIT :

Mostly abortive

$Br., BrL., \oplus, \ominus, K_{(5)}, C_5, A_{(2)}, \underline{G}_{(5)}$



10.GYNOECIUM :

Ovary superior
Bicarpellary,
Syncarpous
Bilocular
but tetralocular
due to false septa

Carpels obliquely placed
Ovules on swollen axile
placentation,

Style simple ,
Long,filiform.

Stigma two lobed

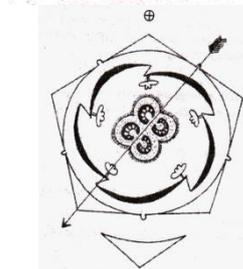
11.FRUIT :

Spinescent capsule with
persistent calyx

12.SEED :

Endospermous

$Br., EbrL., \oplus, \ominus, K_{(5)}, C_{(5)}, A_5, \underline{G}_{(2)}$



9.GYNOECIUM :

Absent
but pistillode is present

$Br., EbrL., \oplus, \ominus, P_{(3)}, A_{(3)}, \underline{G}_3$

10.Female Flower

Bracteate
Ebracteolate
Pedicellate
Actinomorphic
Incomplete
Hyphogynous

11-Perianth

Tepals 3
Arranged Single whorl
Gamophyllous
Valvate aestivation

12.ANDROECIUM:

Absent
but staminode is present

13.GYNOECIUM :

Ovary superior
Tricarpellary,
Syncarpous
Trilocular
Axile placentation
Style 3, long
Stigma Bifid feathery

9.GYNOECIUM :

Ovary inferior
Tricarpellary,
Syncarpous
Trilocular
Axile placentation
Style simple ,filiform
stigma three lobed

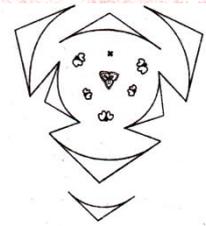
10.FRUIT:

Fleshy Berry

11.Seeds

not produced in
cultivated varities

$Br., EbrL., \oplus, \ominus, P_{(3+2)+1}, A_{3+3}, \overline{G}_{(3)}$



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14. FRUIT :

Regma
covered by
spinous outgrowth

15.SEED

Endospermous

$Br., EbrL., \oplus, \ominus, P_{(3)}, A_{(3)}, \underline{G}_{(3)}$

