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TARGET

HIGHER SECONDARY FIRST YEAR

BIO-BOTANY

Volume - I & II

1 Mark

Questions & Answers

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Salient Features :

- Prepared as per the New Textbook for the year 2018-19.
- Complete 1 mark questions- Book Back, In-text, HOTS, Competitive Examination Questions with Answers.
- Given in Chapter-wise sequence.
- Useful for Public Exam 2019.

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11th STD

BIOLOGY

BIO-BOTANY (Vol-I)

1 Mark

UNIT-I DIVERSITY OF LIVING WORLD

1. LIVING WORLD

Textbook Questions

CHOOSE THE CORRECT ANSWERS

1. Which one of the following statement about virus is correct?

(a) Possess their own metabolic system.
(b) They are facultative parasites
(c) They contain DNA or RNA
(d) Enzymes are present

[Ans. (c) They contain DNA or RNA]

2. Identify the incorrect statement about the Gram positive bacteria

(a) Teichoic acid absent
(b) High percentage of peptidoglycan is found in cell wall
(c) Cell wall is single layered
(d) Lipopolysaccharide is present in cell wall

[Ans. (a) Teichoic acid absent and (d) Lipopolysaccharide is present in cell wall]

3. Identify the Archaebacterium

(a) *Acetobacter* (b) *Erwinia*
(c) *Treponema* (d) *Methanobacterium*

[Ans. (d) *Methanobacterium*]

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4. The correct statement regarding Blue green algae is

(a) lack of motile structures
(b) presence of cellulose in cell wall
(c) absence of mucilage around the thallus
(d) presence of floridean starch

[Ans. (a) lack of motile structures]

5. Identify the correctly matched pair

(a)	Actinomycete	-	(a)	Late blight
(b)	Mycoplasma	-	(b)	Lumpy jaw
(c)	Bacteria	-	(c)	Crown gall
(d)	Fungi	-	(d)	Sandal spike

[Ans. (c) Bacteria - Crown gall]

In-Text Questions

1. Earth was formed _____ billion years ago.

(a) 4.6 (b) 5.5 (c) 4 (d) 3 **[Ans. (a) 4.6]**

2. _____ is a sexual method of reproduction.

(a) Binary fission (b) Budding
(c) Conidia (d) Gametangial contact

[Ans. (d) Gametangial contact]

3. Vaccination for small pox was discovered by ____.

(a) d' Herelle (b) Edward Jenner
(c) Robert Gallo (d) F.W. Twort

[Ans. (b) Edward Jenner]

4. 1 nanometer =_____.

(a) 10^{9} metres (b) 10^{-9} metres
(c) 10^{8} metres (d) 10^{-6} metres

[Ans. (b) 10^{-9} metres]

5. Size of TMV =_____.

(a) 300 × 200 nm (b) 30 × 20 nm
(c) 300 × 20 nm (d) 100 × 40 nm

[Ans. (c) 300 × 20 nm]

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24. A marine cyanobacterial species_____.

(a) *Trichodesmium* (b) *Gloeocapsa*

(c) *Nostoc* (d) *Cycas*

[Ans. (a) *Trichodesmium*]

25. The organisms isolated from pleural fluid of cattle _____.

(a) Actinomycetes (b) Virus

(c) Phage (d) Mycoplasma

[Ans. (d) Mycoplasma]

26. Nitrogen fixation in non leguminous plants is done by_____.

(a) *Rhizobium* (b) *Alnus*

(c) *Frankia* (d) *Streptomyces*

[Ans. (c) *Frankia*]

27. Yellow powder which saved lives of soldiers in world war II was_____.

(a) Streptomycin (b) Aureomycin

(c) Penicillin (d) Bacitracin **[Ans. (c) Penicillin]**

28. _____is considered as founder of mycology.

(a) P.A. Micheli (b) Webster

(c) Blackley (d) Ainsworth

[Ans. (a) P.A. Micheli]

29. Spermatization is a sexual mode of reproduction in _____.

(a) *Rhizopus* (b) *Neurospora*

(c) *Ascomycetes* (d) *Penicillium*

[Ans. (b) *Neurospora*]

30. Sac fungi refers to_____.

(a) Ascomycetes (b) Zygomycetes

(c) Basidiomycetes (d) Deuteromycetes

[Ans. (a) Ascomycetes]

31. A plant growth promoter got from fungi is _____.

(a) Rennet (b) Gibberellin

(c) Ergot (d) Griseofulvin

[Ans. (b) Gibberellin]

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41. Organisms grow by _____ .

(a) cell division (b) spore formation
(c) fragmentation (d) vegetative propagation

[Ans. (a) cell division]

42. Increase in body mass is considered as _____ .

(a) cell division (b) homeostasis
(c) reproduction (d) growth **[Ans. (d) growth]**

43. _____ do not grow.

(a) Living organisms (b) Microorganisms
(c) Dead organisms (d) All the above

[Ans. (c) Dead organisms]

44. _____ multiply and spread very fast by producing millions of asexual spores.

(a) Bacteria (b) Pteridophytes
(c) Fungi (d) Sea weeds **[Ans. (c) Fungi]**

45. Some fungi, filamentous algae and the protonema of mosses multiply by _____ .

(a) fission (b) fertilization
(c) pollination (d) fragmentation

[Ans. (d) fragmentation]

46. Yeast and *Hydra* reproduce by _____ .

(a) Budding (b) Fission
(c) Spore formation (d) Vegetative propagation

[Ans. (a) Budding]

47. _____ is the building block of all living things.

(a) Cell (b) Organ
(c) Atom (d) Compound **[Ans. (a) Cell]**

48. _____ is a basic unit of life.

(a) Atom (b) Compound
(c) Soil (d) Cell **[Ans. (d) Cell]**

49. Detection of changes in their living place by organisms is called _____ .

(a) Interactions (b) Consciousness
(c) Autotropic (d) Meterotropic

[Ans. (b) Consciousness]

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66. Bacterial photosynthesis differs from higher plants in evolution of _____ .

(a) Oxygen (b) Hydrogen sulphide

(c) Hydrogen (d) CO_2 **[Ans. (a) Oxygen]**

67. Who discovered the Transformation process?

(a) Griffith (b) Ehrenberg

(c) Pasteur (d) Hooke **[Ans. (a) Griffith]**

68. Which of the following is called 'true bacteria'?

(a) Archaebacteria (b) Eubacteria

(c) *Methanobacterium* (d) *Halobacterium*

[Ans. (b) Eubacteria]

69. Which one of the following organisms completely lacks a cell wall?

(a) Eubacteria (b) Archaebacteria

(c) Fungi (d) Mycoplasma

[Ans. (d) Mycoplasma]

70. Who introduced the Gram staining method?

(a) Bergy (b) Christian Gram

(c) Ehrenberg (d) Lederberg

[Ans. (b) Christian Gram]

71. The study of Bacteria is called _____ .

(a) Virology (b) Mycology

(c) Physiology (d) Bacteriology

[Ans. (d) Bacteriology]

72. Who discovered plasmid ?

(a) David (b) Koch

(c) Joshua Lederberg (d) Griffith

[Ans. (c) Joshua Lederberg]

73. Bacteria were first discovered by _____ .

(a) Ehrenberg (b) Leeuwenhoek

(c) Koch (d) Bergy **[Ans. (b) Leeuwenhoek]**

74. Who is the Father of Indian Mycology?

(a) P.A. Micheli (b) Sir Edwin John Butler

(c) Blackley (d) Raper

[Ans. (b) Sir Edwin John Butler]

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Higher Order Thinking Skills (HOTS)

1. Bacteria are included in _____ kingdom.

(a) Protista (b) Monera
(c) Fungi (d) Plantae **[Ans. (b) Monera]**

2. A virus with ds DNA.

(a) Parvo viruses (b) Toga viruses
(c) Adeno viruses (d) Retro viruses
[Ans. (c) Adeno viruses]

3. Match the following :

1. Toga Virus	(a) Mottling
2. TMV	(b) Eaters of bacteria
3. Phage	(c) Cauliflower Mosaic Virus
4. Ribo virus	(d) ss RNA

(a) 1 - c, 2 - d, 3 - a, 4 - b (b) 1 - b, 2 - c, 3- d, 4 - a
(c) 1 - a, 2 - b, 3 - c, 4 - d (d) 1 - d, 2 - a, 3 - b, 4 - c
[Ans. (d) 1 - d, 2 - a, 3 - b, 4 - c]

4. Identify the correct statement regarding bacterial genome.

A) Nucleoid B) Contains histone
C) Linear
D) Absence of nuclear membrane

(a) A and D (b) A and B
(c) C and D (d) All the above
[Ans. (a) A and D]

5. Food poisoning is caused by _____.

(a) *Yersinia* (b) *Clostridium*
(c) *Treponema* (d) *Vibrio* **[Ans. (b) *Clostridium*]**

6. _____is found in corolloid roots of *Cycas*.

(a) *Dermacarpa* (b) *Nostoc*
(c) *Scytonema* (d) *Chara* **[Ans. (b) *Nostoc*]**

7. Basidiomycetes do not possess this feature.

(a) Clamp connection (b) Club Fungi
(c) Dolipore septum (d) Lack sexual reproduction
[Ans. (d) Lack sexual reproduction]

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8. The cancer causing viruses are also called _____ .

(a) Oncogenic viruses (b) Corona viruses
(c) HIV (d) Mycoviruses

[Ans. (a) Oncogenic viruses]

9. Which one of the following bacterium can cause crown gall disease in plants?

(a) *Bacillus*
(b) *Clostridium*
(c) *Agrobacterium tumefaciens*
(d) *E.Coli*

[Ans. (c) *Agrobacterium tumefaciens*]

10. Identify the fastest growing cyanobacteria.

(a) *Halobacterium* (b) *Methanobacterium*
(c) *Spirulina* (d) *Thermoprotens*

[Ans. (c) *Spirulina*]

Competitive Examination Questions

1. Which of the following are found in extreme saline conditions? **(NEET-2017)**

(a) Archaebacteria (b) Eubacteria
(c) Cyanobacteria (d) Mycobacteria

[Ans. (a) Archaebacteria]

2. Select the mismatch **(NEET – 2017)**

(a) *Frankia* *Alnus*
(b) *Rhodospirillum* *Mycorrhiza*
(c) *Anabaena* *Nitrogen fixer*
(d) *Rhizobium* *Alfalfa*

[Ans. (b) *Rhodospirillum* *Mycorrhiza*]

3. Which among the following are the smallest living cells, known without a definite cell wall, pathogenic to plants as well as animals and can survive without oxygen?

(a) *Bacillus* (b) *Pseudomonas* **(NEET – 2017)**
(c) Mycoplasma (d) *Nostoc*

[Ans. (c) Mycoplasma]

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2. Plant Kingdom

Textbook Questions

Choose the Correct Answers

1. Which of the plant group has gametophyte as a dominant phase?

(a) Pteridophytes (b) Bryophytes

(c) Gymnosperm (d) Angiosperm

[Ans. (b) Bryophytes]

2. Which of following represent gametophytic generation in pteridophytes?

(a) Prothallus (b) Thallus

(c) Cone (d) Rhizophore

[Ans. (a) Prothallus]

3. The haploid number of chromosome for an Angiosperm is 14 , the number of chromosome in its endosperm would be

(a) 7 (b) 14 (c) 42 (d) 28 **[Ans. (c) 42]**

4. Endosperm in Gymnosperm is formed

(a) At the time of fertilization.

(b) Before fertilization.

(c) After fertilization.

(d) Along with the development of embryo.

[Ans. (b) Before fertilization]

In-Text Questions

1. _____ is a alga found on shell of molluscs.

(a) *Ulva* (b) *Cladophora*

(c) *Oedogonium* (d) *Funaria* **[Ans. (b) *Cladophora*]**

2. _____ is a halophytic alga.

(a) *Chlamydomonas* (b) *Gelidium*

(c) *Dunaliella* (d) *Vaucheria* **[Ans. (c) *Dunaliella*]**

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47. Turpentine is got from _____ .

(a) *Ephedra* (b) *Pinus*
(c) *Agathis* (d) *Araucaria* **[Ans. (b) *Pinus*]**

48. _____ after fertilization becomes a seed.

(a) Ovary (b) Megaspore
(c) Ovule (d) Microsporangium
[Ans. (c) Ovule]

49. The Father of Indian Phycology is _____.

(a) Whittaker (b) M.O.P. Iyenger
(c) Hippocrates (d) John Ray
[Ans. (b) M.O.P. Iyenger]

50. The Father of Indian Bryology is _____.

(a) Hippocrates (b) John Ray
(c) Shiv Ram Kashyap (d) M.O.P. Iyengar
[Ans. (c) Shiv Ram Kashyap]

51. The Father of Indian Paleobotany is _____.

(a) M.O.P. Iyengar (b) Birbal Sahni
(c) Shiv RamKashyap (d) Ramaniyam
[Ans. (b) Birbal Sahni]

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Higher Order Thinking Skills (HOTS)

1. Which plants produce resin?

(a) cycas revluta (b) Abies balsamea
(c) Pinus gerardiana (d) cedrus deodara
[Ans. (b) Abies balsamea]

2. Identify the odd one based on vegetative reproduction in algae.

(a) Akinetes (b) Bulbils
(c) Zoospores (d) Fission **[Ans. (c) Zoospores]**

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9. _____ is used in nurseries.

(a) *Liverworts* (b) *Sphagnum*

(c) *Riccia* (d) *Funaria* **[Ans. (b) *Sphagnum*]**

10. _____ are naked seeded plants.

(a) Gymnosperms (b) Bryophytes

(c) Algae (d) Pteridophytes

[Ans. (a) Gymnosperms]

Competitive Examination Questions

1. Read the following statements (A to E) and select the option with all correct statements **(AIPMT – 2015)**

A. Mosses and Lichens are the first organisms to colonise a bare rock.

B. Selaginella is a homosporous pteridophyte.

C. Coralloid roots in Cycas have VAM.

D. Main plant body in bryophytes is gametophytic, whereas in pteridophytes it is sporophytic.

E. In gymnosperms, male and female gametophytes are present within sporangia located on sporophyte.

(a) B, C and E (b) A, C and D

(c) B, C and D (d) A, D and E

[Ans. (d) A, D and E]

2. An example of colonial alga is **(NEET – 2017)**

(a) *Chlorella* (b) *Volvox*

(c) *Ulothrix* (d) *Spirogyra* **[Ans. (b) *Volvox*]**

3. Select the mismatch **(NEET – 2017)**

(a) *Pinus* — Dioecious (b) Cycas — Dioecious

(c) Salvinia — Heterosporous

(d) Equisetum — Homosporous

[Ans. (a) Pinus — Dioecious]

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UNIT-II PLANT MORPHOLOGY AND TAXONOMY OF ANGIOSPERM

3. VEGETATIVE MORPHOLOGY

Textbook Questions

CHOOSE THE CORRECT ANSWERS

1. Roots are

(a) Descending, negatively geotropic, positively phototropic
(b) Descending, positively geotropic, negatively phototropic
(c) Ascending, positively geotropic, negatively phototropic
(d) Ascending, negatively geotropic, positively phototropic

[Ans. (b) Descending, positively geotropic, negatively phototropic]

2. When the root is thick and fleshy, but does not take a definite shape, it said to be

(a) Nodulose root (b) Tuberous root
(c) Monilliform root (d) Fasiculated root

[Ans. (b) Tuberous root]

3. Example for negatively geotropic roots

(a) *Ipomoea, Dahlia* (b) *Asparagus, Ruellia*
(c) *Vitis, Portulaca* (d) *Avicennia, Rhizophora*

[Ans. (d) *Avicennia*, *Rhizophora*]

4. *Curcuma amada*, *Curcuma domestica*, *Asparagus, Maranta* are example of

(a) Tuberous root (b) Beaded root
(c) Moniliform root (d) Nodulose root

[Ans. (d) Nodulose root]

5. *Bryophyllum* and *Dioscorea* are example for

(a) Foliar bud, apical bud (b) Foliar bud, cauline bud
(c) Cauline bud, apical bud
(d) Cauline bud, foliar bud **[Ans. (b) Foliar bud, cauline bud]**

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33. Stilt roots are seen in _____ .

(a) *Zea mays* (b) *Delonix regia*

(c) *Begonia* (d) *Ficus* **[Ans. (a) *Zea mays*]**

34. Identify the wrong statement.

(a) Branches of stem arise endogenously

(b) Stem bears multicellular hairs

(c) Stem is positively phototropic

(d) Stem bears floral buds

[Ans. (a) Branches of stem arise endogenously]

35. Culm is seen in _____ .

(a) Bamboo (b) *Tridax*

(c) Mango (d) *Merremia* **[Ans. (a) Bamboo]**

36. In _____ the leaflets are modified into curved hook.

(a) *Carissa* (b) *Hiptage*

(c) *Bignonia* (d) *Pisum* **[Ans. (c) *Bignonia*]**

37. In *Clematis* _____ is modified into a tendril.

(a) stipule (b) petiole

(c) leaf (d) leaflet **[Ans. (b) petiole]**

38. Pneumatopore occurs in _____ . ⊗

(a) Halophytes

(b) Free floating hydrophytes

(c) Submerged hydrophytes

(d) Carnivorous plants **[Ans. (a) Halophytes]**

Higher Order Thinking Skills (HOTS)

1. _____ is a submerged aquatic plant.

(a) Suaeda (b) Rhizophora

(c) *Vallisneria* (d) *Eicchornia*

[Ans. (c) *Vallisneria*]

2. Choose the plant not having stilt roots

(a) *Saccharum* (b) *Piper betel*

(c) *Zea Mays* (d) *Pandanus* **[Ans. (b) *Piper betel*]**

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10. ***Bulbophyllum*** **is an example for _____ .**

(a) Rhizome (b) Bulb

(c) Pseudobulb (d) Tuber **[Ans. (c) Pseudobulb]**

Competitive Examination Questions

1. Leaves become modified into spines in **[AIPMT-2015]**

(a) Silk Cotton (b) *Opuntia*

(c) Pea (d) Onion **[Ans. (b) *Opuntia*]**

2. Keel is the characteristic feature of flower of **[AIPMT-2015]**

(a) Tomato (b) Tulip

(c) *Indigofera* (d) *Aloe* **[Ans. (c) *Indigofera*]**

3. Perigynous flowers are found in **[AIPMT-2015]**

(a) Rose (b) Guava

(c) Cucumber (d) China rose **[Ans. (a) Rose]**

4. Which one of the following statements is correct

(a) The seed in grasses is not endospermic **[AIPMT-2014]**

(b) Mango is a parthenocarpic fruit

(c) A proteinaceous aleurone layer is present in maize grain

(d) A sterile pistil is called a staminode

[Ans. (c) A proteinaceous aleurone layer is present in maize grain]

5. An example of edible underground stem is **[AIPMT-2014]**

(a) Carrot (b) Groundnut

(c) Sweet potato (d) Potato **[Ans. (d) Potato]**

6. Phyllode is present in **[AIPMT Prelims-2012]**

(a) Australian *Acacia* (b) *Opuntia*

(c) *Asparagus* (d) *Euphorbia*

[Ans. (a) Australian *Acacia*]

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4. Reproductive Morphology

Textbook Questions

Choose the Correct Answers

1. Vexillary aestivation is characteristic of the family

(a) Fabaceae (b) Asteraceae
(c) Solanaceae (d) Brassicaceae

[Ans. (a) Fabaceae]

2. Gynoecium with united carpels is termed as

(a) Apocarpous (b) Multicarpellary
(c) Syncarpous (d) None of the above

[Ans. (c) Syncarpous]

3. Aggregate fruit develops from

(a) Multicarpellary, apocarpous ovary
(b) Multicarpellary, syncarpous ovary
(c) Multicarpellary ovary
(d) Whole inflorescence

[Ans. (a) Multicarpellary, apocarpous ovary]

4. In an inflorescence where flowers are borne laterally in an acropetal succession the position of the youngest floral bud shall be

(a) Proximal (b) Distal
(c) Intercalary (d) Anywhere **[Ans. (b) Distal]**

5. A true fruit is the one where

(a) Only ovary of the flower develops into fruit
(b) Ovary and calyx of the flower develops into fruit
(c) Ovary, calyx and thalamus of the flower develops into fruit
(d) All floral whorls of the flower develops into fruit

[Ans. (a) Only ovary of the flower develops into fruit]

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Competitive Examination Questions

1. Placenta and pericarp are both edible portions in **[AIPMT-2014]**

(a) Apple (b) Banana
(c) Tomato (d) Potato **[Ans. (c) Tomato]**

2. When the margins of sepals or petals overlap one another without any particular direction, the condition is termed as **[AIPMT-2014]**

(a) Vexillary (b) Imbricate
(c) Twisted (d) Valvate **[Ans. (b) Imbricate]**

3. An aggregate fruit is one which develops from **[AIPMT-2014]**

(a) Multicarpellary syncarpous gynoecium
(b) Multicarpellary apocarpous gynoecium
(c) Complete inflorescence
(d) Multicarpellary superior ovary
[Ans. (b) Multicarpellary apocarpous gynoecium]

4. Non-albuminous seed is produced in **[AIPMT-2014]**

(a) Maize (b) Castor
(c) Wheat (d) Pea **[Ans. (d) Pea]**

5. Seed coat is not thin, membranous in **[NEET-2013]**

(a) Coconut (b) Groundnut
(c) Gram (d) Maize **[Ans. (a) Coconut]**

6. Vexillary aestivation is characteristic of the family **[AIPMT Prelims-2012]**

(a) Solanaceae (b) Brassicaceae
(c) Fabaceae (d) Asteraceae
[Ans. (c) Fabaceae]

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5. TAXONOMY AND SYSTEMATIC BOTANY

Textbook Questions

Choose the Correct Answers

1. Specimen derived from non-original collection serves as the nomenclatural type, when original specimen is missing. It is known as

(a) Holotype (b) Neotype
(c) Isotype (d) Paratype **[Ans. (b) Neotype]**

2. Phylogenetic classification is the most favoured classification because it reflects

(a) Comparative Anatomy
(b) Number of flowers produced
(c) Comparative cytology
(d) Evolutionary relationships
[Ans. (d) Evolutionary relationships]

3. The taxonomy which involves the similarities and dissimilarities among the immune system of different taxa is termed as

(a) Chemotaxonomy
(b) Molecular systematics
(c) Serotaxonomy
(d) Numerical taxonomy **[Ans. (c) Serotaxonomy]**

4. Which of the following is a flowering plant with nodules containing filamentous nitrogen fixing micro - organisms?

(a) *Crotalaria juncea* (b) *Cycas revoluta*
(c) *Cicer arietinum* (d) *Casuarina equisetifolia*
[Ans. (d) *Casuarina equisetifolia*]

5. Flowers are zygomorphic in

(a) *Ceropegia* (b) *Thevetia*
(c) *Datura* (d) *Solanum* **[Ans. (c) *Datura*]**

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In-Text Questions

1. ..... was the first to use the term 'Systematics'.

(a) Bauhin (b) Engler

(c) Linnaeus (d) John Ray **[Ans. (c) Linnaeus]**

2. ..... is the lowest rank of classification.

(a) Genus (b) Family

(c) Species (d) Taxon **[Ans. (c) Species]**

3. Plantae is a ..... .

(a) Kingdom (b) Species

(c) Genus (d) Order **[Ans. (a) Kingdom]**

4. Choose the wrong statement with reference to 'species'.

(a) Common ancestor

(b) Closely resemble

(c) Do not interbreed

(d) Morphologically similar **[Ans. (c) Do not interbreed]**

5. 19th International Botanical Congress was held in ..... .

(a) Australia (b) China

(c) India (d) Egypt **[Ans. (b) China]**

6. Binomial system of nomenclature was introduced by ..... .

(a) Linnaeus (b) Bauhin

(c) De condolle (d) Engler **[Ans. (b) Bauhin]**

7. Duplicate specimen of holotype collected from same population ..... .

(a) Holotype (b) Paratype

(c) Isotype (d) Lectotype **[Ans. (c) Isotype]**

8. First modern botanical garden was established in ..... .

(a) China (b) Melbourne

(c) Italy (d) France **[Ans. (c) Italy]**

9. The largest botanical garden is in ..... .

(a) Kew (b) Kolkata

(c) Brazil (d) Sydney **[Ans. (a) Kew]**

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26. Red sandalwood belongs to Family ..... .

(a) Fabaceae (b) Solanaceae
(c) Liliaceae (d) Apocynaceae

[Ans. (a) Fabaceae]

27. A plant used as Green manure ..... .

(a) *Lathyrus* (b) *Sesbania*
(c) *Solanum nigrum*
(d) *Gloriosa*

[Ans. (b) *Sesbania*]

28. ..... is known as Father of Botany.

(a) John Ray (b) Theophrastus
(c) Bauhin (d) Linnaeus

[Ans. (b) Theophrastus]

29. The concept of species was proposed by..... .

(a) Stebbins (b) Plato
(c) Barhis (d) Bentham **[Ans. (b) Plato]**

30. The method of ..... is followed currently for preservation of herbarium sheets throughout the world.

(a) Applying DDT (b) Fumigation
(c) Dry storage (d) Deep freezing

[Ans. (d) Deep freezing]

31. ..... is called father of Taxonomy.

(a) Bentham (b) Karl prantl
(c) Linnaeus (d) Cronquist **[Ans. (c) Linnaeus]**

32. Bentham and Hooker described ..... species.

(a) 90,205 (b) 97,305
(c) 98,304 (d) 97,205 **[Ans. (d) 97,205]**

33. In Bentham and Hooker's system, the class Monocotyledonae has ..... series.

(a) 8 (b) 7 (c) 6 (d) 4 **[Ans. (b) 7]**

34. ..... system is a evolving system of classification that might undergo change based on new data.

(a) Natural (b) Phylogenetic
(c) APG (d) Cronquist **[Ans. (c) APG]**

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Higher Order Thinking Skills (HOTS)

1. ..... is called the father of Barcoding.

(a) Darlington (b) Paul Hebert

(c) Gilly (d) Nuttal **[Ans. (b) Paul Hebert]**

2. Identify the dye yielding plant.

(a) *Butea* (b) *Clitoria*

(c) *Calotropis* (d) *Crotalaria* **[Ans. (b) *Clitoria*]**

3. The National Orchidarium at Yercaud is famous for collection of ..... .

(a) Germplasm (b) Rose hybrids

(c) Insectivorous plants (d) Bambusetum

[Ans. (c) Insectivorous plants]

4. ..... is not a characteristic of Fabaceae.

(a) Papilionaceous corolla

(b) Monocarpellary ovary

(c) Oblique ovary

(d) Marginal placentation **[Ans. (c) Oblique ovary]**

5. Match the following.

1. *Phormium*	(i) Alkaloid
2. *Colchicum*	(ii) Vegetable
3. *Asparagus*	(iii) Fishing nets
4. *Urginea*	(iv) Raticide

(a) 1 – i	2 – ii	3 – iv	4 – ii
(b) 1 – iii	2 – i	3 – ii	4 – iv
(c) 1 – iv	2 – ii	3 – iii	4 – i
(d) 1 – iv	2 – i	3 – ii	4 – iii

[Ans. (b) 1 – iii, 2 – i, 3 – ii, 4 – iv]

6. Prickles are seen in ..... .

(a) Solanum tuberosum

(b) Solanum xanthocarpum

(c) Solanum nigrum

(d) Solanum trilobatum **[Ans. (d) Solanum trilobatum]**

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UNIT-III CELL BIOLOGY AND BIOMOLECULES

6. CELL: THE UNIT OF LIFE

Textbook Questions

CHOOSE THE CORRECT ANSWERS

1. The two subunits of ribosomes remain united at critical ion level of

(a) Magnesium (b) Calcium

(d) Sodium (d) Ferrous **[Ans. (a) Magnesium]**

2. Sequences of which of the following is used to know the phylogeny

(a) mRNA (b) rRNA

(c) tRNA (d) Hn RNA **[Ans. (b) rRNA]**

3. Many cells function properly and divide mitotically even though they do not have

(a) plasma membrane (b) cytoskeleton

(c) mitochondria (d) plastids **[Ans. (d) plastids]**

4. Keeping in view the fluid mosaic model for the structure of cell membrane, which one of the following statements is correct with respect to the movement of lipids and proteins from one lipid monolayer to the other

(a) Neither lipid nor proteins can flip-flop

(b) Both lipid and proteins can flip flop

(c) While lipids can rarely flip-flop proteins cannot

(d) While proteins can flip-flop lipids cannot

[Ans. (c) While lipids can rarely flip-flop proteins cannot]

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5. Match the columns and identify the correct option:

	Column-I		Column-II
A	Thylakoids	1.	Disc-shaped sacs in Golgi apparatus
B	Cristae	2.	Condensed structure of DNA
C	Cisternae	3.	Flat membranous sacs in stroma
D	Chromatin	4.	Infoldings in mitochondria

	(A)	(B)	(C)	(D)
(a)	3	4	2	1
(b)	4	3	1	2
(c)	3	4	1	2
(d)	3	1	4	2

[Ans. (c) A-3, B-4, C-1, D-2]

In-Text Questions

1. Robert Hooke coined the term cell based on observation of_____.

(a) Cork (b) Bacteria
(c) Cyano bacteria (d) Pus cells **[Ans. (a) Cork]**

2. The term animalcules was used by_____.

(a) Pasteur (b) Dutrochet
(c) Leeuwenhock (d) Robert Hooke

[Ans. (c) Leeuwenhock]

3. A patch stop carrier is a part of _____.

(a) Bright field microscope
(b) Dark field microscope
(c) Electron microscope
(d) Phase contrast microscope

[Ans. (b) Dark field microscope]

4. _____provides 3 dimensional images of surface of microscopic objects.

(a) TEM (b) SEM
(c) Phase Contrast microscope
(d) Dark field microscope **[Ans. (b) SEM]**

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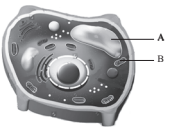
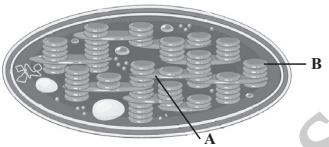
44. Give the name of A and B in the given diagram.



(a) Crystals, Starch granules
(b) Vacuole, Mitochondrion
(c) Nucleus, Golgi apparatus
(d) Golgi appartus, Chloroplast

[Ans. (b) Vacuole, Mitochondrion]

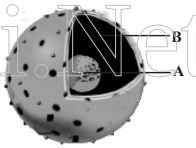
45. What do A and B indicate in the given diagram.



(a) Granum, Stroma (b) Granum Thylakoids
(c) Stroma, Thylakoids (d) Lumen, Granum

[Ans. (b) Granum Thylakoids]

46. What do A and B indicate in the given diagram.



(a) Nucleolus, Nuclear membrane
(b) Nucleolus, Chromatin
(c) Nucleolus, Nucleoplasm
(d) Chromosome, Nuclear membrane

[Ans. (c) Nucleolus, Nucleoplasm]

Higher Order Thinking Skills (HOTS)

1. In higher plants cell wall is made up of _____.

(a) Peptidoglycan (b) Cellulose
(c) Lipoprotein (d) Callose **[Ans. (b) Cellulose]**

2. Mitochondria produces _____.

(a) Carbohydrate (b) Protein
(c) ATP (d) Lipid **[Ans. (c) ATP]**

3. The leucoplast which stores protein is known as

(a) Aleuroplast (b) Chloroplast
(c) Amyloplast (d) Elainoplast

[Ans. (a) Aleuroplast]

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10. Choose the group that belongs to Mesokaryotes.

(a) Dinoflagellates and Protozoa
(b) Fungi and Plants
(c) Bacteria and Archaebacteria
(d) Algae and Fungi **[Ans. (c) Bacteria and Archaebacteria]**

11. Choose the correct statement with regard to working of Scanning Electron Microscope.

(i) Glass slides are used
(ii) They work in a vacuum medium
(iii) The stubs are coated in gold
(iv) 2-D picture is obtained.

(a) (i) and (ii) (b) (ii) and (iii)
(c) (i) and (iv) (d) (iii) and (iv)

[Ans. (b) (ii) and (iii)]

Competitive Examination Questions

1. Who invented electron microscope? **(2010 AIIMS, 2008 JIPMER)**

(a) Janssen (b) Edison
(c) Knoll and Ruska (d) Landsteiner

[Ans. (c) Knoll and Ruska]

2. Specific proteins responsible for the flow of materials and information into the cell are called **(2009 AIIMS)**

(a) Membrane receptors (b) carrier proteins
(c) integeral proteins
(d) none of these **[Ans. (b) carrier proteins]**

3. Genes present in the cytoplasm of eukaryotic cells are found in **(2006 AIIMS)**

(a) mitochondria and inherited via egg cytoplasm
(b) lysosomes and peroxisomes
(c) Golgi bodies and smooth endoplasmic reticulum
(d) Plastids inherited via male gametes

[Ans. (a) mitochondria and inherited via egg cytoplasm]

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7. Cell Cycle

Textbook Questions

Choose the Correct Answers

1. The correct sequence in cell cycle is

(a) S-M-G1-G2 (b) S-G1-G2-M

(c) G1-S-G2-M (d) M-G-G2-S

[Ans. (c) G1-S-G2-M]

2. If cell division is restricted in G1 phase of the cell cycle then the condition is known as

(a) S Phase (b) G_2 Phase

(c) M Phase (d) G_0 Phase **[Ans. (d) G_0 Phase]**

3. Anaphase promoting complex APC is a protein degradation machinery necessary for proper mitosis of animal cells. If APC is defective in human cell, which of the following is expected to occur?

(a) Chromosomes will be fragmented

(b) Chromosomes will not condense

(c) Chromosomes will not segregate

(d) Recombination of Chromosomes will occur

[Ans. (c) Chromosomes will not segregate]

4. In S phase of the cell cycle

(a) Amount of DNA doubles in each cell

(b) Amount of DNA remains same in each cell

(c) Chromosome number is increased

(d) Amount of DNA is reduced to half in each cell

[Ans. (a) Amount of DNA doubles in each cell]

5. Centromere is required for

(a) transcription (b) crossing over

(c) cytoplasmic cleavage

(d) movement of Chromosome towards pole

[Ans. (d) movement of Chromosome towards pole]

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20. During which phase of prophase-I of meiosis does the process of synapsis occur ?

(a) Pachytene (b) Leptotene
(c) Zygotene (d) Diplotene **[Ans. (c) Zygotene]**

21. Which is the longest phase of meitoic division ?

(a) Prophase-I (b) Metaphase-I
(c) Anaphase-I (d) Telophase-I
[Ans. (a) Prophase-I]

22. Meiosis-II is :

(a) Cell division (b) Mitotic division
(c) Cell elongation (d) Reduction division
[Ans. (b) Mitotic division]

23. The minimum number of meiotic divisions required to produce 400 seeds in a pea plant is.

(a) 200 (b) 700
(c) 500 (d) 400 **[Ans. (d) 400]**

24. Significance of meiosis _____.

(a) The number of chromosomes is maintained in all cells.
(b) It is an important process for evolution.
(c) Due to division, cell can maintain their efficient size.
(d) A very significant contribution of mitosis is cell repair.
[Ans. (b) It is an important process for evolution]

25. During which of the following phases of mitosis asters do appear around the centrioles?

(a) Anaphase (b) Metaphase
(c) Prophase (d) Telophase **[Ans. (c) Prophase]**

26. During which stage of meiosis does crossing over take place?

(a) Leptotene (b) Zygotene
(c) Pachytene (d) Diakinesis
[Ans. (d) Diakinesis]

27. At which of the following stages of cell cycle proteins and microtubules, required for mitosis, are synthesized?

(a) G_2 phase (b) G_1 phase
(c) Interphase (d) M phase **[Ans. (a) G_2 phase]**

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33. Cytokinesis is generally, but not always, seen in mitosis. If cells undergo mitosis and do not follow cytokinesis then it would result in:

(a) Cells with abnormal small nuclei
(b) Ensuring genetic homogeneity of cell
(c) A cell with a single large nucleus
(d) A cell with two or more nuclei

[Ans. (d) A cell with two or more nuclei]

34. How many times is the genetic material replicated during meiosis ?

(a) Twice (b) Once
(c) Four times (d) None of the above **[Ans. (b) Once]**

35. How does the pairs of homologous chromosomes appear during zygotene phase ?

(a) Univalent (b) Trivalent
(c) Tetravalent
(d) Bivalent **[Ans. (d) Bivalent]**

36. During Prophase-I of meiosis homologous chromosomes pair with each other to form bivalent. A bivalent is an association of:

(a) Two chromatids and two centromeres.
(b) Four chromatids and four centromeres.
(c) Four chromatids and two centromeres.
(d) Two chromatids and one centromere.

[Ans. (c) Four chromatids and two centromeres]

37. Crossing over involves _____.

(a) Exchange of genetic material
(b) Deletion of chromosomes
(c) Duplication of chromosomes
(d) Addition of chromosome

[Ans. (a) Exchange of genetic material]

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45. The locations at which crossing over occurs are known as

(a) Centromere (b) Kinetochore

(c) Chiasmata (d) Centriole

[Ans. (c) Chiasmata]

46. Which of the following structure will not be common to mitotic cell of a higher plant ?

(a) Cell plate (b) Centromere

(c) Centriole (d) Spindle fibre

[Ans. (c) Centriole]

47. Prophase is characterized by_____.

(a) spliting of centromere

(b) thread like appearance of chromosomes

(c) arrangement of chromosomes on equatorial plate

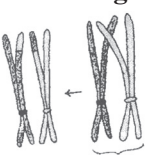
(d) pairing of homologous chromosome

[Ans. (b) thread like appearance of chromosomes]

48. Phase of cell cycle unique for DNA replication is:

(a) S (b) G_1 (c) G_2 (d) M **[Ans. (a) S]**

49. Given below is the representation of a certain event at a particular stage of a type of cell division. What is this stage?



(a) Prophase-II during meiosis

(b) Prophase of mitosis

(c) Both prophase and metaphae of mitosis

(d) Prophase-I during meiosis

[Ans. (d) Prophase-I during meiosis]

50. Centrosome structure was given by _____ .

(a) John Ray (b) T. Boweri

(c) Van Benden (d) Franchi **[Ans. (b) T. Boweri]**

51. The fluid filled in nucleus is known as _____.

(a) Nucleoplasm (b) Centroplasm

(c) Cytoplasm (d) Protoplasm

[Ans. (a) Nucleoplasm]

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52. During cell division chromatin fibres become condensed to form thick structures called _____ .

(a) Nuclear membrane
(b) Chromosomes
(c) Mitochondria
(d) Endoplasmic reticulum **[Ans. (b) Chromosomes]**

53. _____ chromosome has middle centromere forming two equal arms of the chromosome.

(a) Acrocentric
(b) Sub-metacentric
(c) Metacentric
(d) Telocentric **[Ans. (c) Metacentric]**

54. _____ chromosome has centromere nearer to one end of the chromosome resulting into one shorter arm and one longer arm.

(a) Telocentric
(b) Sub-metacentric
(c) Acrocentric
(d) Metacentric **[Ans. (b) Sub-metacentric]**

55. _____ chromosome has a terminal centromere.

(a) Metacentric
(b) Acrocentric
(c) Telocentric
(d) Sub-metacentric **[Ans. (c) Telocentric]**

Higher Order Thinking Skills (HOTS)

1. Which of the following is present in maximum number in an adult person ?

(a) Zygote (b) Gamete
(c) Reproductive cell (d) Somatic cell
[Ans. (d) Somatic cell]

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8. BIOMOLECULES

Textbook Questions

CHOOSE THE CORRECT ANSWERS

1. The most basic amino acid is

(a) Arginine (b) Histidine
(c) Glycine (d) Glutamine

[Ans. (a) Arginine]

2. An example of feedback inhibition is

(a) Cyanide action on cytochrome
(b) Sulpha drug on folic acid synthesiser bacteria
(c) Allosteric inhibition of hexokinase by glucose-6-phosphate
(d) The inhibition of succinic dehydrogenase by malonate

[Ans. (c) Allosteric inhibition of hexokinase by glucose-6- phosphate]

3. Enzymes that catalyse interconversion of optical, geometrical or positional isomers are

(a) Ligases (b) Lyases
(c) Hydrolases (c) Isomerases

[Ans. (c) Hydrolases]

4. Proteins perform many physiological functions. For example some functions as enzymes. One of the following represents an additional function that some proteins discharge :

(a) Antibiotics
(b) Pigment conferring colour to skin
(c) Pigments making colours of flowers
(d) Hormones **[Ans. (d) Hormones]**

In-Text Questions

1. The only carbohydrate stored in animals is_____.

(a) Chitin (b) Glycogen
(c) Cellulose (d) Starch **[Ans. (b) Glycogen]**

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27. Which macromolecule is the most diverse in cell and controlls biochemical properties?

(a) Polynucleotide (b) Polysaccharide
(c) Polypeptide (d) Polysomes

[Ans. (c) Polypeptide]

28. The primary structure of proteins is due to _____.

(a) Ionic bonds (b) Peptide bonds
(c) Hydrogen bond (d) S-S Linkages

[Ans. (b) Peptide bonds]

29. The word proteins means _____.

(a) Micromolecule (b) First rank
(c) Catalyst (d) Colloidal

[Ans. (b) First rank]

30. Which biomolecule fights against infectious organisms?

(a) Lipid (b) Nucleic acid
(c) Protein (d) Enzyme **[Ans. (c) Protein]**

31. Which one molecule is finding a weakly acidic substrate of unknown function in the nuclei of human WBC?

(a) Nucleic acid (b) Nuclein
(c) Protein (d) Chromosome

[Ans. (a) Nucleic acid]

32. Which one of the following is the major component of chromosome?

(a) Nucleic acid (b) Protein
(c) Nitrogen base (d) Lipid

[Ans. (a) Nucleic acid]

33. Which group composes of subunits of a nucleotide?

(a) Pentose sugar, Nitrogen
(b) Purine, Pyrimidine, Phosphorus
(c) Nitrogen base, Sugar
(d) Pentose sugar, Nitrogen base, Phosphoric acid

[Ans. (d) Pentose sugar, Nitrogen base, Phosphoric acid]

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50. The RNA transporting amino acid to the protein synthesizing site known as

(a) t-RNA (b) r-RNA

(c) m-RNA (d) Any one of a, b, c

[Ans. (a) t-RNA]

51. _____ is the first alkaloid to be found.

(a) Chitin (b) Marphine

(c) Inulin (d) Ricin **[Ans. (b) Marphine]**

52. What is enzyme?

(a) All proteins which are in all living cells

(b) Chemicals which act as biological catalysts

(c) All amino acids which are in polypeptide chain

(d) All above **[Ans. (b) Chemicals which act as biological catalysts]**

53. Which of the following is not true for enzyme?

(a) Water soluble and colloidal in nature

(b) Lowers the activation energy level

(c) Used up in the biochemical reaction

(d) Affected by the change in temperature

[Ans. (c) Used up in the biochemical reaction]

54. What is Ribozymes?

(a) Only nucleic acids

(b) Only protein

(c) Some nucleic acids that behave like enzyme

(d) More than one Ribosome

[Ans. (c) Some nucleic acids that behave like enzyme]

55. Which part of the plant contains Enzymes?

(a) Only in leaves

(b) Only in fruits

(c) In apical meristem of root and shoot

(d) In all the living cell of plant body

[Ans. (d) In all the living cell of plant body]

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72. Which of the following is the contractile protein?

(a) Collagen (b) Globular

(c) Tropomycin (d) Keratin **[Ans. (d) Keratin]**

Higher Order Thinking Skills (HOTS)

1. Choose the wrong statements:

1. Lipids are not soluble in polar solvents.
2. Lipids are hydrophobic
3. Lipids do not dissolve in ether
4. The term Lipid is derived from Latin word

(a) 1 and 2 (b) 3 and 4

(c) 1, 3, 4 (d) 4 only **[Ans. (b) 3 and 4]**

2. Which of the following statement regarding the properties of starch is not correct?

(a) Made up of amylose and amylopectin chains.

(b) Stored food in plants.

(c) Soluble in water.

(d) Not sweet. **[Ans. (c) Soluble in water]**

3. Find out the mismatched pairs:

(a) Protein - Important components of nucleus

(b) Nucleic acid - Major components of chromosomes

(c) Amino acid - An amphoteric compound

(d) Enzymes - Colloidal catalysts

[Ans. (d) Enzymes - Colloidal catalysts]

4. Which one is the most abundant protein in the animal world?

(a) Collagen (b) Keratin

(c) Albumin (d) Haemoglobin

[Ans. (a) Collagen]

5. Which are the structural units of DNA?

(a) Nitrogen base (b) Pentose sugar

(c) Nucleotide (d) Phosphoric acid

[Ans. (c) Nucleotide]

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BIO-BOTANY (Vol-II)

UNIT-IV PLANT ANATOMY

9. TISSUE AND TISSUE SYSTEM

Textbook Questions

CHOOSE THE CORRECT ANSWERS

1. Refer to the given figure and select the correct statement

i) A,B,and C are histogen of shoot apex
ii) A Gives rise to medullary rays.
iii) B Gives rise to cortex
iv) C Gives rise to epidermis

(a) i and ii only (b) ii and iii only
(c) i and iii only (d) iii and iv only

[Ans. (c) i and iii only]

2. Read the following sentences and identify the correctly matched sentences.

i) In exarch condition, the protoxylem lies outside of metaxylem.
ii) In endarch condition, the protoxylem lies towards the centre .
iii) In centrarch condition, metaxylem lies in the middle of the protoxylem.
iv) In mesarch condition, protoxylem lies in the middle of the metaxylem..

(a) i, ii and iii only (b) ii,iii and iv only
(c) i, ii and iv only (d) All of these.

[Ans. (c) i, ii and iv only]

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3. In Gymnosperms, the activity of sieve tubes are controlled by.

(a) Nearby sieve tube members
(b) Phloem parenchyma cells
(c) Nucleus of companion cell
(d) Nucleus of albuminous cells

[Ans. (d) Nucleus of albuminous cells]

4. When a leaf trace extends from a vascular bundle in a dicot stem, what would be the arrangement of vascular tissues in the veins of the leaf?

(a) Xylem would be on top and the phloem on the bottom
(b) Phloem would be on top and the xylem on the bottom
(c) Xylem would encircle the phloem
(d) Phloem would encircle the xylem **[Ans. (a) Xylem would be on top and the phloem on the bottom]**

In-Text Questions

1. Match the column A with column B and select the correct option from the given codes .

	Column. A	Column. B
A.	Brachysclereids	(i) Seed coat of Hakea
B.	Macrosclereids	(ii) Pisum sativum
C.	Osteosclereids	(iii) Pulp of Pyrus
D.	Astrosclereids	(iv) Petioles of Nymphaea
E.	Trichosclereids	(v) Aerial roots of Monstera

(a) A (iii) B (ii) C (i) D (iv) and E (v)
(b) A (ii) B (iii) C (i) D (iv) and E (v)
(c) A (i) B (iii) C (ii) D (iv) and E (v)
(d) A (ii) B (iii) C (i) D (iv) and E (v)

[Ans. (a) A (iii) B (ii) C (i) D (iv) and E (v)]

2. The theory equivalent to Tunica corpus theory is ..... .

(a) Root Apical Meristem theory
(b) Histogen theory
(c) Korper kappe theory
(d) Apical cell theory **[Ans. (c) Korper kappe theory]**

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27. ..... recognised three tissue system in plants.

(a) Hanstein (b) Nageli
(c) Sachs (d) Haberlandt **[Ans. (c)]**

28. Atactostele is characteristic of ..... .

(a) Monocot leaf (b) Monocot stem
(c) Dicot root (d) Dicot Stem **[Ans. (b) Sachs]**

29. ..... are modified stomata.

(a) Guard cells (b) Bulliform cells
(c) Motor cells (d) Hydathodes
[Ans. (d) Hydathodes]

30. Mangrove plants excrete ..... through their leaves.

(a) water (b) salt
(c) pigments (d) tannins **[Ans. (b) salt]**

31. The Vascular bundle of a dicot leaf is described as ..... .

(a) collateral and open (b) bicollateral
(c) Radial and closed (d) collateral and closed
[Ans. (d) collateral and closed]

32. In the stem of maize the vascular bundle is ..... shaped.

(a) wedge (b) circular
(c) skull (d) 'Y' **[Ans. (c) skull]**

33. Conjunctive tissue ..... .

(a) covers the phloem
(b) covers the vascular bundle
(c) covers the stele
(d) separates xylem and phloem
[Ans. (d) separates xylem and phloem]

34. In insectivorous plants the ..... help to trap insects.

(a) Subsidiary cells (b) Trichomes
(c) Root hairs (d) Leaf cells **[Ans. (c) Root hairs]**

35. Multilayered epidermis is seen in leaf of ..... .

(a) Ficus (b) Grasses
(c) Helianthus (d) Maize **[Ans. (a) Ficus]**

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Higher Order Thinking Skills (HOTS)

1. Which of the following is not a function of epidermis?

(a) Protection of internal tissues

(b) Exchange of gases

(c) Providing mechanical strength and flexibility

(d) Minimising surface transpiration

[Ans. (c) Providing mechanical strength and flexibility]

2. Choose the correct pair/pairs.

i	Liriodendrom	Multiple perforation
ii	Mangifera	Fibre
iii	Gnetum	Single Perforation
iv	Pteridophytes	Tracheids

(a) i and iii (b) i, ii and iii

(c) i and iv (d) iv only **[Ans. (c) i and iv]**

3. Pick out the feature not applicable to roots.

(a) Radial arrangement of vascular tissues

(b) endarch Xylem

(c) Meta xylem is polygonal is shape

(d) Endogenous lateral roots **[Ans. (b) endarch Xylem]**

4. Assertion (A): In grasses the bundle sheath is called Kranz sheath.

Reason (R) : It is involved in photosynthesis.

(a) A and R are right

(b) A and R are wrong

(c) R does not Explain A

(d) A is right and R is wrong **[Ans. (a) A and R are right]**

5. If xylem and phloem occur in the same radius the vascular bundle is described as ..... .

(a) collateral (b) conjoint

(c) radial (d) bicollateral **[Ans. (b) conjoint]**

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10. Secondary Growth

Textbook Questions

Choose the Correct Answers

1. Consider the following statements

In spring season vascular cambium

i) is less active

ii) produces a large number of xylary elements

iii) forms vessels with wide cavities.

of these,

(a) (i) is correct but(ii) and(iii) are not correct

(b) (i) is not correct but(ii) and (iii) are correct

(c) (i) and (ii)are correct but (iii) is not correct

(d) (i)and (ii) are not correct but (iii) is correct.

[Ans. (b) (i) is not correct but(ii) and (iii) are correct]

2. Usually, the monocotyledons do not increase their girth, because

(a) They possess actively dividing cambium

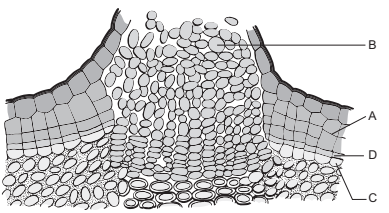
(b) They do not possess actively dividing cambium

(c) Ceases activity of cambium

(d) All are correct

[Ans. (b) They do not possess actively dividing cambium]

3. In the diagram of lenticel identify the parts marked as A, B, C, D



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11. Lenticels are seen in ..... .

(a) Phelloderm, (b) phellem
(c) phellogen (d) epidermis **[Ans. (b) phellem]**

12. Gum Arabic is got from ..... .

(a) Acacia (b) Pinus
(c) Quercus (d) Hevea **[Ans. (a) Acacia]**

13. A bark used as spice ..... .

(a) Pinus (b) Cinchona
(c) Cinnamon (d) Morus **[Ans. (c) Cinnamon]**

14. In dicot root, periderm originates from ..... .

(a) cortex (b) pericycle
(c) xylem (d) medullary rays
[Ans. (b) pericycle]

15. Which of the following is a part of Radial system.

(a) sieve tubes (b) companion cells
(c) phloem rays (d) phloem parenchyma
[Ans. (c) phloem rays]

16. ..... is a fossil resin.

(a) Gum Arabic (b) Amber
(c) Turpentine (d) Latex **[Ans. (b) Amber]**

Higher Order Thinking Skills (HOTS)

1. Match the following.

(a) Phellum	i. Cork cambium
(b) Phellogen	ii. Secondary cortex
(c) Phelloderm	iii. Cork
(d) Phelloids	iv. lack suberin

(a) a - iii b - ii c - iv d - i
(b) a - iii b - i c - ii d - iv
(c) a - ii b - i c - iii d - iv
(d) a - i b - ii c - iii d - iv

[Ans. (b) a - iii, b - i, c - ii, d - iv]

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2. Choose the wrong statement.

(a) Intrafascicular cambium originates from procambium.

(b) It is a part of primary meristem.

(c) Interfascicular cambium is present inside the vasular bundle

(d) It is a part of secondary meristem.

[Ans. (c) Interfascicular cambium is present inside the vasular bundle]

3. Choose the non living cells.

(i) phellem (ii) phellogen (iii) phloem (iv) xylem vessels

(a) i and ii (b) ii and iv

(c) all the four (d) i and iv **[Ans. (d) i and iv]**

4. Assertion (A) : Heart wood is the dead part of wood.

Reason (R) : It resists microorganisims

(a) A and R are wrong

(b) A and R are correct but R is not the explanation for A

(c) A is right, R is wrong

(d) R explains A. **[Ans. (b) A and R are correct but R is not the explanation for A]**

Competitive Examination Questions

1. The balloon – shaped structures called tyloses

(a) originate in the lumen of vessels **(NEET II – 2016)**

(b) characterise the sap wood

(c) are extensions of xylem parenchyma cells into vessels

(d) are linked to the ascent of sap through xylem vessels

[Ans. (c) are extensions of xylem parenchyma cells into vessels]

2. Cortex is the region found between **(NEET II – 2016)**

(a) epidermis and stele (b) pericycle and endodermis

(c) endodermis and pith

(d) endodermis and vascular bundle

[Ans. (a) epidermis and stele]

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8. In barley stem, vascular bundles are **(CBSE -AIPMT 2009)**

(a) open and scattered (b) closed and scattered
(c) open and in a ring (d) closed and radial

[Ans. (b) closed and scattered]

9. Palisade parenchyma is absent in the leaves of **(CBSE- AIPMT 2009)**

(a) sorghum (b) mustard
(c) soyabean (d) gram **[Ans. (a) sorghum]**

10. Sugarcane plant has **(AIIMS 2009)**

(a) reticulate venation (b) capsular fruits
(c) pentamerous flowers (d) dump-bell shaped guard cells

[Ans. (d) dump-bell shaped guard cells]

11. Vascular tissues in flowering plants develop from **(CBSE- AIPMT 2008 & JIPMER 2012)**

(a) phellogen (b) plerome
(c) periblem (d) dermatogen

[Ans. (b) plerome]

12. The length of different internodes in a culm of sugarcane is variable because of **(CBSE -AIPMT 2008)**

(a) short apical meristem
(b) position of axillary buds
(c) size of leaf lamina at the node below each internode
(d) intercalary meristems **[Ans. (d) intercalary meristems]**

13. Passage cells are thin-walled cells found in **(CBSE -AIPMT 2007)**

(a) endodermis of roots facilitating rapid transport of water from cortex to pericycle
(b) phloem elements that serve as entry points for substances for transport to other plant parts
(c) testa of seeds to enable emergence of growing embryonic axis during seed germination
(d) central region of style through which the pollen tube grows towards the ovary

[Ans. (a) endodermis of roots facilitating rapid transport of water from cortex to pericycle]

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25. Which of the following tissues consists of living cells

(a) vessels (b) tracheids **(JIPMER 2012)**

(c) companion cell (d) sclerenchyma

[Ans. (c) companion cell]

26. The Quiescent centre in root meristem serves as a **(JIPMER 2011)**

(a) site for storage of food, which is utilized during maturation

(b) reservoir of growth hormones

(c) reserve for replenishment of damaged cells of the meristem

(d) region for absorption of water **[Ans. (c) reserve for replenishment of damaged cells of the meristem]**

27. In the sieve elements, which one of the following is the most likely function of P.Proteins? **(JIPMER 2011)**

(a) Deposition of callose on sieve plates

(b) Providing energy for active translocation

(c) Autolytic enzymes

(d) Sealing-off mechanism on wounding

[Ans. (d) Sealing-off mechanism on wounding]

28. Which of the following is made up of dead cells?

(a) Xylem parenchyma (b) Collenchyma **(NEET 2017)**

(c) Phellem (d) Phloem **[Ans. (c) Phellem]**

29. The vascular cambium normally gives rise to **(NEET 2017)**

(a) phelloderm (b) primary phloem

(c) secondary xylem (d) periderm

[Ans. (c) secondary xylem]

30. Which of the following plants shows multiple epidermis? **(Manipal 2012)**

(a) Croton (b) Allium

(c) Nerium (d) Cucurbita **[Ans. (c) Nerium]**

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UNIT-V PLANT PHYSIOLOGY

11. TRANSPORT IN PLANTS

Textbook Questions

CHOOSE THE CORRECT ANSWERS

1. In a fully turgid cell

(a) DPD =10 atm; OP = 5 atm; TP =10 atm
(b) DPD = 0 atm; OP = 10 atm; TP =10 atm
(c) DPD = 0 atm; OP = 5 atm; TP= 10 atm
(d) DPD =20 atm; OP = 20 atm; TP= 10 atm

[Ans. (b) DPD = 0 atm; OP = 10 atm; TP =10 atm]

2. Which among the following is correct?

i) apoplast is fastest and operate in nonliving part
ii) Transmembrane route includes vacuole
iii) symplast interconnect the nearby cell through plasmadesmata
iv) symplast and transmembrane route are in living part of the cell

(a) i and ii (b) ii and iii
(c) iii and iv (d) i, ii, iii, iv **[Ans. (d) i, ii, iii, iv]**

3. What type of transpiration is possible in the xerophyte Opuntia?

(a) Stomatal (b) Lenticular
(c) Cuticular (d) All the above

[Ans. (c) Cuticular]

4. Stomata of a plant open due to

(a) Influx of K^+ (b) Efflux of K^+
(c) Influx of Cl^- (d) Influx of OH^-

[Ans. (a) Influx of K^+]

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4. According to cytochrome pump theory the anions and cations are transported by,

(a) active absorption
(b) passive absorption
(c) active and passive absorption respectively
(d) passive and active absorption respectively

[Ans. (c) active and passive absorption respectively]

5. Process of fumigation works on the principle of ..... .

(a) Imbibition (b) Diffusion
(c) Active transport (d) Passive transport

[Ans. (b) Diffusion]

6. Water potential of pure water is ..... .

(a) 0 (b) –2 (c) 1 (d) +2 **[Ans. (a) 0]**

7. The term DPD was coined by ..... .

(a) Renner (b) Munch
(c) Dixon (d) Meyer **[Ans. (d) Meyer]**

8. Experiment with Balsam demonstrates

(a) Translocation of solute (b) Plasmolysis
(c) Transpiration pull (d) Ascent of Sap

[Ans. (d) Ascent of Sap]

9. Match the following.

1. J C Bose	(i) Phosphorylase
2. Strasburger	(ii) Cohesive force
3. Dixon	(iii) Crescograph
4. Hanes	(iv) Oak tree

(a) 1-iii, 2-iv, 3-i, 4-ii (b) 1-iii, 2-iv, 3-ii, 4-i
(c) 1-iv, 2-iii, 3-ii, 4- i (d) 1-i, 2-iv, 3-ii, 4-iii

[Ans. (b) 1-iii, 2-iv, 3-ii, 4-i]

10. ..... is a natural antitranspirant.

(a) O_2 (b) CO_2 (c) NO_2 (d) SO_2

[Ans. (b) CO_2]

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18. DPD is also called ..... .

(a) Turgor pressure (b) Osmotic pressure
(c) Suction pressure (d) Wall pressure

[Ans. (c) Suction pressure]

19. Immersion of dry raisins in water is an example of ..... .

(a) Plasmolysis (b) Osmosis
(c) Deplasmolysis (d) Suction pressure

[Ans. (c) Deplasmolysis]

20. Desalination of water works on the principle of ..... .

(a) Plasmolysis (b) Deplasmolysis
(c) Reverse Osmosis (d) DPD

[Ans. (c) Reverse Osmosis]

21. The term root pressure was coined by ..... .

(a) Stephen Hales (b) Bose
(c) Strassburger (d) Boehm

[Ans. (a) Stephen Hales]

22. The ..... theory was proposed by J.C.Bose.

(a) Root Pressure (b) Relay pump
(c) Pulsation (d) Capillary **[Ans. (c) Pulsation]**

23. As much as 450 litres of water is lost by transpiration per day in ..... .

(a) Corn plant (b) Date palm
(c) Maple tree (d) Sun flower

[Ans. (b) Date palm]

24. The theory of K^+ transport to explain stomatal opening was proposed by ..... .

(a) Steward (b) Levit
(c) Hanes (d) Lloyd **[Ans. (b) Levit]**

25. Starch - Sugar Interconversion theory was proposed by ..... .

(a) Lloyd (b) Sayre
(c) Levit (d) Hanes **[Ans. (a) Lloyd]**

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26. The electro-osmotic theory explains ..... .

(a) ascent of sap (b) translocation

(c) stomatal movement (d) water movement

[Ans. (b) translocation]

Higher Order Thinking Skills (HOTS)

1. Which one of the following statement is correct regarding stomata, lenticel and hydathode?

i) Opening and closing is not regulated in lenticel and hydathode

ii) Stomata and lenticel allow gaseous exchange

iii) Stomata and hydathode are living cells but lenticel is a dead cell

iv) Gaseous exchange is not possible in hydathode

(a) i only (b) ii and iii

(c) i, iii, iv (d) all **[Ans. (a) i only]**

2. Identify the wrong statement with reference to Diffusion.

i) It is seen in gases and liquids.

ii) It is a active process and hence no energy expenditure is required.

iii) The rate of diffusion is determined by concentration gradient.

iv) It is independent of the living system.

(a) ii and iii (b) i and iv

(c) ii only (d) i only **[Ans. (c) ii only]**

3. Choose the correct statement.

(i) In guard cells starch is converted to malic acid.

(ii) Stomata open in dark and close in light.

(iii) Accumulation of CO_2 in guard cells lowers the pH level.

(iv) CO_2 is a natural antitranspirant

(a) i, ii, iii (b) i, ii, iii, iv

(c) none (d) i, iii, iv **[Ans. (d) i, iii, iv]**

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5. Identify the correct statement

(i) Sulphur is essential for amino acids Cystine and Methionine

(ii) Low level of N, K, S and Mo affect the cell division

(iii) Non-leguminous plant Alnus which contain bacterium Frankia

(iv) Denitrification carried out by Nitrosomonas and Nitrobacter.

(a) I, II are correct (b) I, II, III are correct

(c) I only correct (d) all are correct

[Ans. (b) I, II, III are correct]

In-Text Questions

1. Which chelating agent found in soil are produced by bacteria?

(a) Siderophores (b) EDTA

(c) Auxin (d) Leghaemoglobin

[Ans. (a) Siderophores]

2. Leghaemoglobin is

(a) Oxygen scavenger in BGA

(b) Oxygen scavenger in Rhizobium

(c) Oxygen scavenger in legume

(d) scavenger in all nitrogen fixers.

[Ans. (c) Oxygen scavenger in legume]

3. Roots of which plant contain a red pigment which have affinity for oxygen?

(a) Carrot (b) Soybean

(c) Mustard (d) Radish **[Ans. (b) Soybean]**

4. Plant deficient of element zinc, shows its effect on the biosynthesis of plant growth hormone

(a) Auxin (b) Cytokinin

(c) Ethylene (d) Abscisic acid **[Ans. (a) Auxin]**

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12. ..... is a mineral required in greatest amount by plants.

(a) P (b) K (c) N (d) Mg **[Ans. (c) N]**

13. ..... is a mineral needed for binding of Ribosomal subunits.

(a) Manganese (b) Magnesium
(c) Zinc (d) Molybdenum

[Ans. (b) Magnesium]

14. Khaira disease of Rice is caused due to deficiency of ..... .

(a) Mo (b) Zn (c) B (d) O **[Ans. (b) Zn]**

15. The term hydroponics was coined by ..... .

(a) Von Sachs (b) Arnon
(c) Goerick (d) Hopkins **[Ans. (c) Goerick]**

16. Coralloid Roots are seen in ..... .

(a) Cycas (b) Legume
(c) Alnus (d) Lichens **[Ans. (a) Cycas]**

17. ..... is a saprophyte.

(a) Monotropa (b) Cycas
(c) Anabaena (d) Cuscuta

[Ans. (a) Monotropa]

18. A free living anaerobic Nitrogen fixing bacteria ..... .

(a) Azolla (b) Klebsiella
(c) Clostridium (d) Frankia

[Ans. (c) Clostridium]

19. The appearance of brown spots surrounded by chlorotic veins is a symptom caused by toxicity of ..... .

(a) Magnesium (b) Potassium
(c) Manganese (d) Sodium **[Ans. (c) Manganese]**

20. The skeletal elements constitute ..... of dry weight.

(a) 92% (b) 90% (c) 98% (d) 94%

[Ans. (d) 94%]

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29. Whip tail disease of cauliflower is due to deficiency of ..... .

(a) B (b) Zn (c) Mo (d) Cl **[Ans. (c) Mo]**

30. ..... is a free living Nitrogen fixing fungi.

(a) Anabaena (b) Pullularia

(c) Chlorobium (d) Mucor **[Ans. (b) Pullularia]**

31. ..... is a saprophytic angiosperm.

(a) Monotropa (b) Alnus

(c) Cuscuta (d) Viscum **[Ans. (a) Monotropa]**

32. ..... is a not a parasite.

(a) Loranthus (b) Santalum album

(c) Viscum (d) Neottia **[Ans. (d) Neottia]**

33. ..... is the main amino acid from which other amino acids are synthesized.

(a) Glutamic acid (b) Valine

(c) Cysteine (d) Methionine

[Ans. (a) Glutamic acid]

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Higher Order Thinking Skills (HOTS)

1. Identify Wrongly matched pair.

(i) Calcium - Mitotic spindle formation and mitotic cell divisions

(ii) Manganese - Photolysis of water

(iii) Potassium - Stomatal movement

(iv) Zinc - Synthesis of cytokinin

(v) Magnesium - Binding of Thylakoids

(a) i and ii (b) iv and v

(c) iv and i (d) v and ii **[Ans. (b) iv and v]**

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13. PHOTOSYNTHESIS

Textbook Questions

CHOOSE THE CORRECT ANSWERS

1. Assertion (A): Increase in Proton gradient inside lumen responsible for ATP synthesis

Reason (R) : Oxygen evolving complex of PS I located on thylakoid membrane facing Stroma, releases H+ ions

(a) Both Assertion and Reason are True
(b) Assertion is True and Reason is False
(c) Reason is True and Assertion is False
(d) Both Assertion and Reason are False.

[Ans. (b) Assertion is True and Reason is False]

2. Which chlorophyll molecule does not have a phytol tail?

(a) Chl- a (b) Chl-b
(c) Chl- c (d) Chl -d **[Ans. (c) Chl- c]**

3. The correct sequence of flow of electrons in the light reaction is

(a) PS II, plastoquinone, cytochrome, PS I, ferredoxin.
(b) PS I, plastoquinone, cytochrome, PS II ferredoxin.
(c) PS II, ferredoxin, plastoquinone, cytochrome, PS I.
(d) PS I, plastoquinone, cytochrome, PS II, ferredoxin.

[Ans. (a) PS II, plastoquinone, cytochrome, PS I, ferredoxin.]

4. For every CO_2 molecule entering the C_3 cycle, the number of ATP & NADPH required

(a) 2ATP + 2NADPH (b) 2ATP + 3NADPH
(c) 3ATP + 2NADPH (d) 3ATP + 3NADPH

[Ans. (c) 3ATP + 2NADPH]

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10. All carotenoid pigments have ..... carbon atoms.

(a) 30 (b) 40 (c) 50 (d) 20 **[Ans. (b) 40]**

11. The red pigment found in roses is ..... .

(a) carotene (b) phycoerythrin

(c) phycobilin (d) lycopene **[Ans. (d) lycopene]**

12. The term quantosome was coined by ..... .

(a) Emerson (b) Warburg

(c) Steinman Park (d) Beggins **[Ans. (d) Beggins]**

13. Red Drop experiment was done using ..... .

(a) Plant (b) Chlorella

(c) Bacteria (d) Virus **[Ans. (b) Chlorella]**

14. The pathway of electron during phosphorescence is ..... .

(a) $S_2 \rightarrow S_1 \rightarrow T_1 \rightarrow S_0$

(b) $S_2 \rightarrow T_1 \rightarrow S_0$

(c) $S_1 \rightarrow S_0 \rightarrow S_2 \rightarrow T_1 \rightarrow S_i \rightarrow S_6$

(d) $T_1 \rightarrow S_0 \rightarrow S_2 \rightarrow S_i$ **[Ans. (a) $S_2 \rightarrow S_1 \rightarrow T_i \rightarrow S_0$]**

15. RUBISCO constitutes ..... of chloroplast protein.

(a) 17 % (b) 20 %

(c) 16 % (d) 21 % **[Ans. (c) 16 %]**

16. Dicarboxylic Acid pathway refers to

(a) C_3 pathway (b) C_4 pathway

(c) C_2 pathway (d) CAM **[Ans. (b) C_4 pathway]**

17. Choose the plant showing CAM cycle.

(a) Potato (b) Wheat

(c) Opuntia (d) Maize **[Ans. (c) Opuntia]**

18. During dark respiration the end products are .....

(a) O_2 and H_2O (b) H_2O only

(c) CO_2 (d) CO_2 and water

[Ans. (d) CO_2 and water]

19. Identify Wrongly matched pair.

(a) O_2 and H_2O (b) H_2O only

(c) CO_2 (d) CO_2 and water

[Ans. (b) H_2O only]

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28. ..... is involved in formation of chlorophyll.

(a) Alanine (b) Valine
(c) Glycine (d) Leucine **[Ans. (c) Glycine]**

29. Pheophytin resembles chlorophyll except that it lacks ..... .

(a) Fe (b) Mg
(c) pyrrole (d) Nitrogen **[Ans. (b) Mg]**

30. The term Quantasome was coined by ..... .

(a) Steinman (b) Emerson
(c) Park and Biggins (d) Hatch and Slack
[Ans. (c) Park and Biggins]

31. The quantum yield for reduction of one CO_2 molecule is.... .

(a) 14% (b) 10% (c) 12% (d) 8%
[Ans. (c) 12%]

32. Release of one electron from pigment system requires ..... quanta of light.

(a) 4 (b) 2 (c) 3 (d) 6 **[Ans. (b) 2]**

33. 1 complete light reaction involves ..... quanta of light.

(a) 50 (b) 46 (c) 48 (d) 40 **[Ans. (c) 48]**

34. ..... is the first stable product of C_3 cycle.

(a) DHAP (b) PGA
(c) Succinic acid (d) fumaric acid **[Ans. (b) PGA]**

Higher Order Thinking Skills (HOTS)

1. Identify the Correct pair:

I. Quantum requirement for evolution of Oxygen molecule - 8 photons
II. Energy requirement to fix 6 CO_2 in C_3 plants- 30 ATP
III. Energy requirement to fix 6 CO_2 in C_4 plants- 2 photons
IV. Quantum requirement to release one electron- 18 ATP

(a) I and II (b) II and III
(c) I only Correct (d) IV only Correct
[Ans. (c) I only Correc]

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14. Respiration

Textbook Questions

Choose the Correct Answers

1. **The number of ATP molecules formed by complete oxidation of one molecule of pyruvic acid is**

   (a) 12 (b) 13 (c) 14 (d) 15 **[Ans. (d) 15]**

2. **During oxidation of two molecules of cytosolic NADH + H^+, number of ATP molecules produced in plants are**

   (a) 3 (b) 4 (c) 6 (d) 8 **[Ans. (c) 6]**

3. **The compound which links glycolysis and Krebs cycle is**

   (a) succinic acid (b) pyruvic acid

   (c) acetyl CoA (d) citric acid

   [Ans. (c) acetyl CoA]

4. **Assertion(A): Oxidative phosphorylation takes place during the electron transport chain in mitochondria.**
   Reason(R): Succinyl Co A is phosphorylated into succinic acid by substrate phosphorylation.

   (a) A and R is correct. R is correct explanation of A

   (b) A and R is correct but R is not the correct explanation of A

   (c) A is correct but R is wrong

   (d) A and R is wrong. **[Ans. (b) A and R is correct but R is not the correct explanation of A]**

5. **Which of the following reaction is not involved in Krebs cycle.**

   (a) Shifting of phosphate from 3C to 2C

   (b) Splitting of Fructose 1,6 bisphosphate into two molecules 3C compounds.

   (c) Dephosphorylation from the substrates

   (d) All of these **[Ans. (d) All of these]**

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In-Text Questions

1. In succulent plants respiratory quotient is always less than one because of

(a) complete oxidation (b) complete reduction
(c) incomplete reduction (d) incomplete oxidation

[Ans. (d) incomplete oxidation]

2. In Pulses RQ will be

(a) One (b) more than one
(c) less than one (d) zero **[Ans. (c) less than one]**

3. Succinate dehydrogenase enzyme is found in mitochondrial

(a) inner membrane (b) outer membrane
(c) matrix (d) all the above

[Ans. (a) inner membrane]

4. Which of the following electron carrier is not involved in mitochondrial electron transport chain?

(a) Ubiquinone (b) cytochrome b_6
(c) cytochrome c (d) cytochrome a_3

[Ans. (b) cytochrome b_6]

5. The number of O_2 molecules required for breaking down of one molecule of glucose forglycolysis.

(a) 2 (b) 4 (c) 5 (d) 6 **[Ans. (d) 6]**

6. Choose the correct option:

Column A	Column B
(a) Molecular oxygen	- α-ketoglutaric acid
(b) Complex IV	- Cytochrome c oxidase
(c) Pyruvate dehydrogenase	- Cytochrome c
(d) Decarboxylation	- Citric acid

[Ans. (b) Complex IV - Cytochrome c oxidase]

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24. In Anabrobic respiration only ..... ATP molecules are produced.

(a) 4 (b) 2 (c) 6 (d) 8 **[Ans. (b) 2]**

25. Link reaction refers to the following.

(a) ATP → ATP

(b) Pyruvic acid → Acetyl CoA

(c) Acetyl CoA → citric acid

(d) Glucose → pyruvic acid

[Ans. (b) Pyruvic acid → Acetyl CoA]

26. Sir Hans Kreb, was born in ..... .

(a) Austria

(b) England

(c) Germany

(d) USA **[Ans. (c) Germany]**

27. F_1 particles are called ..... .

(a) quantosome

(b) cytochromes

(c) oxysome

(d) Osmosomes **[Ans. (c) oxysome]**

28. ..... is a small lipid soluble electron proton carrier located in inner membrane of mitochondria.

(a) FMP

(b) FAD

(c) UQ

(d) Cyt b_6 **[Ans. (c) UQ]**

29. ..... is not a electron transport chain inhibitor.

(a) 2,4 DNP (b) Rotenone

(c) Oligomycin (d) Co Q **[Ans. (d) Co Q]**

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15. Plant Growth and Development

Textbook Questions

Choose the Correct Answers

1. Select the wrong statement from the following:

(a) Formative phase of the cells retain the capability of cell division.

(b) In elongation phase development of central vacuole takes place.

(c) In maturation phase thickening and differentiation takes place.

(d) In maturation phase, the cells grow further.

[Ans. (d) In maturation phase, the cells grow further.]

2. If the diameter of the pulley is 6 inches, length of pointer is 10 inches and distance travelled by pointer is 5 inches. Calculate the actual growth in length of plant.

(a) 3 inches (b) 6 inches

(c) 12 inches (d) 30 inches **[Ans. (*)]**

* None of the option is correct. Correct Ans. = 1.5 inches.

[Diameter of pulley = 6 inches.

∴ Radius of pulley = 3 inches

Actual growth in length

$$= \frac{\text{Distance travelled by the pointer} \times \text{Radius of the pulley}}{\text{Length of the pointer}}$$

$$= \frac{5 \times 3}{10_2} = 1.5\ ]$$

3. In unisexual plants, sex can be changed by the application of

(a) Ethanol (b) Cytokinins

(c) ABA (d) Auxin **[Ans. (c) ABA]**

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19. ..... is a munocarpic prennial.

(a) Rose (b) Bamboo
(c) Banyan (d) Money plant

[Ans. (b) Bamboo]

20. The growth rate becomes zero in ..... phase.

(a) Decelerating (b) maturation
(c) exponential (d) lag **[Ans. (b) maturation]**

21. Identify a character which is not related to phytohormones.

(a) Phytohormones are inorganic in nature.
(b) They influence physiological activities.
(c) They are required in trace quantities.
(d) They are produced in tips of roots and stems

[Ans. (a) Phytohormones are inorganic in nature]

22. The term auxin was coined by ..... .

(a) Darwin (b) Went
(c) Smith (d) Miller **[Ans. (b) Went]**

23. ..... isolated Auxin A from human urine.

(a) Went (b) Kogl
(c) Darwin (d) Skoog **[Ans. (b) Kogl]**

24. ..... is a synthetic auxin.

(a) IBA (b) PAA
(c) NAA (d) IAA **[Ans. (c) NAA]**

25. ..... is a antiauxin compound.

(a) 2,4 - D (b) 2,4,5 -T
(c) TIBA (d) IPA **[Ans. (c) TIBA]**

26. The name Gibberellin was coined by ..... .

(a) Went (b) Kurosawa
(c) Yabuta (d) Lethan **[Ans. (c) Yabuta]**

27. The primary Precursor of Gibberellin is .....

(a) Tryptophan (b) terpenoids
(c) Acetate (d) adenine **[Ans. (c) Acetate]**

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45. Indeterminate plants refers to ..... plants.

(a) long day (b) short day

(c) intermediate day (d) day neutral

[Ans. (d) day neutral]

Higher Order Thinking Skills (HOTS)

1. The term synergistic action of hormones refers to

(a) When two hormones act together but brings about opposite effects.

(b) When two hormones act together and contribute to the same function.

(c) When one hormone affects more than one function

(d) When many hormones bring about opposite effects

[Ans. (b) When two hormones act together and contribute to the same function.]

2. Choose the correct statement for the physiological effects of Auxin.

(i) Auxin promotes abscission

(ii) Auxin induces vascular differentiation

(iii) Auxin prevents apical dominance

(iv) They promote cell elongation in stem

(a) ii and iv (b) ii and iii

(c) iv only (d) ii, iii, iv **[Ans. (a) ii and iv]**

3. Match the following.

a.	ethylene	(i)	epinasty
b.	cytokinin	(ii)	closure of stomata
c.	Giberellin	(iii)	dwarfism
d.	ABA	(iv)	cell division

(a) a-ii b-iii c-i d-iv (b) a-i b-iv c-iii d-ii

(c) a-ii b-iv c-iii d- i (d) a-iii b-ii c-iv d-i

[Ans. (b) a-i b-iv c-iii d-ii]

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Competitive Examination Questions

1. The water potential of pure water is **(NEET 2017)**

(a) Less than zero
(b) More than zero but less than one
(c) More than one
(d) Zero **[Ans. (d) Zero]**

2. Transpiration and root pressure cause water to rise in plants by **(NEET 2015)**

(a) pulling it upward
(b) pulling and pushing it, respectively
(c) pushing it upward
(d) pushing and pulling it, respectively
[Ans. (b) pulling and pushing it, respectively]

3. Movement of ions or molecules in a direction opposite to that of prevailing electro-chemical gradient is known as **(C.B.S.E. 2000)**

(a) Active transport (b) Pinocytosis
(c) Brownian movement (d) Diffusion
[Ans. (a) Active transport]

4. Correct sequence of events in wilting? (P.M.T. Kerala 2001)

(a) Exosmosis-deplasmolysis-temporary and permanent wilting
(b) Exosmosis-plasmolysis-temporary and permanent wilting
(c) Endosmosis-plasmolysis-temporary and permanent wilting
(d) Endosmosis-deplasmolysis - temporary and permanent wilting
(e) Exosmosis-deplasmolysis-plasmolysis - temporary and permanent wilting **[Ans. (b) Exosmosis-plasmolysis-temporary and permanent wilting]**

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11. Guttated liquid is **(AFMC 2002)**

(a) Pure water
(b) Water plus minerals
(c) Water plus enzymes
(d) All of these **[Ans. (b) Water plus minerals]**

12. Stomata of a plant open due to **(CBSE 2003)**

(a) Influx of potassium ions
(b) Efflux of potassium ions
(c) Influx of hydrogen ions
(d) Influx of calcium ions

[Ans. (a) Influx of potassium ions]

13. Potometer works on the principle of **(CBSE 2000)**

(a) Osmotic pressure
(b) Amount of water absorbed equals the amount transpired
(c) Potential difference between the tip of the tube and then of the plant
(d) Root pressure **[Ans. (b) Amount of water absorbed equals the amount transpired]**

14. Most suitable theory for ascent of sap is **(CBSE 1991, CPMT-UP 1995)**

(a) Transpirational pull and cohesion theory of Dixon and Jolly
(b) Pulsation theory of J.C Bose
(c) Relay pump theory of Godlewski
(d) None of these **[Ans. (a) Transpirational pull and cohesion theory of Dixon and Jolly]**

15. If a cell kept in a solution of unknown concentration gets deplasmolysed, the solution is, **(CPMT-UP 1996)**

(a) Detonic (b) Hypertonic
(c) Isotonic (d) Hypotonic

[Ans. (b) Hypertonic]

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21. Boron in green plants assists in **(RPMT 2007)**

(a) photosynthesis
(b) Sugar transport
(c) activation of enzyme
(d) acting as enzyme cofactor **[Ans. (b) Sugar transport]**

22. Which of the following elements is very essential for the uptake of Ca2+ and membrane function? **(Kerala CEE 2007)**

(a) phosphorus (b) molybdenum
(c) manganese (d) boron **[Ans. (d) boron]**

23. Sulphur is not a constituent of **(AMU 2011)**

(a) cysteine (b) methionine
(c) ferredoxin (d) pyridoxine

[Ans. (d) pyridoxine]

24. Deficiency symptoms of nitrogen and potassium are visible first in ____ **(AIPMT 2014)**

(a) senescent leaves (b) young leaves
(c) roots (d) buds

[Ans. (d) senescent leaves]

25. The first stable product of fixation of atmospheric nitrogen in leguminous plants is _____ **(AIPMT 2013)**

(a) NO^{-3} (b) glutamate
(c) NO^{-2} (d) ammonia

[Ans. (d)ammonia]

26. C_4 plants are more efficient in photosynthesis than C_3 plants due to **(AIPMT 2010)**

(a) presence of thin cuticle
(b) lower rate of photorespiration
(c) higher leaf area
(d) presence of larger number of chloroplast in the leaf cells.

[Ans. (d) lower rate of photorespiration]

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32. Photolysis of each water molecule in light reaction will yield ___ **(Kerala CEE 2007)**

(a) 2 electrons and 4 protons
(b) 4 electrons and 4 protons
(c) 4 electrons and 3 protons
(d) 2 electrons and 2 protons

[Ans. (d) 2 electrons and 2 protons]

33. Photosynthetic active radiation (PAR) has the following range of wavelength **(AIPMT 2005)**

(a) 400-700 nm (b) 450-920 nm
(c) 340-450 nm (d) 500-600 nm

[Ans. (a) 400-700 nm]

34. Phosphoenol pyruvate (PEP) is the primary CO2 acceptor in _____. **(NEET 2017)**

(a) C_3 plants (b) C_4 plants
(c) C_2 plants (d) C_3 and C_4 plants

[Ans. (b) C_4 plants]

35. With reference to factors affecting the rate of photosynthesis, which of the following statements is not correct? **(NEET 2017)**

(a) light saturation for CO_2 fixation occurs at 10 % of full sunlight
(b) increasing atmospheric CO_2 concentration up to 0.05% can enhance CO_2 fixation rate
(c) C_3 plants respond to higher temperature with enhanced photosynthesis while C_4 plants have much lower temperature optimum.
(d) tomato is a greenhouse crop which can be grown in CO_2 enriched atmosphere for higher yield

[Ans. (c) C_3 plants respond to higher temperature with enhanced photosynthesis while C_4 plants have much lower temperature optimum]

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41. Which of the biomolecules is common to respiration-mediated breakdown of fats, carbohydrates and proteins? **(NEET 2013, 2016)**

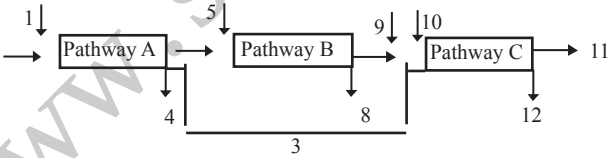
(a) glucose-6-phosphate
(b) fructose1,6-bisphosphate
(c) pyruvic acid
(d) acetyl CoA **[Ans. (d) acetyl CoA]**

42. Which statement is wrong for Krebs cycle? **(NEET 2017)**

(a) there is one point in the cycle where FAD is reduced to $FADH_2$
(b) during conversion of succinyl CoA to succinic acid, a molecule of GTP is synthesised.
(c) the cycle starts with condensation of acetyl group a.cetyl Co a with pyruvic acid to yield citric acid
(d) there are three points in the cycle where NAD^+ is reduced to $NADH+H^+$

[Ans. (c) the cycle starts with condensation of acetyl group a.cetyl Co a with pyruvic acid to yield citric acid]

43. The three boxes in this diagram represents the three major biosynthetic pathways in aerobic respiration and arrows represent net reacts or products. **(NEET 2013)**



Arrows numbered 4, 8 and 12 can be

(a) ATP
(b) H_2O
(c) FAD or $FADH_2$
(d) NADH **[Ans. (a) ATP]**

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49. Which 5-carbon organic acid of the Krebs cycle is a key compound in the N_2 metabolism of a cell **(AIIMS 1989)**

(a) citric acid
(b) fumaric acid
(c) oxalosuccinic acid
(d) α-Ketoglutaric acid **[Ans. (d) α-Ketoglutaric acid]**

50. Which one of the following acts as a hormone involved in ripening of fruits **(CBSE PMT 2000)**

(a) naphthalene acetic acid
(b) ethylene
(c) indole acetic acid
(d) zeatin **[Ans. (b) ethylene]**

51. Coconut milk factor is **(PMT 2003)**

(a) auxin (b) gibberellin
(c) abscisic acid (d) cytokinin

[Ans. (d) cytokinin]

52. Banana is seedless because **(JIPMER 2004)**

(a) it produces asexually
(b) auxin is sprayed
(c) both A and B
(d) none of the above **[Ans. (a) it produces asexually]**

53. Pruning of plants promotes branching due to sensation of axillary buds by **(AIIMS 2004)**

(a) Ethylene (b) Gibberellin
(c) IAA (d) Cytokinin

[Ans. (c) IAA]

54. Avena curvature test is bioassay for activity of **(AIIMS 2006) (NEET 2016)**

(a) Auxin (b) Ethylene
(c) Cytokinin (d) Gibberellin

[Ans. (a) Auxin]

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61. You are given a tissue with its potential for differentiation in an artificial culture. Which of the following pairs of hormones would you add to the medium to secure shoots as well as roots? **(NEET 2016)**

(a) Gibberellin and abscissic acid
(b) IAA and gibberellins
(c) Auxin and cytokinin
(d) Auxin and abscisic acid **[Ans. (c) Auxin and cytokinin]**

62. Phytochrome is a **(NEET 2016)**

(a) Chromo protein (b) Flavo protein
(c) Glyco protein (d) Lipo protein

[Ans. (c) Chromo protein]

63. Typical growth curve in plants is **(NEET 2016)**

(a) Linear (b) Stair – steps shaped
(c) Parabolic (d) Sigmoid

[Ans. (d) Sigmoid]

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Questions & Answers

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11th STD

BIOLOGY

BIO-BOTANY (Vol-I)

5 Marks

UNIT-I DIVERSITY OF LIVING WORLD

1. LIVING WORLD

Textbook Questions

LONG ANSWERS (5 MARKS) :

1. Give a general account on lichens.

Ans. **Lichens :**

1. The symbiotic association between algae and fungi is called **lichens.**
2. The algal partner is called **Phycobiont**, and the fungal partner is called **Mycobiont.**
3. Algae provide nutrition for fungal partner and fix the thallus to the substratum through Rhizinae. They reproduce by akinetes, aplanospore etc., Mycobionts produce ascocarps during sexual reproduction.

Classification :

1. **Based on the habitat** :
   - **(i)** Corticolous(on Bark)
   - **(ii)** Lignicolous (on Wood)
   - **(iii)** Saxicolous(on Rocks)
   - **(iv)** Terricolous(on Ground)
2. **Based on morphology :**
   - **(i)** Leprose (a distinct fungal layer is absent)
   - **(ii)** Crustose - Crust like
   - **(iii)** Foliose - Leaf like
   - **(iv)** Fruticose - Branched pendulous shrub like

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3. Based on algal cells distribution :

(i) Homoiomerous - Algal cells evenly distributed in the thallus.

(ii) Heteromerous - Distinct layer of algae and fungi present.

4. Based on fungal partner:

(i) Ascolichen - Fungal partner is a ascomycete.

(ii) Basidiolichen - Fungal partner is a basidiomycete.

Economic importance :

1. Lichens secrete organic acids like Oxalic acids and helps in weathering of rocks, they act as pioneers in Xerosere.

2. They are sensitive to air pollutants (sulphur-di oxide) and are considered as pollution indicators.

3. Usnic acid produced from lichens show antibiotic properties.

4. Dye present in litmus paper (acid base indicator in labs) is got from *Roccella montagnei*.

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In-Text Questions

1. Give a brief account on the attributes of living world.

Ans. **Attributes of living organisms :**

1. Growth : It is an intrinsic property of all living organisms through which they can increase cells both in number and mass.

(i) Addition of new protoplasm within the cells occur. Unicellular and multicellular organisms grow by cell division.

(ii) Plants show indefinite growth life throughout and animals show definite growth.

(iii) Growth in non-living objects is extrinsic. In bacteria growth occurs by cell division. Hence, growth and reproduction are mutually inclusive events.

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3. The capsid is made up of approximately 2130 identical protein subunits called capsomeres.
4. The Nucleic acid consists of central single stranded RNA molecule.
5. The genetic information necessary for the formation of a complete TMV particle is contained in its RNA. It has 6,500 nucleotides.

5. Write down the general characteristic features of Bacteria.

Ans. **General characteristic features of Bacteria :**

1. They are prokaryotic organisms and lack nuclear membrane and membrane bound organelles.
2. The genetic material is called nucleoid or genophore or incipient nucleus.
3. The cell wall is made up of **polysaccharides** and **proteins.**
4. Most of them lack chlorophyll, hence they are heterotrophic but some are autotrophic and possess Bacteriochlorophyll.
5. They reproduce vegetatively by fission and endospore formation.
6. They exhibit variations which are due to genetic recombination and is achieved through conjugation, transformation and transduction.
7. The shape and flagellation of the bacteria varies in different types of bacteria.

6. Explain the ultrastructure of bacterial cell.

Ans. The bacterial cell reveals three layers 1. Capsule/Glycocalyx 2. Cell wall and 3.Cytoplasm .

Capsule/Glycocalyx :

1. A thick layer of glycocalyx bound tightly to the cell wall is called capsule.
2. It protects cell from desiccation and antibodies.
3. It helps to retain the nutrients in bacterial cell.

Cell wall :

1. The bacterial cell wall is granular and is rigid. It provides protection and gives shape to the cell.

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7. Tabulate the comparison of kingdoms in the Five Kingdom classification based on the criteria used.

Ans.

Criteria	Monera	Protista	Fungi	Plantae	Animalia
Cell type	Prokaryotic	Eukaryotic	Eukaryotic	Eukaryotic	Eukaryotic
Level of organization	Unicellular	Unicellular	Multicellular and Unicellular	Tissue/Organ	Tissue/Organ/ Organ system.
Cell wall	Present (made up of Peptidoglycan and Mucopeptides).	Present in some (made up of cellulose), absent in others.	Present (made up of chitin).	Present (made up of cellulose).	Absent.
Nutrition	Autotrophic, (Phototrophic, Chemoautotrophic) Heterotrophic (Parasitic and Saprophytic).	Autotrophic - Photosynthetic. Heterotrophic.	Heterotrophic Parasitic or Saprophytic.	Autotrophic (Photosynthetic).	Heterotrophic (Holozoic).
Motility	Motile or Non-motile.	Motile or Non-motile.	Non-motile	Mostly Non - motile.	Mostly Motile.
Organisms	Archaebacteria, Eubacteria, Cyanobacteria, Actinomycetes and Mycoplasma.	Chrysophytes, Dinoflagellates, Euglenoids, Slime molds, Amoeba, Plasmodium, Trypanosoma, Paramecium.	Yeast, Mushrooms and Molds.	Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.	Sponges, Invertebrates and Vertebrates.

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12. What are Mycorrhizae? Explain the types.

Ans. **Mycorrhizae:**

1. The Symbiotic association between fungal mycelium and roots of plants is called as mycorrhizae.
2. In this relationship fungi absorbs nutrition from the root and in turn the hyphal network of the fungi helps the plant to absorb water and mineral nutrients from the soil. Mycorrhizae are classified into three types.

The are,

1. Ectomycorrhizae, 2. Endomycorrhizae,
3. Ectendomycorrhizae.

1. Ectomycorrhizae :

The fungal mycelium forms a dense sheath around the root called mantle. The hyphal network penetrate the intercellular spaces of the epidermis and cortex to form Hartignet. Eg: ***Pisolithus tinctorius.***

2. Endomycorrhizae :

The hyphae grows mainly inside the roots, penetrate the outer cortical cells of the plant root. A small portion of the mycelium is found outside the root. This form is also called Vesicular Arbuscular Mycorrhizal fungi (VAM Fungi) due to the presence of Vesicle or arbuscle like haustoria.

(i) Arbuscular mycorrhizae (VAM) Eg: ***Gigaspora***
(i) Ericoid mycorrhizae- Eg: ***Oidiodendron***
(i) Orchid mycorrhizae - Eg: ***Rhizoctonia***

3. Ectendomycorrhizae :

The fungi form both mantle and also penetrates the cortical cells.

13. Explain conjugation in bacteria.

Ans. **1.** It is a method of sexual reproduction in bacteria. J. Lederberg and Edward L. Tatum demonstrated conjugation in E. coli. in the year 1946.

2. In this method of gene transfer the donor cell gets attached to the recipient cell with the help of pili. The pilus grows in size and forms the conjugation tube.

3. The plasmid of donor cell which has the F+ (fertility factor) undergoes replication.

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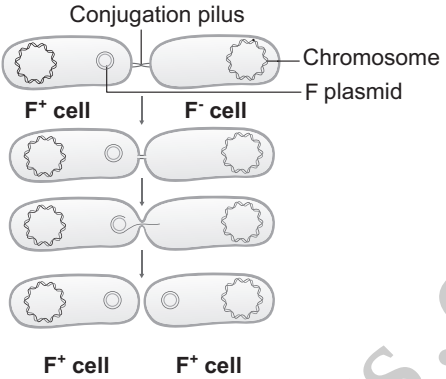
4. Only one strand of DNA is transferred to the recipient cell through conjugation tube.



Conjugation

5. The recipient completes the structure of double stranded DNA by synthesizing the strand that complements the strand acquired from the donor.

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14. List the differences between Bacteria and Cyanobacteria.

Ans.

S. No.	Bacteria	Cyanobacteria
1.	Cells are smaller.	Cells are comparatively larger.
2.	They may possess flagella.	They usually lack flagella.
3.	They are both autotrophic and heterotrophic.	They are autotrophic..
4.	Autotrophic bacteria contain bacteriochlorophyll.	They possess the pigments chlorophyll a phycocyanin and phycoerythrin.
5.	They may be aerobic or anaerobic.	They are aerobic.
6.	The reserve food is glycogen.	The reserve food is cyanophycean starch.
7.	Sexual reproduction is seen.	Sexual reproduction is absent.

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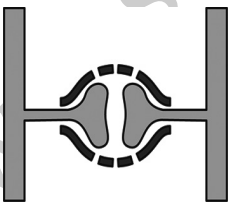
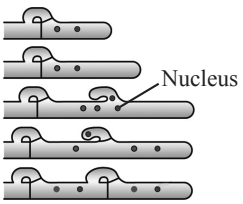
2. In 1928 the bacteriologist Frederick Griffith demonstrated transformation in Mice using *Diplococcus pneumoniae*.
3. Two strains of this bacterium are present. One strain produces smooth colonies and are virulent in nature (S type). In addition another strain produced rough colonies and are avirulent (R type).
4. When S-type of cells were injected into the mouse, the mouse died. When R-type of cells were injected, the mouse survived.
5. When he injected heat killed S-type cells into the mouse the mouse did not die.
6. When the mixture of heat killed S-type cells and R-type cells were injected into the mouse. The mouse died.
7. The avirulent rough strain of ***Diplococcus*** had been transformed into S-type cells.
8. The hereditary material of heat killed S-type cells had transformed R-type cell into virulent smooth strains.
9. Thus the phenomenon of changing the character of one strain by transferring the DNA of another strain into the former is called **Transformation.**

17. Write a note on Basidiomycetes.

Ans. **1.** Basidiomycetes include Puff balls, Toad stools, Bird nest's fungi, Bracket fungi, Stink horns, Rusts and Smuts.



Dolipore Septum



Clamp connection

2. The members are terrestrial and lead a saprophytic and parasitic mode of life.
3. The mycelium is well developed, septate with dolipore septum(bracket like). Three types of Mycelium namely Primary, Secondary and Tertiary are found.
4. Clamp connections are formed to maintain dikaryotic condition.

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5. Asexual reproduction is by means of conidia, oidia or budding.
6. Sexual reproduction is present but sex organs are absent. Somatogamy or spermatisation results in plasmogamy.
7. Karyogamy is delayed and dikaryotic phase is prolonged. Karyogamy takes place in basidium and it is immediately followed by meiotic division.
8. The four nuclei thus formed are transformed into basidiospores which are borne on sterigmata outside the basidium (Exogenous).
9. The basidium is club shaped with four basidiospores. Thus this group of fungi is popularly called **club fungi**. The fruit body formed is called **Basidiocarp**.

18. Describe the Respiration life processes in Bacteria.

Ans. **Respiration :**

Two types of respiration is found in Bacteria. They are

1. Aerobic respiration **2.** Anaerobic respiration

1. Aerobic respiration :

These bacteria require oxygen as terminal acceptor and will not grow under anaerobic conditions (i.e. in the absence of O_2)

Eg: ***Streptococcus.***

Obligate aerobes :

Some Micrococcus species are obligate aerobes (i.e. they must have oxygen to survive).

2. Anaerobic respiration :

These bacteria do not use oxygen for growth and metabolism but obtain their energy from fermentation reactions. Eg : ***Clostridium.***

a) Facultative anaerobes :

(i) There are bacteria that can grow either using oxygen as a terminal electron acceptor or anaerobically using fermentation reaction to obtain energy.

(ii) Facultative anaerobes are often termed "aerobes".

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21. What is Cyanobacteria? Explain its different Habitats.

Ans. **1.** Cyanobacteria are popularly called as **Blue green algae** or **Cyanophyceae.**

2. They are photosynthetic, prokaryotic organisms.

3. Most of them are fresh water and few are marine such as ***Trichodesmium*** and ***Dermacarpa***. ***Thichodesmium erythraeum*** a Cyanobacterium imparts red color to sea (Red sea). Species of ***Nostoc, Anabaena*** lead an endophytic life in the corolloid root of ***Cycas***, leaves of aquatic fern ***Azolla*** and thallus of hornworts like ***Anthoceros*** by establishing a symbiotic association and fix atmospheric nitrogen.

5. Members like ***Gloeocapsa, Nostoc, Scytonema*** are found as phycobionts in lichen thalli.

22. Explain the characteristic features of Mycoplasma or Mollicutes.

Ans. **1.** The Mycoplasma are very small (0.1 – 0.5µm), pleomorphic gram negative microorganisms.

2. They are first isolated by **Nocard** and **coworkers** in the year 1898 from pleural fluid of cattle affected with bovine **pleuropneumonia.**

3. They lack cell wall and appears like "Fried Egg" in culture.

4. The DNA contains low Guanine and Cytosine content than true bacteria.

5. They cause disease in animals and plants. Little leaf of brinjal, witches broom of legumes phyllody of cloves, sandal spike are some plant diseases caused by mycoplasma.

6. Pleuropneumonia is caused by ***Mycoplasma mycoides.***

23. Explain the general characteristic features of Actinomycetes.

Ans. **Actinomycetes :**

1. Actinomycetes are also called **'Ray fungi'** due to their mycelia like growth.

2. They are anaerobic or facultative anaerobic microorganisms and are Gram positive. They do not produce an aerial mycelium.

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5. **Production of enzymes :**
   Aspergillus Oryzae, Aspergillus niger were employed in the production of enzymes like Amylase, Protease, Lactase etc. 'Rennet' which helps in the coagulation of milk in cheese manufacturing is derived from and *Mucor spp.*
6. **Agriculture :**
   Mycorrhiza forming fungi like *Rhizoctonia, Phallus, Scleroderma* helps in absorption of water and minerals.
   Fungi like *Beauveria bassiana, Metarhizium anisoplia* are used as Biopesticides to eradicate the pests of crops.
   Gibberellin, produced by a fungus *Gibberella fujikuroi* induce the plant growth and is used as growth promoter.

Higher Order Thinking Skills (HOTS)

1. Why are viruses known as the intermediate between living and non-living entities?

Ans. Viruses are the intermediate between living and non-living entities.

Viruses resembles living beings which are as follows:

1. Presence of nucleic acid and protein.
2. Capable of mutation.
3. Ability to multiply within living cells.
4. Able to infect and cause diseases in living beings.
5. Show irritability.
6. Host –specific.

Viruses resembles non-living beings which are as follows:

1. Can be crystallized.
2. Absence of metabolism.
3. Inactive outside the host.
4. Do not show functional autonomy.
5. Energy producing enzyme system is absent.

Hence viruses are said to be intermediate between living and non-living entities.

2. Discuss in detail about mode of nutrition in bacteria.

Ans. **Nutrition :**

On the basis of their mode of nutrition bacteria are classified into two types namely **autotrophs** and **heterotrophs.**

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2. Plant Kingdom

In-Text Questions

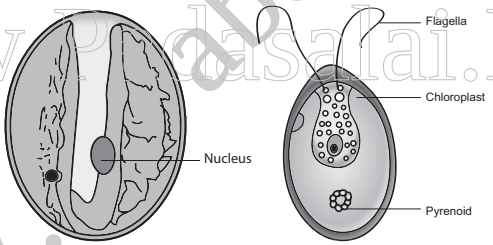
Long Answers

1. Write down the characteristic features of chlorophyceae.

Ans. **1.** The members are commonly called **'Green algae'.** Most of the species are aquatic (Fresh water - ***Spirogyra,*** Marine - ***Ulva).*** A few are terrestrial ***(Trentipholia).***

2. Variation among the shape of the chloroplast is found in members of algae. It is Cup shaped ***(Chlamydomonas)***; Discoid ***(Chara);*** Girdle shaped ***(Ulothrix);*** Reticulate ***(Oedogonium)***; Spiral ***(Spirogyra);*** Stellate ***(Zygnema)***; Plate like ***(Mougeoutia).***

3. Chlorophyll a and Chlorophyll b are the major photosynthetic pigments.



Chlorella *Chlamydomonas*

4. Storage bodies called pyrenoids are present in the chloroplast and store starch. They also contain proteins.

5. The cell wall is made up of inner layer of cellulose and outer layer of Pectin.

6. Vegetative reproduction takes place by means of fragmentation and asexual reproduction is by the production of zoospores, aplanospores and akinetes.

7. Sexual reproduction is present and may be isogamous, anisogamous or Oogamous.Eg: ***Chlorella, Chlamydomonas, Volvox, Spirogyra, Ulothrix, Chara*** **and** ***Ulva.***

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(a) **Ectophloic solenostele** – Pith is in the centre and the xylem is surrounded by phloem. Eg: ***Osmunda.***

(b) **Amphiphloic solenostele** – Pith is in the centre and the phloem is present on both sides of the xylem. Eg: ***Adiantum pedatum.***

(c) **Dictyostele** – The stele is separated into several vascular strands and each one is called meristele. Eg: ***Adiantum capillus-veneris.***

(i) **Eustele:** The stele is split into distinct collateral vascular bundles around the pith.
Eg: **Dicot stem.**

(ii) **Atactostele:** The stele is split into distinct collateral vascular bundles and are scattered in the ground tissue Eg: **Monocot stem.**

(iii) **Polycyclicstele:** The vascular tissues are present in the form of two or more concentric cylinders. Eg: ***Pteridium.***

7. Write down the similarities of Gymnosperms with Angiosperms.

Ans. **Gymnosperms resemble angiosperms in the following features :**

1. Presence of well organised plant body which is differentiated into roots, stem and leaves.

2. Presence of cambium in gymnosperms as in dicotyledons.

3. Flowers in Gnetum resemble the angiosperm male flower. The Zygote represent the first cell of sporophyte.

4. Presence of integument around the ovule.

5. Both plant groups produce seeds.

6. Pollen tube helps in the transfer of male nucleus in both.

7. Presence of Eustele.

8. List the salient features of Bryophytes.

Ans. **Salient features of Bryophytes :**

1. The plant body of bryophyte is gametophyte and is not differentiated into root, stem and leaf like structure.

2. Most of them are primitive land dwellers. Some of them are aquatic (*Riella*, *Ricciocarpus*).

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9. Write down the Salient features of Angiosperms.

Ans. **Salient features of Angiosperms:**

1. Vascular tissue (Xylem and Phloem) is well developed.
2. Flowers are produced instead of cone.
3. The embryosac(Ovule) remains enclosed in the ovary.
4. Pollen tube helps in fertilization, so water is not essential for fertilization.
5. Double fertilization is present. The endosperm is triploid. Angiosperms are broadly classified into two classes namely Dicotyledons and Monocotyledons.

10. Write the general characteristic features of Gymnosperms.

Ans. Gymnosperms are naked seed bearing plants.

Salient features of Gymnosperms:

1. Most of the gymnosperms are evergreen woody trees or shrubs. Some are lianas (*Gnetum*).
2. The plant body is sporophyte and is differentiated into root, stem and leaves.
3. A well developed Tap root system is present. Coralloid Roots of *Cycas* have symbiotic association with blue green algae. In Pinus the roots have mycorrhizae.
4. The stem is aerial, erect and branched or unbranched (*Cycas*) with leaf scars.
5. In conifers two types of branches namely branches of limited growth (Dwarf shoot) and Branches of unlimited growth (Long shoot) is present.
6. Leaves are dimorphic, foliage and scale leaves are present. Foliage leaves are green, photosynthetic and borne on branches of limited growth. They show xerophytic features.
7. The xylem consists of tracheids but in *Gnetum* and *Ephedra* Vessels are present.
8. Secondary growth is present. The wood may be Manoxylic (Porous, soft, more parenchyma with wide medullary ray -*Cycas*) or Pycnoxylic (compact with narrow medullary ray-*Pinus*).

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2.	Vascular bundles are open (Cambium present).	Vascular bundles are closed (Cambium absent).
3.	Secondary growth is present.	Secondary growth is absent.

13. Write the general characteristic features of Pteridophytes.

Ans. Gymnosperms are naked seed bearing plants.

Salient features of Pteridophytes:

1. Plant body is sporophyte (2n) and it is the dominant phase. It is differentiated into root, stem and leaves.

2. Roots are adventitious.

3. Stem shows monopodial or dichotomous branching.

4. Leaves may be microphyllous or megaphyllous.

5. Stele is protostele but in some forms siphonostele is present (*Marsilea*).

6. Tracheids are the major water conducting elements but in Selaginella vessels are found.

7. Sporangia, spore bearing bag like structures are borne on special leaves called sporophyll. The sporophylls gets organized to form cone or strobilus. Eg: *Selaginella, Equisetum* .

8. They may be homosporous (produce one type of spores-*Lycopodium*) or Heterosporous (produce two types of spores-*Selaginella*). Heterospory is the origin for seed habit.

9. Development of sporangia may be eusporangiate (development of sporangium from group of initials) or leptosporangiate (development of sporangium from single initial).

10. Spore mother cells undergo meiosis and produce spores (n).

11. Spore germinates to produce haploid, multicellular green, cordate shaped independent gametophytes called prothallus.

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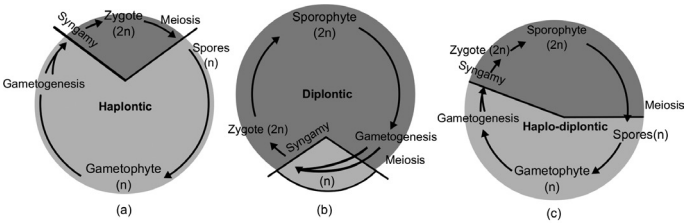

Life cycle patterns in plants a) Haplontic, b) Diplontic, c) Haplo-diplontic

In Bryophytes dominant independent phase is gametophyte and it alternates with short-lived multicellular sporophyte totally or partially dependent on the gametophyte.

In Pteridophytes sporophyte is the independent phase. It alternates with multicellular saprophytic or autotrophic, independent, short lived gametophyte(n).

Higher Order Thinking Skills (HOTS)

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1. Heterospory is a development towards seed habit. Do you agree?

Ans. **1.** Yes. Production of two types of spores by a plant is called heterospory. Eg : *Selaginella*.

2. Large spores are called megaspores and small spores are called microspores. Megaspore → Female gametophyte → Archegonia → egg.

Microspore → Male gemetophyte → Antheridia → Antherozoids.

3. The two gametophytes remain protected inside the respective spores in the sporophytic phase.

4. Microspores are dispersed by wind and reach the Megaspore. The Antherozoid fuses with the egg to form zygote.

5. Thus the gametophytic generation is completed in the sporophyte plant itself. Only after zygote formation the female gametophyte is shed from the sporophyte.

6. This is a basic requisite for seed habit.

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UNIT-II PLANT MORPHOLOGY AND TAXONOMY OF ANGIOSPERMS

3. VEGETATIVE MORPHOLOGY

Textbook Questions

LONG ANSWERS

1. Write the similarities and differences between

1. *Avicennia* and *Trapa*

2. Banyan and Silk cotton

3. Fusiform and Napiform root

***Ans.* 1. Similarities between *Avicennia* and *Trapa* :**

Both the plants are found in aquatic environment. *Avicennia* is a Mangrove plant.

Difference between *Avicennia* and *Trapa* :

S.No.	*Avicennia*	*Trapa*
1.	It is a mangrove plant.	It is a free floating aquatic plant.
2.	The Main root produces pneumatophores or respiratory roots which project above the soil and have pores for breathing.	The leaves float on the water surface. Respiratory roots are not seen.

2. Similarities of Banyan and Silk cotton:

The similarity is that prop roots and buttress root grow downward. But prop root grows from horizontal branches and buttress roots grow from base of the trunk.

Difference between Banyan and Silk cotton

S.No.	Banyan	Silk cotton
1.	Banyan produces Prop roots.	Silk cotton produces Buttress roots.

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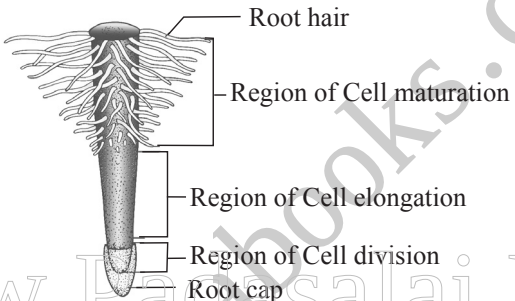
In-Text Questions

Long Answers

1. Write a note on the regions of the root.

Ans. Root tip is covered by a dome shaped parenchymatous cells called root cap. It protects the meristematic cells in the apex. The following three zones have been classified based on their meristematic activity above the root cap.



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1. Meristamatic Zone
2. Zone of Elongation
3. Zone of Maturation

Features	Root cap	Meristematic Zone	Zone of Elongation	Zone of Maturation
Position	Sub apical just below the root apex.	It lies just above the root cap.	It lies just above the meristematic zone.	It lies above the zone of elongation.
Types of cells	Dead cells.	Meristematic cells, actively dividing and continuously increase in number.	Elongated cells.	Mature differentiated cells.

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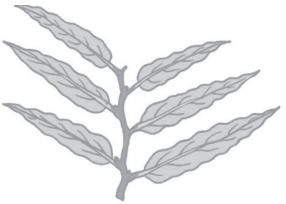
3. The four main types of phyllotaxy are Alternate, Opposite, Ternate, Whorled.



Alternate-*Polyathia*

Opposite
Superposed - *Guava*

Opposite
Decussate - *Calotropis*

Ternate - *Nerium*

Whorled - *Allamanda*

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Alternate phyllotaxy :

In this type there is only one leaf per node and leaves on the successive nodes are arranged alternate to each other. Spiral arrangement of leaves show vertical rows are called orthostichies. They are two types.

(a) Alternate spiral: In which the leaves are arranged alternatively in a spiral manner. Eg: ***Hibiscus.***

(b) Alternate distichous or Bifarious: In which the leaves are organized alternatively in two rows on either side of the stem. Eg: ***Polyalthia.***

Opposite phyllotaxy :

In this type each node possess two leaves opposite to each other. They are organized in two different types.

(a) Opposite superposed: The pair of leaves arranged in succession are in the same direction, that is two opposite leaves at a node lie exactly above those at the lower node. Eg: ***Psidium.***

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(b) Opposite decussate: In this type of phyllotaxy one pair of leaves is placed at right angles to the next upper or lower pair of leaves. Eg: ***Calotropis.***

Ternate phyllotaxy :

In this type there are three leaves attached at each node. Eg: ***Nerium.***

Whorled (verticillate) type of phyllotaxy :

In this type more than three leaves are present in a whorl at each node forming a circle or whorl. Eg: ***Allamanda.***

Higher Order Thinking Skills (HOTS)

1. Explain the sub aerial stem modifications. Explain the types of subaerial stem modifications? ***[First Mid-18]***

Ans. Sub aerial stem found in plants with weak stem in which branches lie horizontally on the ground. These are meant for vegetative propagation. They are classified as:

1. Runner 2. Stolon
3. Sucker 4. Offset

1. Runner : This is a slender, prostrate branch creeping on the ground and rooting at the nodes. Eg: ***Centella***, ***Oxalis***.

2. Stolon : This is also a slender, lateral branch originating from the base of the stem. But it first grows obliquely above the ground, produces a loop and bends down towards the ground. When touches the ground it produces roots and becomes an independent plantlet. Eg: ***Mentha piperita***, ***Fragaria***

3. Sucker : Sucker develops from a underground stem and grows obliquely upwards and gives rise to a separate plantlet or new plant. Eg: ***Chrysanthemum.***

4. Offset : Offset is similar to runner but found in aquatic plants especially in rosette leaved forms. A short thick lateral branch arises from the lower axil and grows horizontally leafless for a short distance, then it produces a bunch of rosette leaves and root at nodes. Eg: ***Eichhornia.***

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4. Reproductive Morphology

Textbook Questions

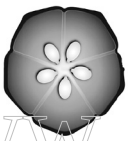
Long Answers

1. Explain the types of placentation with examples.

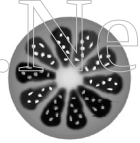
Ans. Placentation:

The mode of distribution of placenta inside the ovary is called placentation. (Placenta bears the ovules.) It is of different types as follows:

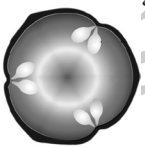
1. **Marginal:** It is with the placentae along the margin of a unicarpellate ovary. Eg: **Fabaceae**.



2. **Axile :** The placentae arises from the column in a compound ovary with septa. Eg: ***Hibiscus***, **tomato, lemon.**



3. **Superficial:** Ovules arise from the surface of the septa. Eg: **Nymphaeceae**.



4. **Parietal:** It is the placentae on the ovary walls or upon intruding partitions of a unilocular, compound ovary. Eg: **Mustard, Argemone, cucumb**

5. **Basal:** It is the placenta at the base of the ovary. Eg: **Sunflower, Marigold**.

6. **Free-central:** It is with the placentae along the column in a compound ovary without septa. Eg: **Caryophyllaceae, Dianthus, Primrose**.

2. Explain the different types of fleshy fruit with suitable example.

Ans. **Different types of fleshy fruits:**

The fruits are derived from single pistil where the pericarp is fleshy, succulent and differentiated into epicarp, mesocarp and endocarp. It is subdivided into the following.

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In-Text Questions

Long Answers

1. Mention the types of Cymose inflorescence. (or) Explain in detail about the types of cymose inflorescence.

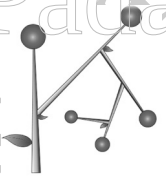
Ans. **Cymose :** Central axis stops growing and ends in a flower. Further growth is by means of axillary buds. Old flowers present at apex and young flowers at base.

Types of cymose :

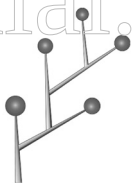
Simple cyme(Solitary): Determinate inflorescence consists of a single flower. It may be terminal or axillary. Eg: *Hibiscus*.

Monochasial Cyme (Uniparous): The main axis ends with a flower. From two lateral bracts, Only one branch grows further. It may be **Helicoid** or **Scorpiod**.

(a) Helicoid: Monochasial cyme in which axis develop on only one side and looks like a coil, atleast during the stage of early development. Eg :***Hamelia*, Potato.**



Helicoid



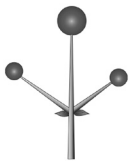
Scorpiod

(b) Scorpiod: Monochasial cyme in which axes develop on alternate sides.

Eg: ***Heliotropium.***

Simple dichasium (Biparous):

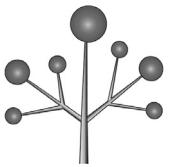
A central axis ends in a terminal flower; further growth is produced by two lateral buds.



Simple dichasium

Each cyme consists of three flowers of which central one is old one. This is **true cyme.** Eg: ***Jasminum.***

Compound dichasium: It has many flowers. A terminal old flower has lateral simple dichasial cymes on both sides. Each compound dichasium consists of seven flowers.Eg : ***Clerodendron***.



Compound dichasium

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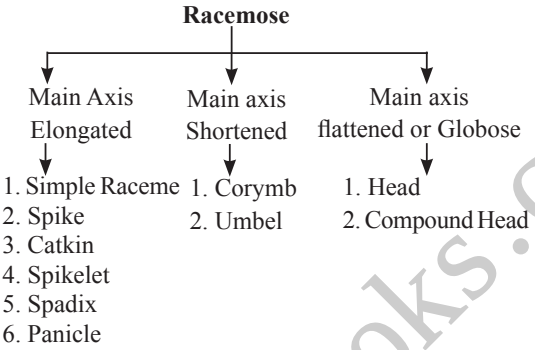
3. Explain the types of racemose inflorescence with stick diagrams.

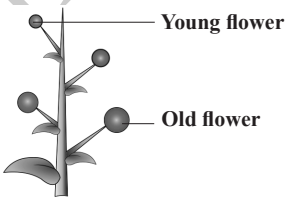
Ans. **Racemose Inflorescence :** Main axis is of unlimited growth and flowers are arranged in acropetal succession. Opening of flowers is centripetal.



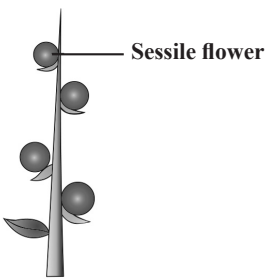
Main Axis Elongated : Axis of inflorescence is elongated and flowers my be pedicellate or sessile.

Types :

Simple Raceme : Unbranched Main axis has pedicellate flowers. Eg: **Mustard.**



Spike : Unbranched Main axis with sessile flowers. Eg: ***Achyranthes.***



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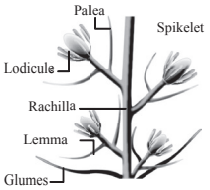
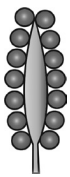
Spikelet : Small spike is called **spikelet.** The inflorescence axis has bracts at base called **glumes.** Each flower has bract (lemma) and bracteole (palea). Eg : *Sorghum.*

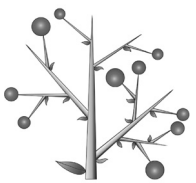


Catkin : Pendulous spikes with long, drooping axis bearing small unisexual or bisexual flowers. Eg: *Acalypha hispida.*

Spadix : Fleshy or thickened central axis with many unisexual flowers is acropetal succession. Entire inflorescence is covered by a brightly coloured bract called spathe. Eg : *Colocasia.*



Panicle : A branched raceme is called panicle or compound raceme. Eg: ***Neem.***



Main Axis Shortened : Inflorescence shows reduced growth of central axis.

Corymb : Shorter pedicellate flowers at top and longer pedicellate flowers at the bottom of inflorescence. All flowers appear at same level. Eg: ***Caesalpinia.***

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2. Explain the types of aestivation with diagram.

Ans. **Aestivation:** Arrangement of sepals and petals in the flower bud.

Valvate: Margins of sepals or petals do not overlap but just touch each other.

Eg: Calyx in members of Malvaceae, *Calotropis*, *Annona*.

Twisted or Convolute or Contorted: One margin of each petal or sepal overlapping on the other petal

Eg: Petals of chinarose.

Imbricate: Sepals and petals irregularly overlap on each other; one member of the whorl is exterior, one interior and rest of the three having one margin exterior and the other interior.

Eg: *Cassia*, *Delonix*. There are 3 types. 1.Ascendingly imbricate. 2.Quincuncial. 3.Vexillary.

Quincuncial: It is a type of imbricate aestivation in which two petals are external and two internal and one petal with one margin internal and the other margin external.

Eg: Guava, calyx of *Ipomoea*, *Catharanthus*.

Vexillary: Large posterior petals both margins overlap lateral petals. Lateral petals other margin overlaps anterior petals.

Eg: Pea,bean.

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5. TAXONOMY AND SYSTEMATIC BOTANY

Textbook Questions

Long answers

1. How does molecular markers work to unlock the evolutionary history of organisms?

Ans. **1.** Molecular Taxonomy is the branch of phylogeny that analyses hereditary molecular differences, mainly in DNA sequences, to gain information and to establish genetic relationship between the members of different taxonomic categories.

2. Different molecular markers like allozymes, mitochondrial DNA, micro satellites, RFLP (Restriction Fragment Length Polymorphism), RAPD (Random amplified polymorphic DNA), AFLPs (Amplified Fragment Length Polymorphism), single nucleotide polymorphism- SNP, microchips or arrays are used in analysis.

(a) RFLP (Restriction Fragment Length Polymorphism):

RFLPs is a molecular method of genetic analysis that allows identification of taxa based on unique patterns of restriction sites in specific regions of DNA.

(b) Amplified Fragment Length Polymorphism (AFLP):

A restriction enzyme is used to cut DNA into numerous smaller pieces, each of which terminates in a characteristic nucleotide sequence.

AFLP is largely used for population genetics studies, studies of closely related species etc.,

(c) Random Amplified Polymorphic DNA (RAPD):

It is a method to identify genetic markers using a randomly synthesized primer that will anneal (recombine (DNA) in the double stranded form) to complementary regions located in various locations

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10.	Gynoecium	Bicarpellary, syncarpous, obliquely placed ovary. Tetralocular due to false septa, axile placentation.	Tricarpellary, syncarpous, trilocular with ovules on axile placentation. Nectar secreting glands present in the ovary.
11.	Fruit	Capsule / Berry.	Septicidal or loculicidal capsule or berry.

In-Text Questions

LONG ANSWERS

1. What is Flora? Explain the types.

Ans. Flora is the document of all plant species in a given geographic area. Flora consists of total number of plant species in an area and gives information about flowering season, fruiting season and distribution for the given geographic area. It also provides details on rare and endemic species of that area. Eg: **Flora of Tamil Nadu Carnatic by K.M. Matthew**. Floras are categorized based on the scope and area covered.

Local Flora :

It covers the limited areas, usually state, country, city or mountain range. Eg: **Flora of Thiruvannamalai District by R. Vijaysankar, K. Ravikumar and P. Ravichandran**.

Regional Flora :

It includes large geographical area or a botanical region. Eg: **Flora of Tamil Nadu Carnatic by K.M.Matthew (1983), Flora of Madras Presidency by J.S. Gamble and Fischer**.

Continental Flora :

This flora covers the entire continent. Eg: **Flora of Europaea by D. A. Web**.

Electronic Floras (e - floras) :

It is nothing but the digitized form of a flora published online. Eg: **e – Flora China**. This provides the information and also the identification tool.

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3. List out the uses of Herbarium.

Ans. **Uses of Herbarium :**

1. Herbarium provides resource material for systematic research and studies.
2. It is a place for orderly arrangement of voucher specimens.
3. Voucher specimen serves as a reference for comparing doubtful newly collected fresh specimens.
4. Voucher specimens play a role in studies like floristic diversity, environmental assessment, ecological mechanisms and survey of unexplored areas.
5. Herbarium provides opportunity for documenting biodiversity and studies related to the field of ecology and conservation biology.

4. Describe the general characters of solanaceae.

Ans. **General characteristic features of Solanaceae:**

1. **Distribution :** Family Solanaceae includes about 88 genera and about 2650 species, of these ***Solanum*** is the largest genus of the family with about 1500 species.
2. **Habit :** Mostly annual herbs, shrubs, small trees *(Solanum violaceum)* lianas with prickles *(Solanum trilobatum)* many with stellate trichomes; rarely vines *(Lycium sinensis)*.
3. **Root :** Branched tap root system.
4. **Stem :** Herbaceous or woody; erect or twining, or creeping; sometimes modified into tubers *(Solanum tuberosum)* often with bicollateral vascular bundles.
5. **Leaves :** Alternate, simple, rarely pinnately compound *(Solanum tuberosum and Lycopersicon esculentum)* exstipulate, opposite or sub- opposite in upper part, unicostate reticulate venation.
6. **Inflorescence :** Generally axillary or terminal cymose *(Solanum)* or solitary flowers *(Datura stramonium)*. Extra axillary scorpiod cyme called rhiphidium *(Solanum nigrum)* solitary and axillary *(Datura and Nicotiana)* umbellate cyme *(Withania somnifera)*.

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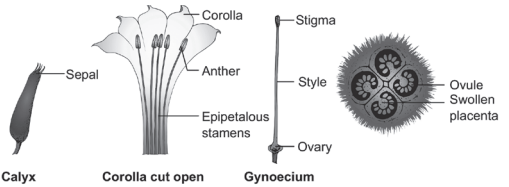
13. Floral Formula:

Br., Ebrl., ⊕, ♀, $K_{(5)}$, $C_{(5)}$, A_5, $\underline{G}_{(2)}$.



Datura metal

Higher Order Thinking Skills (HOTS)

1. List the ICN principles.

Ans. **ICN Principles :**

International Code of Nomenclature is based on the following six principles.

1. Botanical nomenclature is independent of zoological and bacteriological nomenclature.
2. Application of names of taxonomic group is determined by means of nomenclatural types.
3. Nomenclature of a taxonomic group is based on priority of publication.
4. Each taxonomic group with a particular circumscription, position and rank can bear only one correct name, the earliest that is in accordance with the rules except in specified cases.
5. Scientific names of taxonomic groups are treated as Latin regardless of their derivation.
6. The rules of nomenclature are retroactive unless expressly limited.

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UNIT-III CELL BIOLOGY AND BIOMOLECULES

6. CELL: THE UNIT OF LIFE

Textbook Questions

LONG ANSWERS

4. Distinguish between prokaryotes and eukaryotes.

Ans.

Features	Prokaryotes	Eukaryotes
Nuclear character	Nuclear material is called Nucleoid and not bound by nuclear membrane.	A well designed nucleus with nuclear membrane is seen.
Histones	DNA is not associated with histone protein.	DNA is associated with histone protein.
Organelles	Membrane bound organelles like Mitochondria, Plastids, Golgi are absent. Eg : Bacteria.	Membrane bound organelles are present. Eg: Higher plants.
Ribosomes.	Ribosomes (50s + 30s) type.	Ribosomes (60s + 40s type.
DNA	DNA is usually circular.	DNA is usually linear.
Cell division	Cell division occurs by Binary fission.	Cell division occurs by Mitosis and Meiosis.

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4. Write down the functions of Lysosomes.

Ans. **Functions of Lysosomes:**

1. **Intracellular digestion:** They digest carbohydrates, proteins and lipids present in cytoplasm.
2. **Autophagy:** During adverse condition they digest their own cell organelles like mitochondria and endoplasmic reticulum.
3. **Autolysis:** Lysosome causes self destruction of cell on insight of disease they destroy the cells.
4. **Ageing:** Lysosomes have autolytic enzymes that disrupts intracellular molecules.
5. **Phagocytosis:** Large cells or contents are engulfed and digested by macrophages, thus forming a phagosome in cytoplasm. These phagosome fuse with lysosome for further digestion.
6. **Exocytosis:** Lysosomes release their enzymes outerside the cell to digest other cells.

5. What are Cell Inclusions? Explain in detail.

Ans. **Cell Inclusions :**

The cell inclusions are the non-living materials present in the cytoplasm. They are organic and inorganic compounds.

Inclusions in prokaryotes :

1. In prokaryotes, reserve materials such as phosphate granules, cyanophycean granules, glycogen granules, poly β-hydroxy butyrate granules, sulphur granules, carboxysomes and gas vacuoles are present.
2. Inorganic inclusions in bacteria are polyphosphate granules (volutin granules) and sulphur granules. These granules are also known as **metachromatic granules.**

Inclusions in Eukaryotes :

1. **Reserve food materials:** Starch grains, glycogen granules, aleurone grains, fat droplets.
2. Secretions in plant cells are essential oil, resins, gums, latex and tannins.
3. **Inorganic crystals** – Plant cell have calcium carbonate, calcium oxalate and silica.
4. **Cystolith** – Hypodermal leaf cells of ***Ficus*** **bengalensis,** calcium carbonate.

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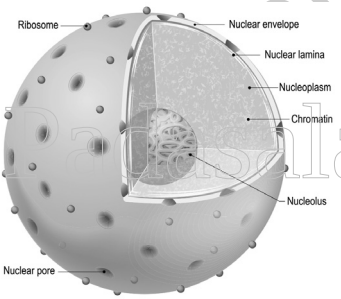
5. **Sphaeraphides** – Star shaped calcium oxalate, ***Colocasia.***
6. **Raphides** – Calcium oxalate, ***Eichhornia.***
7. **Prismatic crystals** – Calcium oxalate, dry scales of ***Allium cepa.***

6. Describe the structure of nucleus with a suitable diagram.

Ans. **Structure of Nucleus :**

1. Nucleus is an important unit of cell which control all activities of the cell. Nucleus holds the hereditary information.
2. It is the largest among all cell organelles. It may be spherical, cuboidal, ellipsoidal or discoidal. It is surrounded by a double membrane structure called **nuclear envelope,** which has the inner and outer membrane.



Cell Nucleus

3. The inner membrane is smooth without ribosomes and the outer membrane is rough by the presence of ribosomes and is continues with irregular and infrequent intervals with the endoplasmic reticulum.
4. The membrane is perforated by pores known as nuclear pores which allows materials such as mRNA, ribosomal units, proteins and other macromolecules to pass in and out of the nucleus.
5. The pores enclosed by circular structures called **annuli.** The pore and annuli forms the pore complex. The space between two membranes is called **perinuclear space.**
6. Nuclear space is filled with nucleoplasm, a gelatinous matrix has uncondensed chromatin network and a conspicuous nucleoli. The chromatin network is the uncoiled, indistinct and remain thread like during the interphase.

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5. The centromere contains a complex system of protein fibres called **kinetochore.** Kinetochore is the region of Chromosome which is attached to the spindle fibre during mitosis.
6. Besides primary there are secondary constrictions. Nucleoli develop from these secondary constrictions and are called **nucleolar organizers.**
7. Secondary constrictions contains the genes for ribosomal RNA which induce the formation of nucleoli and are called nucleolar organizer regions.
8. A satellite or SAT Chromosome are short chromosomal segment or rounded body separated from main Chromosome by a relatively elongated secondary constriction. It is a morphological entity in certain Chromosomes.
9. Based on the position of centromere, chromosomes are called **telocentric** (terminal centromere), **Acrocentric** (terminal centromere capped by telomere), **Sub metacentric** (centromere subterminal) and **Metacentric** (centromere median).
10. **Telomere** is the terminal part of chromosome. It offers stability to the chromosome.

8. What are the types of mounting involved in the preparation of slides?

Ans. **Preparation of Slides :**

There are different types of mounting based on the portion of a specimen to be observed.

1. **Whole mount:** The whole organism or smaller structure is mounted over a slide and observed.
2. **Squash:** Is a preparation where the material to be observed is crushed/squashed on to a slide so as to reveal their contents. Eg: Pollen grains, mitosis and meiosis in root tips and flower buds to observe Chromosomes.
3. **Smears:** Here the specimen is in the fluid (blood, microbial cultures etc.,) are scraped, brushed or aspirated from surface of organ. Eg: **Epithelial cells.**
4. **Sections:** Free hand sections from a specimen and thin sections are selected, stained and mounted on a slide. Eg: **Leaf and stem of plants.**

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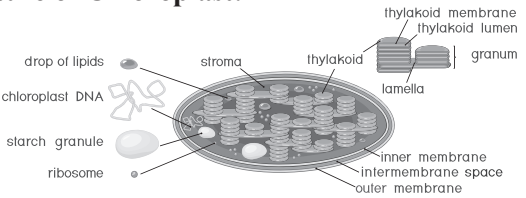
10. Describe the structure of Chloroplast.

Ans. **Structure of Chloroplast:**



Structure of Chloroplast

1. Chloroplast has a double membrane the outer membrane and the inner membrane separated by a space called **periplastidial space**.
2. The space enclosed by the inner membrane of chloroplast is filled with gelatinous matrix, lipo-proteinaceous fluid called **stroma**.
3. Inside the stroma there is flat interconnected sacs called **thylakoid**. The membrane of thylakoid enclose a space called **thylakoid lumen**.
4. Grana (singular: Granum) are formed when many of these thylakoids are stacked together like pile of coins.
5. Light is absorbed and converted into chemical energy in the granum, which is used in stroma to prepare carbohydrate.
6. The chloroplast contains osmophilic granules, 70s ribosomes, DNA (circular and non histone) and RNA. These chloroplast genome encodes approximately 30 proteins involved in photosynthesis including the components of photosystem I & II, cytochrome bf complex and ATP synthase, a subunits of Rubisco. It is the major protein component of chloroplast stroma, single most abundant protein on earth.

6. The thylakoid contain small, rounded photosynthetic units called **quantosomes**.

Higher Order Thinking Skills (HOTS)

1. Who proposed the fluid mosaic model of plasma membrane? Describe the fluid mosaic model of plasma membrane with the help of labelled diagram.

Ans. **Fluid Mosaic Model :**

Jonathan Singer and Garth Nicolson (1972) proposed fluid mosaic model.

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2. The **Polytene Chromosome** and **Lamp brush Chromosome** occur in animals and are also called as **Giant Chromosomes.**

Polytene Chromosomes:

1. It is observed in the salivary glands of ***Drosophila*** (fruit fly) by C.G. Balbiani in 1881. In larvae of many flies, and some insects the interphase Chromosomes duplicates and reduplicates without nuclear division.
2. A single Chromosome which is present in multiple copies form a structure called **Polytene Chromosome** which can be seen in light microscope.
3. They are genetically active. There is a distinct alternating dark bands and light inter-bands. About 95% of DNA are present in bands and 5% in inter-bands.
4. The polytene Chromosome has extremely large puff called **Balbiani rings** which is seen in chironomous larvae. It is also known as **chromosomal puff.** Puffing of bands are the sites of intense RNA synthesis.
5. As this Chromosome occurs in the salivary gland it is known as **salivary gland Chromosomes.** Polyteny is achieved by repeated replication of chromosomal DNA several times (**endomitosis**).
6. Gene expression, transcription of genes and RNA synthesis occurs in the bands along the Polytene Chromosomes.

Lampbrush Chromosomes:

1. It occurs at the diplotene stage of first meiotic prophase in oocytes of an animal **Salamandar** and in giant nucleus of the unicellular alga ***Acetabularia.***
2. It was first observed by **Flemming** in 1882. The highly condensed Chromosome forms the chromosomal axis, from which lateral loops of DNA extend as a result of intense RNA synthesis.

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7. Cell Cycles

Textbook Questions

Long answers

1. Differentiate between mitosis and meiosis.

Ans. **Difference between Mitosis and Meiosis :**

S. No.	Mitosis	Meiosis
1.	One division.	Two divisions.
2.	Number of Chromosomes remains the same.	Number of Chromosomes is halved.
3.	Homologous Chromosomes line up separately on the metaphase plate.	Homologous Chromosomes line up in pairs at the metaphase plate.
4.	Homologous Chromosome do not pair up.	Homologous Chromosome pair up to form bivalent.
5.	Chiasmata do not form and crossing over never occurs.	Chiasmata form and crossing over occurs.
6.	Daughter cells are genetically identical.	Daughter cells are genetically different from the parent cells.
7.	Two daughter cells are formed.	Four daughter cells are formed.

2. Differentiate cytokinesis in plant cells and animal cells.

Ans. **Cytokinesis in Animal Cells :**

1. It is a contractile process. The contractile mechanism contained in contractile ring is located inside the plasma membrane.
2. The ring consists of a bundle of microfilaments assembled from **actin** and **myosin.**

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2. These points of attachment where 'X' shaped structures occur at the sites of crossing over is called **Chiasmata.** Chiasmata are chromatin structures at sites where recombination has taken place.
3. They are specialised chromosomal structures that hold the homologous Chromosomes together.
4. Sister chromatids remain closely associated whereas the homologous Chromosomes tend to separate from each other but are held together by chiasmata.
5. This substage may last for days or years depending on the sex and organism. The Chromosomes are very actively transcribed in females as the egg stores up materials for use during embryonic development.
6. In animals, the Chromosomes have prominent loops called **lampbrush Chromosome.**

In-Text Questions

Long Answers

1. Explain the events in Mitosis.

Ans. **Mitosis:**

The number of chromosomes in the parent and the daughter (Progeny) cells remain the same so it is also called as **equational division**.

Mitosis is divided into four stages prophase, metaphase, anaphase and telophase.

Prophase:

1. Prophase is the longest phase in mitosis.
2. Chromosomes condense become visible as long thin thread like structure.
3. Initiation of spindle fibres takes place, nucleolus disappears. Nuclear envelope breaks down.
4. In animal cell the centrioles form asters.
5. Plant cells do not form asters.

Metaphase:

1. Chromosomes (two sister chromatids) are attached to the spindle fibres by kinetochore of the centromere.

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other Celltimes, the chromosomes are very long, thin, uncoiled threads. In this condition they give the stained nucleus the granular appearance. The granules are called chromatin.

The four important features of the chromosome are:

- The shape of the chromosome is specific: The long, thin, lengthy structured chromosome contains a short, constricted region called centromere. A centromere may occur anywhere along the chromosome, but it is always in the same position on any given chromosome.
- The number of chromosomes per species is fixed: for example the mouse has 40 chromosomes, the onion has 16 and humans have 46.

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- The number of chromosomes per species is fixed: for example the mouse has 40 chromosomes, the onion has 16 and humans have 46.

2. Define cell cycle and explain its duration. write a note on G_1 phase.

Ans. **Cell Cycle :**

Definition: A series of events leading to the formation of new cell is known as cell cycle. The phenomenonal changes leading to formation of new population take place in the cell cycle. It was discovered by Prevost and Dumans (1824). The series of events include several phases.

Duration of Cell Cycle :

Different kinds of cells have varied duration for cell cycle phases. Eukaryotic cell divides every 24 hours. The cell cycle is divided into mitosis and interphase. In cell cycle 95% is spent for interphase whereas the mitosis and cytokinesis last only for an hour.

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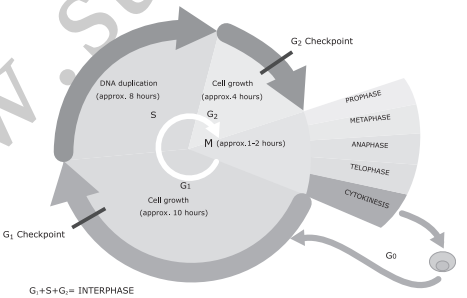
Cell cycle of a proliferating human cell	
Phase	**Time duration (in hrs)**
G_1	11
S	8
G_2	4
M	1

G_1 Phase :

The first gap phase – 2C amount of DNA in cells of G_1. The cells become metabolically active and grows by producing proteins, lipids, carbohydrates and cell organelles including mitochondria and endoplasmic reticulum. Many checkpoints control the cell cycle. The checkpoint called the restriction point at the end of G_1, determines a cells fate whether it will continue in the cell cycle and divide or enter a stage called G_0 as a quiescent stage and probably as specified cell or die. Cells are arrested in G_1 due to:

- Nutrient deprivation
- Lack of growth factors or density dependant inhibition
- Undergo metabolic changes and enter into G_0 state.



Cell cycle

Biochemicals inside cells activates the cell division. The proteins called kinases and cyclins activate genes and their proteins to perform cell division. Cyclins act as major checkpoint which operates in G_1 to determine whether or not a cell divides.

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8. BIOMOLECULES

Textbook Questions

LONG ANSWERS

1. What are the factors affecting the rate of enzyme reaction?

Ans. **Factors affecting the rate of enzyme reactions :** Enzymes are sensitive to environmental condition. It could be affected by temperature, pH, substrate concentration and enzyme concentration. The rate of enzyme reaction is measured by the amount of substrate changed or amount of product formed, during a period of time.

1. **Temperature :** Heating increases molecular motion. Thus the molecules of the substrate and enzyme move more quickly resulting in a greater probability of a reaction occurring. The temperature that promotes maximum activity is referred to as **optimum temperature.**

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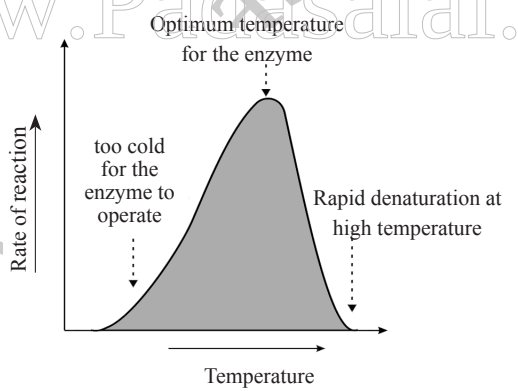

2. **pH:** The **optimum pH** is that at which the maximum rate of reaction occurs. Thus the pH change leads to an alteration of enzyme shape, including the active site. If extremes of pH are encountered by an enzyme, then it will be denatured.

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3. Write the characteristic features of DNA.

Ans. **Structure of DNA :**

1. DNA consists of right handed double helix with 2 helical polynucleotide chains that are coiled around a common axis to form right handed B form of DNA.
2. The coils are held together by hydrogen bonds which occur between complementary pairs of nitrogenous bases.
3. The sugar is called 2′-deoxyribose because there is no hydroxyl at position 2′.
4. A purine pairs with pyrimidine and vice versa. Adenine (A) always pairs with Thymine (T) by double bond and Guanine (G) always pairs with Cytosine (C) by triple bond.

Features of DNA :

1. If one strand runs in the 5'- 3' direction, the other runs in 3'- 5' direction and thus are antiparallel (they run in opposite direction).The 5' end has the phosphate group and 3'end has the OH group.
2. The angle at which the two sugars protrude from the base pairs is about 120˚, for the narrow angle and 240˚ for the wide angle. The narrow angle between the sugars generates a **minor groove** and the large angle on the other edge generates **major groove.**
3. Each base is 0.34nm apart and a complete turn of the helix comprises 3.4 nm or 10 base pairs per turn in the predominant B form of DNA.
4. DNA helical structure has a diameter of 20A° and a pitch of about 34A°. X-ray crystal study of DNA takes a stack of about 10 bp to go completely around the helix (360°).
5. The phosphodiester linkages gives an inherent polarity to the DNA helix. They form strong covalent bonds, gives the strength and stability to the plolynucleotide chain.
6. **Plectonemic coiling** - The two strands of the DNA are wrapped around each other in a helix, making it impossible to simply move them apart without breaking the entire

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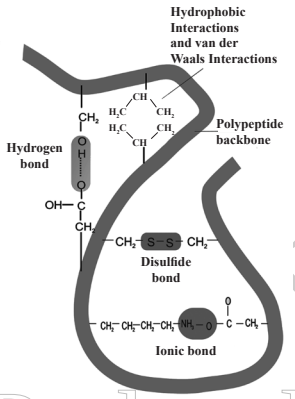
In-Text Questions

Long Answers

1. Explain the different types of protein bonding.

Ans.



Protein bonding

Hydrogen Bond :

1. It is formed between some hydrogen atoms of oxygen and nitrogen in polypeptide chain. The hydrogen atoms have a small positive charge and oxygen and nitrogen have small negative charge. Opposite charges attract to form hydrogen bonds.
2. Though these bonds are weak, large number of them maintains the molecule in 3D shape.

Ionic Bond :

1. It is formed between any charged groups that are not joined together by peptide bond. It is stronger than hydrogen bond and can be broken by changes in pH and temperature.

Disulfide Bond :

1. Some amino acids like cysteine and methionine have sulphur.
2. These form disulphide bridge between sulphur atoms and amino acids.

Hydrophobic Bond :

1. This bond helps some protein to maintain structure.

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5. Secondary structure arises when various functional groups are exposed on outer surface of the molecular interaction by forming hydrogen bonds. This causes the amino acid chain to twist into coiled configuration called α-helix or to fold into a flat β-pleated sheets.
6. Tertiary protein structure arises when the secondary level proteins fold into globular structure called domains.
7. Quaternary protein **structure** may be assumed by some complex proteins in which more than one polypeptide forms a large multi unit protein. The individual polypeptide chains of the protein are called **subunits** and the active protein itself is called a **multimer.** Eg: Enzymes serve as catalyst for chemical reactions in cell and are non-specific. Antibodies are complex glycoproteins with specific regions of attachment for various organisms.

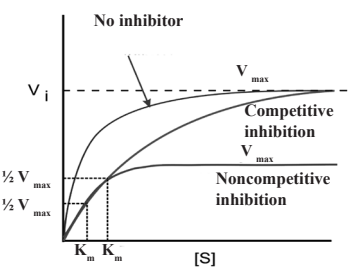
3. Write down the properties of enzymes.

Ans. **Properties of enzymes :**

1. All are globular proteins.
2. They act as catalysts and effective even in small quantity.
3. They remain unchanged at the end of the reaction.
4. They are highly specific.
5. They have an active site where the reaction takes place.
6. Enzymes lower activation energy of the reaction they catalyse.

4. What are enzyme Inhibitors? Explain the two types of inhibitors?

Ans. Certain substances present in the cells may react with the enzyme and lower the rate of reaction. These substances are called **inhibitors.** It is of two types **competitive** and **non-competitive inhibitors.**



Enzyme inhibitors

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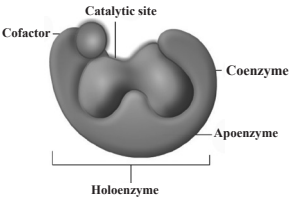
1. **Holoenzyme** – Active enzyme with its non protein component.
2. **Apoenzyme** – The inactive enzyme without its non protein component.
3. **Inorganic ions** help to increase the rate of reaction catalysed by enzymes. Eg: Salivary amylase activity is increased in the presence of chloride ions.



Enzyme components

4. **Prosthetic groups** are organic molecules that assist in catalytic function of an enzyme. Flavin adenine dinucleotide (FAD) contains riboflavin(vit B2), the function of which is to accept hydrogen.
5. **Coenzymes** are organic compounds which act as cofactors but do not remain attached to the enzyme. The essential chemical components of many coenzymes are vitamins. Eg. NAD, NADP, Coenzyme A, ATP.

6. Describe the structure of DNA as proposed by Watson and Crick.

Ans. **Structure of DNA:**

1. **Watson** and **Crick** shared the Nobel Prize in 1962 for their discovery, along with **Maurice Wilkins,** who had produced the crystallographic data supporting the model.
2. **Rosalind Franklin** (1920–1958) had earlier produced the first clear crystallographic evidence for a helical structure.
3. **James Watson** and **Francis Crick** of Cavendish built a scale model of double helical structure of DNA which is the most prevalent form of DNA, the B-DNA. This is the secondary structure of DNA.
4. DNA consists of right handed double helix with 2 helical polynucleotide chains that are coiled around a common axis to form right handed B form of DNA.
5. The coils are held together by hydrogen bonds which occur between complementary pairs of nitrogenous bases. The sugar is called **2′-deoxyribose** because there is no hydroxyl at position 2′.
6. Adenine and thiamine base pairs has two hydrogen bonds while guanine and cytosine base pairs have three hydrogen bonds. As published by **Erwin Chargaff** in 1949, a purine pairs with pyrimidine and vice versa.

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Isomerase	Control the conversion of one isomer to another by transferring a group of atoms from one molecule to another.	A – B – C → A – C – B	Isomerase
Lyase	Break chemical bond without addition of water.	A – B → A + B	Decarboxylase
Ligase	Formation of new chemical bonds using ATP as a source of energy.	A + B + ATP → A – B + ADP + Pi	DNA ligase

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BIO-BOTANY (Vol-II)

UNIT-IV PLANT ANATOMY

9. TISSUE AND TISSUE SYSTEM

Textbook Questions

LONG ANSWERS

1. Explain sclereids with their types.

Ans. **(i)** Sclereids are dead cells. They are isodiametric but some are elongated too.

(ii) The cell wall is very thick due to lignification. Lumen is very much reduced.

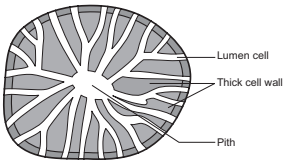
(iii) The pits may simple or branched.

(iv) Sclereids are mechanical in function. They give hard texture to the seed coats, endosperms etc.

Types of Sclereids

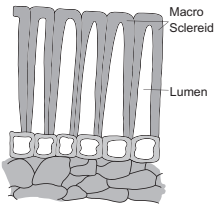
(a) Brachysclereids or Stone cells:

Isodiametric sclereids, with hard cell wall. It is found in bark, pith cortex, hard endosperm and fleshy portion of some fruits. Example: - Pulp of Pyrus.



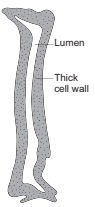
(b) Macrosclereids:

Elongated and rod shaped cells, found in the outer seed coat of leguminous plants. Example: Crotalaria and Pisum sativum.



(c) Osteosclereids (Bone cells):

Rod shaped with dilated ends. They occur in leaves and seed coats. Example: seed coat of Pisum and Hakea



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(vii) In mature sieve tube, Nucleus is absent. It contains a lining layer of cytoplasm. A special protein (P. Protein = Phloem Protein) called slime body is seen in it.

(viii) In mature sieve tubes, the pores in the sieve plate are blocked by a substance called callose (callose plug). The conduction of food material takes place through cytoplasmic strands. Sieve tubes occur only in Angiosperms.

In-Text Questions

LONG ANSWERS

1. Explain anty two theory of root apical meristem .

Ans. **Root Apical Meristem :**

Root apex is present opposite to the shoot apex. The roots contain root cap at their apices and the apical meristem is present below the root cap . The different theories proposed to explain root apical meristem organization is given below .

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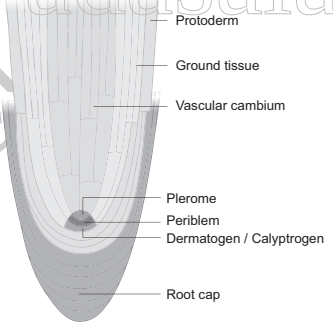

Histogen Theory

1. Apical Cell Theory :

(i) Apical cell theory is proposed by Nageli. The single apical cell or apical initial composes the root meristem.

(ii) The apical initial is tetrahedral in shape and produces root cap from one side.

(iii) The remaining three sides produce epidermis, cortex and vascular tissues. It is found in vascular cryptogams.

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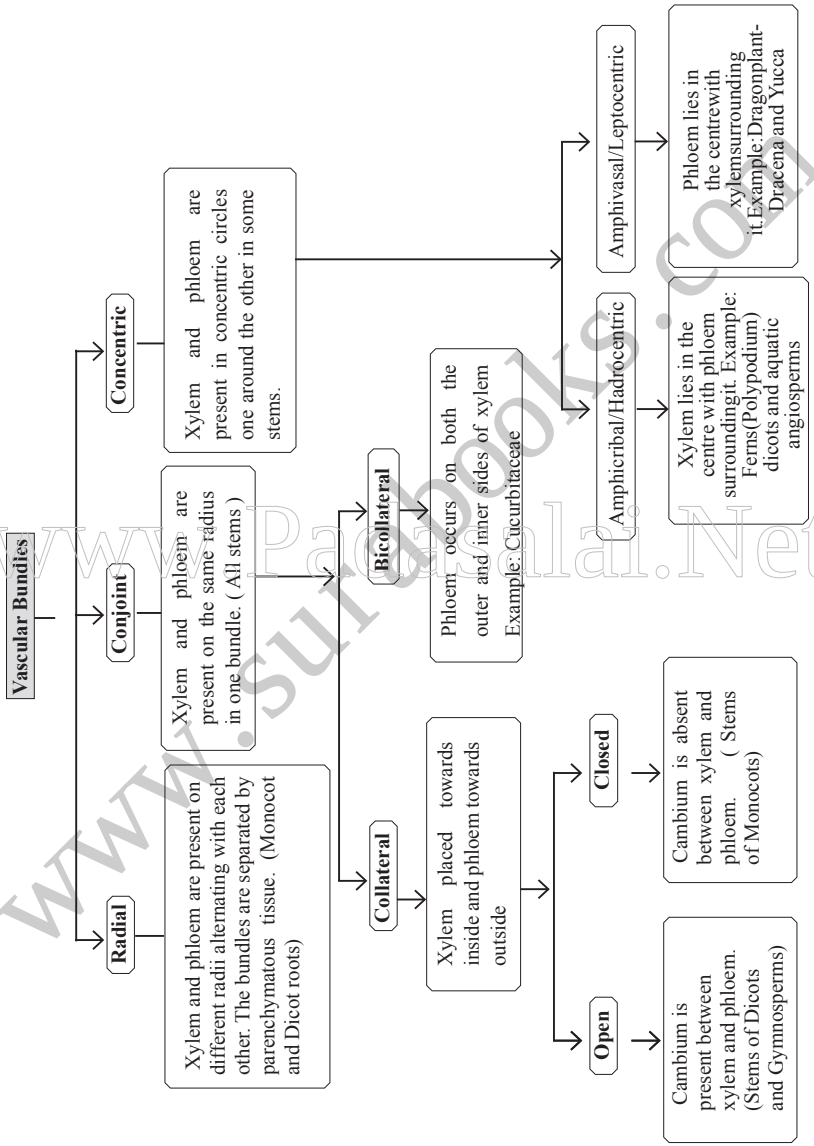
3. Explain types of Vascular bundles. (Diagrams not necessary)

Ans.



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Piliferous Layer or Epiblema

1. The outermost layer of the root is called piliferous layer or epiblema. It is made up of single layer of compactly arranged parenchyma cells.
2. It possesses root hairs which are single celled to absorb water and mineral salts from the soil.
3. The chief function of piliferous layer is **protection**.

Cortex

Cortex consists of only parenchyma cells. These cells are loosely arranged with intercellular spaces to make gaseous exchange easier. These cells may store food reserves.

Endodermis

1. The innermost layer of the cortex is endodermis. Endodermis is made up of single layer of barrel shaped parenchymatous cells.
2. Stele is completely surrounded by endodermis.
3. The radial and the inner tangential walls of endodermal cells are thickened with suberin and lignin. This thickening was first noted by Robert Casparay in 1965. So these thickenings are called casparian strips.
4. Casparian strips are absent in the endodermal cells which are located opposite the protoxylem elements. These thin-walled cells without casparian strips are called passage cells through which water and mineral salts are conducted from the cortex to the xylem elements.

Stele

All the tissues present inside endodermis comprise the stele. It includes pericycle and vascular system.

Pericycle

1. Pericycle is generally a single layer of parenchymatous cells found inner to the endodermis.
2. Lateral roots originate from the pericycle.

Vascular System

1. Vascular tissues are in radial arrangement. The tissue by which xylem and phloem are separated is called conjunctive tissue. In bean, the conjuctive tissue is composed of parenchyma tissue.

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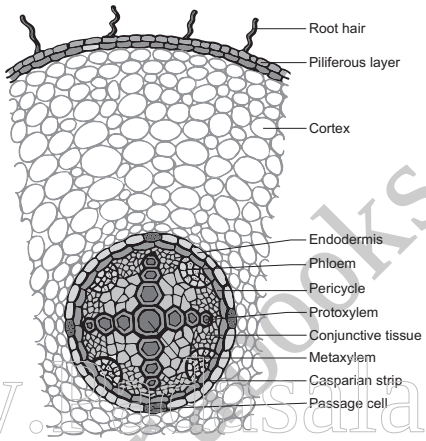
2. Xylem is in exarch condition. The number of protoxylem points is four and so the xylem is called tetrach.
3. Each phloem patch consists of sieve tubes, companion cells and phloem parenchyma. Metaxylem vessels are generally polygonal in shape.

T.S. of Dicot root



A sector enlarged

6. Describe the vascular bundle of a monocot stem?

Ans. **Vascular Bundles:**

1. In a monocot stem vascular bundles are scattered (atactostele) in the parenchymatous ground tissue.
2. Each vascular bundle is surrounded by a sheath of sclerenchymatous fibres called bundle sheath.
3. The vascular bundles are conjoint, collateral, endarch and closed.
3. Vascular bundles are numerous, small and closely arranged in the peripheral portion. Towards the centre, the bundles are comparatively large in size and loosely arranged.
4. Vascular bundles are skull or oval shaped.

Phloem

The phloem in the monocot stem consists of sieve tubes and companion cells. Phloem parenchyma and phloem fibres are absent.

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10. Secondary Growth

Textbook Questions

Long answers

1. Continuous state of dividing tissue is called meristem. In connection to this, what is the role of lateral meristem?

Ans. The secondary growth in dicots and gymnosperms is brought about by two lateral meristems.

- Vascular Cambium and
- Cork Cambium

Vascular Cambium

The vascular cambium is the lateral meristem that produces the secondary vascular tissues. i.e., secondary xylem and secondary phloem.

Origin and Formation of Vascular Cambium

(i) A strip of vascular cambium that is believed to originate from the procambium is present between xylem and phloem of the vascular bundle. This cambial strip is known as intrafascicular or fascicular cambium.

(ii) In between the vascular bundles, a few parenchymatous cells of the medullary rays that are in line with the fascicular cambium become meristematic and form strips of vascular cambium. It is called interfascicular cambium.

(iii) This interfascicular cambium joins with the intrafascicular cambium on both sides to form a continuous ring. It is called a vascular cambial ring.

Organization of Vasular Cambium

(i) The active vascular cambium possesses cells with large central vacuole (or vacuoles) surrounded by a thin, layers of dense cytoplasm.

(ii) The most important character of the vascular cambium is the presence of two kinds of initials, namely, fusiform initials and ray initials.

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In-Text Questions

Long answers

1. List the differences between Sap wood and Heart wood?

Ans.

	Sap Wood (Alburnum)	Heart wood (Duramen)
1.	Living part of the wood.	Dead part of the wood.
2.	It is situated on the outer side of wood	It is situated in the centre part of wood
3.	It is less dark in colour	It is dark in colour
4.	Very soft in nature	Hard in nature
5.	Tyloses are absent	Tyloses are present
6.	It is not durable and not resistant to microorganisms	It is more durable and resists microorganisms

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Higher Order Thinking Skills (HOTS)

1. Differences Secondary Growth in Dicot Stem and Root.

Ans.

	Secondary Growth in Dicot Stem	Secondary Growth in Root
1.	The cambial ring formed is circular in cross section from the beginning.	The cambial ring formed is wavy in the beginning and later becomes circular.
2.	The cambial ring is partially primary (fascicular cambium) and partially secondary (Interfascicular cambium) in origin.	The cambial ring is completely secondary in origin.

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11. TRANSPORT IN PLANTS

Textbook Questions

LONG ANSWERS

1. What are the parameters which control water potential?

Ans. **1.** The concept of water potential was introduced in 1960 by Slatyer and Taylor. Water potential is potential energy of water in a system compared to pure water when both temperature and pressure are kept the same.

2. It is also a measure of how freely water molecules can move in a particular environment or system. Water potential is denoted by the Greek symbol Ψ (psi) and measured in Pascal (Pa). At standard temperature, the water potential of pure water is zero.

3. Addition of solute to pure water decreases the kinetic energy thereby decreasing the water potential.

4. Comparatively a solution always has low water potential than pure water. In a group of cells with different water potential, a water potential gradient is generated.

5. Water will move from higher water potential to lower water potential.

Water potential (Ψ) can be determined by,

- Solute concentration or Solute potential (Ψ_S)
- Pressure potential (Ψ_P)

By correlating two factors, water potential is written as,

$$\Psi_W = \Psi_S + \Psi_P$$

Water Potential = Solute potential + Pressure potential

a) Solute Potential (Ψ_S)

1. Solute potential, otherwise known as osmotic potential denotes the effect of dissolved solute on water potential.

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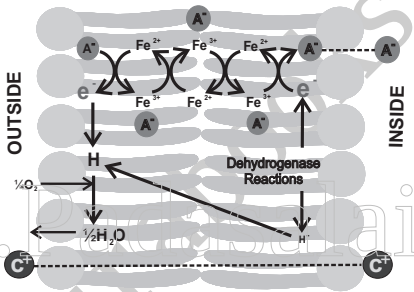
1. The mechanism of anion and cation absorption is different.
2. Anions are absorbed through cytochrome chain by an active process. Cations are absorbed passively.
3. An oxygen gradient responsible for oxidation at the outer surface of the membrane and reduction at the inner surface.

According to this theory, the enzyme *dehydrogenase* on the inner surface is responsible for the formation of protons (H^+) and electrons (e^-). As the electrons pass outward through the electron transport chain there is a corresponding inward passage of anions. The anions are picked up by oxidized cytochrome oxidase and are transferred to the other members of the chain as they transfer the electron to the next component



The theory assumes that the cations (C+) move passively along the electrical gradient created by the accumulation of the anions (A-) at the inner surface of the membrane.

Main defects of the above theory are:

1. Cations also induce respiration.
2. This theory fails to explain the selective uptake of ions.
3. It explains absorption of anions only.

6. Explain 'routes' for path of water across root cells.

Ans. Water is first absorbed by root hair and other epidermal cells through imbibition from soil and moves radially and centripetally across the cortex, endodermis, pericycle and finally reaches xylem elements osmotically.

There are three possible routes of water. They are i) Apoplast ii) Symplast iii) Transmembrane route.

1. **Apoplast:** The apoplast (Greek: apo = away; plast = cell) consists of everything external to the plasma membrane

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12. Mineral Nutrition

In-Text Questions

Long answers

1. Describe biological nitrogen fixation with reference to Rhizobium and Legume.

Ans. The process of converting Atmospheric Nitrogen into Ammonia is termed as Nitrogen fixation.

Biological nitrogen fixation :

Symbiotic bacterium like Rhizobium fixes atmospheric nitrogen. Cyanobacteria found in Lichens, Anthoceros, Azolla and coralloid roots of Cycas also fix nitrogen. Non- Symbiotic (Free living bacteria) like Clostridium also fix nitrogen.

a. Symbiotic nitrogen fixation :

Nitrogen fixation with nodulation

(i) Rhizobium bacterium is found in leguminous plants and fix atmospheric nitrogen.

(ii) This kind of symbiotic association is beneficial for both the bacterium and plant. Root nodules are formed due to bacterial infection.

(iii) Rhizobium enters into the host cell and proliferates, it remains separated from the host cytoplasm by a membrane

b. Stages of Root nodule formation:

1. Legume plants secretes phenolics which attracts Rhizobium.

2. Rhizobium reaches the rhizosphere and enters into the root hair, infects the root hair and leads to curling of root hairs.

3. Infection thread grows inwards and separates the infected tissue from normal tissue.

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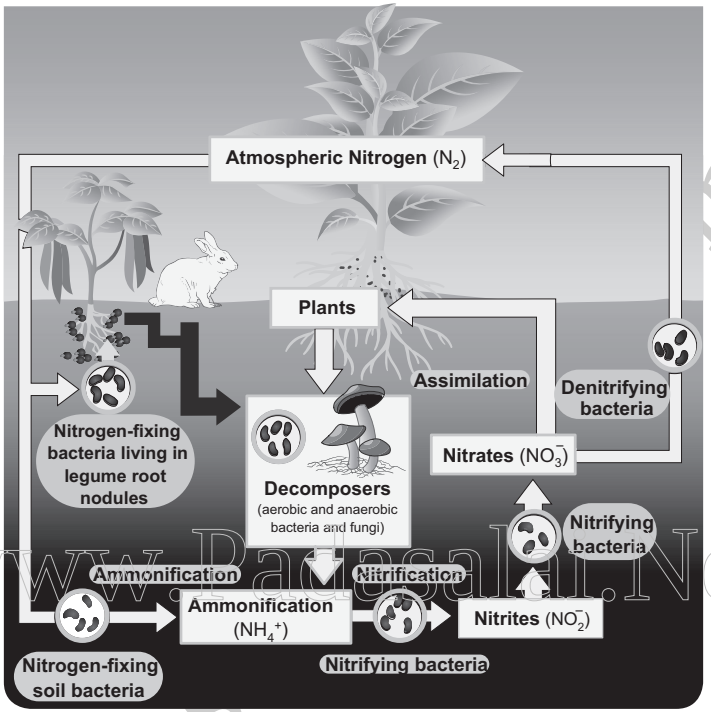
5. Give the schematic represntation of N_2 cycle?

Ans.



Nitrogen Cycle

Higher Order Thinking Skills (HOTS)

1. Explain Macronutrients, their role and deficiency diseases.

Ans. **Functions, mode of absorption and deficiency symptoms of macronutrients :**

Essential minerals which are required in higher concentrations are called Macro nutrients. Their mode of absorption, deficiency symptoms and diseases are described below.

1. **Nitrogen (N):** Required by the Plants in greatest amount. It is an essential component of Proteins, Nucleic acids, Amino acids, Vitamins, Hormones, Alkaloids, Chlorophyll and Cytochrome. Absorbed by the plants as Nitrates (NO_3).

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13. PHOTOSYNTHESIS

Textbook Questions

LONG ANSWERS

1. Grasses have an adaptive mechanism to compensate photorespiratory losses- Name and describe the mechanism.

Ans. The photo respiratory losses are checked by certain grasses by having physiological adaptation. The process of photosynthesis occurs in mesophyll cells and bundle sheath cells.

Mesophyll Cells:

(a) Initially CO_2 is taken up by phosphoenol pyruvate (3C) and changed to oxaloacetate (4C) in the presence of PEP carboxylase.

(b) Oxaloacetate is reduced to Malate /Aspartate.The product formed reaches the bundle sheath.

Bundle Sheath:

(a) The oxidation of Malate and Aspartate occurs with release of carbon di oxide and formation of pyruvate (3C)

(b) Due to increased CO_2 concentration, Rubisco functions as carboxylase and not as *oxygenase*.

(c) The photosynthetic losses are prevented.

(d) RUBP operates now under calvin cycle and pyruvate transported back to Mesophyll cells is changed into Phosphoenol pyruvate to keep the cycle going.

2. In Botany class, teacher explains, Synthesis of one glucose requires 30 ATPs in C_4 plants and only 18 ATPs in C_3plants. The same teacher explains C_4 plants are more advantageous than C_3 plants. Can you identify the reason for this contradiction?

Ans. C_4 plants are more advantageous than C_3 plants because of the following reasons:

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3. The first product of the pathway is a 3- carbon compound (Phospho Glyceric Acid) and so it is also called as C_3 Cycle or Calvin Cycle. It takes place in the stroma of the Chloroplast. It was discovered Melvin Calvin.

4. Dark reaction is temperature dependent and so it is also called Thermo-Chemical Reaction. It consists of three phases.

a) Phase 1- Carboxylation (Fixation)

(i) The acceptor molecule Ribulose 1,5 Bisphosphate (RUBP) a 5 carbon compound with the help of RUBP carboxylase oxygenase (RUBISCO) enzyme accepts one molecule of carbon dioxide to form an unstable 6 carbon compound.

(ii) This 6C compound is broken down into two molecules of 3-carbon compound phospho glyceric acid (PGA).

$$RUBP + CO_2 \xrightarrow{\text{Rubisco}} 2 \text{ molecules PGA}$$

b) Phase 2 – Glycolytic Reversal / Reduction

(i) Phospho glyceric acid is phosphorylated by ATP and produces 1,3 bis phospho glyceric acid by PGA kinase.

(ii) 1,3 bis phospho glyceric acid is reduced to glyceraldehyde 3 Phosphate (G-3-P) by using the reducing power $NADPH + H^+$.

(iii) Glyceraldehyde 3 phosphate is converted into its isomeric form dihydroxy acetone phosphate (DHAP).

$$PGA \xrightarrow[ATP \rightarrow ADP]{\text{PGA Kinase}} \text{1,3 bisphoshoglyceric acid}$$

$$\text{1,3 bisphoshoglyceric acid} \xrightarrow{NADPH + H^+ \rightarrow NADP^+} \text{Glyceraldehyde-3-Phosphate}$$

c) Phase 3 – Regeneration

(iv) Regeneration of RUBP involves the formation of several intermediate compounds of 6-carbon, 5-carbon, 4-carbon and 7- carbon skeleton.

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ii.	**Photo Chemical Phase:**	1. Photolysis of water and oxygen evolution 2. Electron transport and synthesis of assimilatory power.

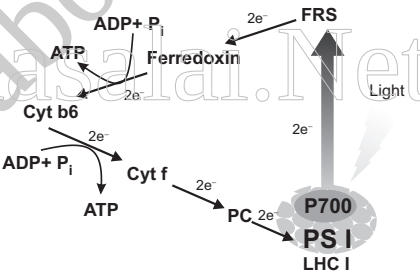
2. Dark reaction (Biosynthetic phase): Fixation and reduction of CO_2 into carbohydrates with the help of assimilatory power produced during light reaction. This reaction does not require light and is not directly light driven. Hence, it is called as Dark reaction or Calvin-Benson cycle.

12. Explain Cyclic photophosphorylation.

Ans. **1.** Cyclic photophosphorylation refers to the electrons ejected from the pigment system I (Photosystem I) and again cycled back to the PS I.

2. When the photons activate P700 reaction centre photosystem II is activated. Electrons are raised to the high energy level.

3. The primary electron acceptor is Ferredoxin Reducing Substance (FRS) which transfers electrons to Ferredoxin (Fd), Plastoquinone (PQ), cytochrome b6-f complex, Plastocyanin (PC) and finally back to chlorophyll P700 (PS I).



Cyclic Photophosphorylation

4. During this movement of electrons Adenosine Di Phosphate (ADP) is phosphorylated, by the addition of inorganic phosphate and generates Adenosine Tri Phosphate (ATP).

5. Cyclic electron transport produces only ATP and there is no NADPH + H^+ formation.

6. At each step of electron transport, electron loses potential energy and is used by the transport chain to pump H^+ ions across the thylakoid membrane. The proton gradient triggers ATP formation in ATP synthase enzyme situated on the thylakoid membrane.

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Higher Order Thinking Skills (HOTS)

1. Differentiate C_3 Plants and C_4 Plants.

Ans.

	C_3 Plants	C_4 Plants
1.	CO_2 fixation takes place in mesophyll cells only	CO_2 fixation takes place mesophyll and bundle sheath
2.	CO_2 acceptor is RUBP only	PEP in mesophyll and RUBP in bundle sheath cells
3.	First product is 3C-PGA	First product is 4C- OAA
4.	Kranz anatomy is not present	Kranz anatomy is present
5.	Granum is present in mesophyll cells	Granum present in mesophyll cells and absent in bundle sheath
6.	Normal Chloroplast	Dimorphic chloroplast
7.	Optimum temperature 20° to 25° C	Optimum temperature 30° to 45° C
8	Fixation of CO_2 at 50 ppm	Fixation of CO_2 even less than 10 ppm
9.	Less efficient due to higher photorespiration	More efficient due to less photorespiration
10.	RUBP carboxylase enzyme used for fixation	PEP carboxylase and RUBP carboxylase used
11.	18 ATPs used to synthesize one glucose	Consumes 30 ATPs to produce one glucose.
12.	Efficient at low CO_2	Efficient at higher CO_2
13.	Eg: **Paddy, Wheat, Potato and soon**	Eg: - **Sugar cane, Maize, Sorghum, Amaranthus and soon**

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photosynthesis is 25 to 35°C. This is not applicable for all plants. The ideal temperature for plants like Opuntia is 55°C, Lichens 20°C and for Algae growing in hot spring it is 75°C. Whether high temperature or low temperature it will close the stomata as well as inactivate the enzymes responsible for photosynthesis.

5. **Water :**

Photolysis of water provides electrons and protons for the reduction of NADP, directly. Indirect roles are stomatal movement and hydration of protoplasm. During water stress, supply of NADPH + H^+ is affected.

6. **Minerals :**

Deficiency of certain minerals affect photosynthesis e.g. mineral involved in the synthesis of Chlorophyll (Mg, Fe and N), Phosphorylation reactions (P), Photolysis of water (Mn and Cl), formation of Plastocyanin (Cu), etc.,

7. **Air Pollutants :**

Pollutants like SO_2, NO_2, O_3 (Ozone) and Smog affects rate of photosynthesis.

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14. RESPIRATION

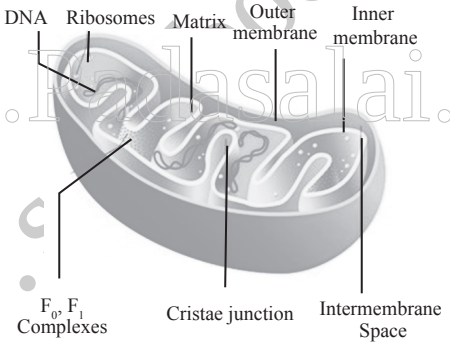
Textbook Questions

LONG ANSWERS

1. Explain the reactions taking place in mitochondrial inner membrane.

Ans. **Krebs cycle or Citric acid cycle or TCA cycle - Third stage of Aerobic Respiration:**

Two molecules of acetyl CoA formed from link reaction now enter into Krebs cycle. It is named after its discoverer,German Biochemist Sir Hans Adolf Krebs (1937). The enzymes necessary for TCA cycle are found in mitochondrial matrix except succinate dehydrogenase enzyme which is found in mitochondrial inner membrane



1. TCA cycle starts with condensation of acetyl CoA with oxaloacetate in the presence of water to yield citrate or citric acid. Therefore, it is also known as Citric Acid Cycle (CAC) or Tri Carboxylic Acid (TCA) cycle.
2. It is followed by the action of different enzymes in cyclic manner.
3. During the conversion of succinyl CoA to succinate by the enzyme succinyl CoA synthetase or succinate thiokinase, a molecule of ATP synthesis from substrate without entering the electron transport chain is called substrate level phosphorylation.

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Higher Order Thinking Skills (HOTS)

1. Differentiate aerobic respiration from anaerobic respiration.

Ans.

S. No.	Aerobic respiration	Anaerobic Respiration
1.	It occurs in all living cells of higher organisms.	It occurs yeast and some bacteria.
2.	It requires oxygen for breaking the respiratory substrate.	Oxygen is not required for breaking the respiratory substrate.
3.	The end products are CO_2 and H_2O	The end products are alcohol, and CO_2 (or) lactic acid. .
4.	Oxidation of one molecule of glucose produces 36 ATP molecules.	Only 2 ATP molecules are produced.
5.	It consists of four stages-glycolysis, link reaction, TCA cycle and electron transport chain.	It consists of two stages-glycolysis and fermentation.
6.	It occurs in cytoplasm and mitochondria.	It occurs only in cytoplasm.

2. What are the factors which influence respiration process? Explain.

Ans. **External Factors :**

1. **Temperature:** Optimum temperature for respiration is 30ºC. At low temperatures and very high temperatures rate of respiration decreases
2. **Oxygen:** When sufficient amount of O_2 is available the rate of aerobic respiration will be optimum and anaerobic respiration is completely stopped. This is called Extinction point.

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15. Plant Growth and Development

Textbook Questions

Long answers

1. Describe the mechanism of photoperiodic induction of flowering.

Ans. **Mechanism of photoperiodic induction of flowering :**

1. The physiological change on flowering due to relative length of light and darkness (photoperiod) is called Photoperiodism.
2. The photoperiod required to induce flowering is called critical day length.

Photoperiodic induction

1. An appropriate photoperiod in 24 hours' cycle constitutes one inductive cycle. Plants may require one or more inductive cycles for flowering.
2. The phenomenon of conversion of leaf primordia into flower primordia under the influence of suitable inductive cycles is called photoperiodic induction. Example: *Xanthium* (SDP) – 1 inductive cycle and *Plantago* (LDP) – 25 inductive cycles.

Site of Photoinductive perception

1. Photoperiodic stimulus is perceived by the leaves. Floral hormone is synthesised in leaves and translocated to the apical tip to promote flowering.
2. This can be explained by a simple experiment on Cocklebur (*Xanthium pensylvanicum*), a short day plant.
3. Usually *Xanthium* will flower under short day conditions. If the plant is defoliated and kept under short day conditions it will not flower.
4. Flowering will occur even when all the leaves are removed except one leaf.

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Practical applications:

1. Vernalization shortens the vegetativeperiod and induces the plant to flower earlier.
2. It increases the cold resistance of the plants.
3. It increases the resistance of plants to fungal disease.
4. Plant breeding can be accelerated.

5. Explain 'senescence'.

Ans. Old age is called senescence in plants. Senescence refers to all collective, progressive and deteriorative processes which ultimately lead to complete loss of organization and function. Four types of senescence:

1. Overall senescence
2. Top senescence
3. Deciduous senescence
4. Progressive senescence

Overall senescence: This kind of senescence occurs in annual plants when entire plant gets affected and dies. Eg: **Wheat and Soybean.** It also occurs in few perennials also. Eg: **Agave and Bamboo.**

Top senescence: It occurs in aerial parts of plants. It is common in perennials, underground and root system remains viable. Eg: **Banana and Gladiolus.**

Deciduous senescence: It is common in deciduous plants and occurs only in leaves of plants, bulk of the stem and root system remains alive. Eg: **Elm and Maple.**

Progressive senescence: This kind of senescence is gradual. First it occurs in old leaves followed by new leaves then stem and finally root system. It is common in annuals.

Physiology of Senescence :

1. Cells undergo changes in structure.
2. Vacuole of the cell acts as lysosome and secretes hydrolytic enzymes.
3. The starch content is decreased in the cells.

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3. What is seed dormancy? Explain the methods of breaking dormancy.

Ans. The condition of a seed when it fails to germinate even in suitable environmental condition is called seed dormancy. There are two main reasons for the development of dormancy: Imposed dormancy and innate dormancy.

Methods of breaking dormancy:

The dormancy of seeds can be broken by different methods. These are:

1. **Scarification:** Mechanical and chemical treatments like cutting or chipping of hard tough seed coat and use of organic solvents to remove waxy or fatty compounds are called as Scarification.
2. **Impaction:** In some seeds water and oxygen are unable to penetrate micropyle due to blockage by cork cells. These seeds are shaken vigorously to remove the plug which is called Impaction.
3. **Stratification:** Seeds of rosaceous plants (Apple, Plum, Peach and Cherry) will not germinate until they have been exposed to well aerated, moist condition under low temperature (0°C to 10°C) for weeks to months. Such treatment is called Stratification.
4. **Alternating temperatures:** Germination of some seeds is strongly promoted by alternating daily temperatures. An alternation of low and high temperature improves the germination of seeds.
5. **Light:** The dormancy of photoblastic seeds can be broken by exposing them to red light.

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11th STD

BIOLOGY

5 Marks

Bio-Zoology (Vol-I)

Unit-I

1. The Living World

Evaluation

1. What is the role of Charles Darwin in relation to concept of species?

Ans. 1. Charles Darwin visited the Galapagos Islands as a naturalist on a five year voyage around South America. He found 13 types of "Mocking birds" on the same island but in different habitats.

2. He brought back the different types and studied them. He found that only the beak pattern and usage was different in these different varieties.

3. This made him think that adaptation to suit a particular habitat (for food) had brought about such changes in these birds which lived in different habitats.

4. After some time they evolved into different species. The formation of new species or 'speciation' is brought about by Natural selection (Nature being the deciding factor).

5. Hence Darwin gets this credit of attempting to explain how species evolved and role of Natural selection. The birds are referred to as Darwin's finches. In 1859 Charles Darwin in his book **Origin of species** explains the evolutionary connection of species by the process of natural selection.

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2. Can we use recent molecular tools to identify and classify organisms?

Ans. Molecular taxonomical tools :

Technological advancement has helped to evolve molecular taxonomical tools from classical tools to molecular tools. The accuracy and authenticity is more significant in the molecular tools.

I. The following methods are being used for taxonomical classification.

a) DNA barcoding - Uses short genetic marker in an organism's DNA to identify it as belonging to a particular species.

b) DNA hybridization - measures the degree of genetic similarity between pools of DNA sequences.

c) DNA fingerprinting - to identify an individual from a sample of DNA by looking at unique patterns in their DNA.

d) Restriction Fragment Length Polymorphisms (RFLP) analysis - difference in homologous DNA sequences that can be detected by the presence of fragments of different lengths after digestion of the DNA samples.

e) Polymerase Chain Reaction (PCR) - sequencing to amplify a specific gene, or portion of gene.

II. Neo taxonomical tools – This is based on Electron Microscopy images to study the molecular structures of cell organelles.

In-Text Questions

1. List the rules of Nomenclature as given by ICZN?

Ans. Rules of Nomenclature :

1. The scientific name should be italicized in printed form and if handwritten, it should be underlined separately.

2. The generic name's (Genus) first alphabet should be in uppercase.

3. The specific name (species) should be in lowercase.

4. The scientific names of any two organisms are not similar.

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Higher Order Thinking Skills (HOTS)

1. How can we save endangered species?

Ans. Saving Endangered Species :

1. The greatest threat to survival is destruction of habitat. It is important to conserve the habitat or the special places where the species live.
2. The animals must have places to find food, shelter and care for their young ones.
3. Setting up Zoological parks and nature reserves will help to conserve the species.
4. Mutual agreement between countries can help to save forests and species in coastal waters.
5. Scientists are setting up gene banks to conserve animals of a species.
6. Several organisations are also working for the protection of endangered species.
7. Hot spots/areas with high biodiversity must be protected from human intervention to conserve the animal and plant species.

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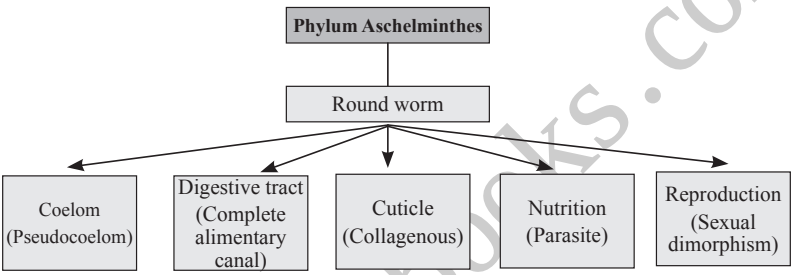
2. KINGDOM ANIMALIA

Evaluation

1. Concept Mapping - Use the following terms to create a concept map that shows the major characteristic features of the phylum nematode: Round worms, pseudocoelomates, digestive tract, cuticle, parasite, sexual dimorphism.

Ans. Concept Mapping:



2. List the characteristic features that distinguish cartilaginous fishes with living jawless fishes.

Ans.

S. No	Living Jawless fishes	Cartilaginous fishes
1.	These belong to class cyclostomata under subphylum vertebrata, Phylum chordata.	These belong to class Chondrichthyes. under subphylum vertebrata, Phylum chordata.
2.	These are Jawless fishes. Mouth is circular and suctorial.	Mouth is located ventrally and Jaws are very powerful.
3.	They have true teeth.	Teeth are modified placoid scales which are backwardly directed.
4.	They have pouch like gills.	They have lamelliform gills without operculum.
5.	**Eg:** Petromyzon, lamprey	**Eg:** Trygon (stingray)

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3. Could the number of eggs or young ones produced by an oviparous and viviparous female be equal? Why?

Ans. Oviparous animals :

1. Animals which lay eggs are called **oviparous animals**. They produce more number of eggs since the eggs are exposed to environmental conditions and predators.
2. They have to pass through several developmental stages before becoming on adult. They face less chances of survival.
3. Hence they produce more number of eggs to ensure continuation of race.
4. Further the eggs are released from the parent and develop with the help of yolk stored in the egg.
5. Parental care is not seen.

Viviparous animals :

1. Animals which give birth to young ones are called **viviparous animals**.
2. One or few eggs are produced by the female since the mother has to undergo gestation period and nurture the young ones in her womb until they are born. Reproduction cycle requires more time.
3. But the embryo is protected from environmental conditions and predators. Chances of survival are very high.
4. Therefore the number of eggs / young ones in a viviparous animal will be less as compared to an oviparous animal.

In-Text Questions

1. Write five characteristic features of phylum cnidaria?

Ans. Characteristic features of phylum cnidaria:

1. Cnidarians (were previously called Coelenterata), are aquatic, sessile or free swimming, solitary or colonial forms with radial symmetry except for sea anemones (bilateral symmetry).
2. The name Cnidaria is derived from cnidocytes or cnidoblasts with stinging cells or nematocyst on tentacles. Cnidoblasts are used for anchorage, defense, and to capture the prey.

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Higher Order Thinking Skills (HOTS)

1. Compare the advantages and disadvantages of direct and indirect development.

Ans. Direct Development:

Advantages:

1. The young ones resemble the adult directly and no larval stages occur.
2. The eggs of these animals have lot of yolk for the young ones to grow or are fed by the mother's tissues. (human being) in the larval stages.
3. Parental care is seen in many cases.

Disadvantages:

1. Since the parents and young ones are found in the same habitat they have to share the same resources.
2. In case of calamities/disasters they will perish together.

Indirect Development:

Advantages:

1. The larval forms are much different from the adult and thrive on different food resources
2. They also grow in a different ecological habitat. Hence in case of calamities they may continue to exist even if the adults Perish.
3. Indirect development is a better means for the species to survive.

Disadvantages:

1. Chances of all larvae developing into adult cannot be assumed.
2. Eggs have very little yolk.
3. Parental care is not seen.

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UNIT-II

3. TISSUE LEVEL OF ORGANISATION

Evaluation

1. Write the classification of connective tissue and their functions.

Ans. Connective tissues are classified into

I. Loose connective tissue
II. Dense connective tissue
III. Specialized connective tissue

Connective tissues

Loose Connective tissues	Dense Connective tissues	Specialised Connective tissues
1. Areolar Tissue	1. Dense Regular	1. Cartilage
2. Adipose Tissue	2. Dense irregular	2. Bone
3. Reticular Tissue	3. Elastic	3. Blood

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I. Loose connective tissues:

The cells and fibres are loosely arranged in a semi fluid ground substance. They are classified as

1. Areolar connective tissue:

It lies beneath the skin

Functions :

Acts as a support for epithelium. Acts as reservoir of water and salts for the surrounding body tissues. Hence it is called tissue fluid.

2. Adipose Tissue :

Found below the skin. 90% of the tissue contains Adipocytes or fat cells.

Functions:

Richly vascularised and supplies energy to the body while fasting.

White fat : (White adipose tissue) Found in subcutaneous tissue surrounding kidneys, eye ball etc.

Functions: Store nutrients.

Brown fat : (brown adipose tissue) contains abundant mitochondria.

Functions: Used to heat the blood stream to warm the body.

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II. Compound epithelium: Multilayered tissue.Their main function is to provide protection against chemical and mechanical stresses. They occur in dry surface of the skin, moist surface of buccal cavity etc.,Compound epithelium is divided into the following types.

Stratified squamous epithelium, Cuboidal epithelium, Transitional epithelium.

1. **Stratified squamous epithelium :**
   - a) **Keratinized type : Eg:** Dry epidermis of the skin.
   - b) **Non keratinized type: Eg:** Moist lining of the oesophagus.
2. **Stratified cuboidal epithelium: Eg:** Ducts of sweat glands.
3. **Stratified columnar epithelium:**
   Eg: Pharynx.
4. **Transitional epithelium: Eg:** Urinary bladder.
   This allows stretching and protective in function.

Cell junctions:

In most of the animal tissues, specialised junctions provide structural and functional links between the individual cells of the epithelium. There are three types of cell Junctions.

- a) **Tight junctions :** Stop substances from leaking across a tissue.
- b) **Adhering junction :**Keeps neighbouring cells together.
- c) **Gap junctions :** Facilitate cytoplasmic connections between cells for transport.

In-Text Questions

1. Write a note on muscle tissue.

Ans. Muscle tissue:

1. Each muscle is made of many long, cylindrical fibres arranged in parallel arrays. These fibres are composed of numerous fine fibrils, called **myofibrils.** Muscle fibres contract (shorten) in response to stimulation, then relax (lengthen) and return to their uncontracted state in a coordinated fashion. In general muscles play an active role in all the movements of the body.

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4. Organ and Organ Systems in Animals

Evaluation

1. Write the types of respiration seen in frog.

Ans. 1. Frog respires on land and in the water by two different methods.

2. In water **skin** acts as aquatic respiratory organ **(cutaneous respiration).** Dissolved oxygen in the water gets, exchanged through the skin by diffusion. On land, the buccal cavity, skin and lungs act as the respiratory organs.

3. In **buccal respiration** on land, the mouth remains permanently closed while the nostrils remain open. The floor of the buccal cavity is alternately raised and lowered. So air is drawn into and expelled out of the buccal cavity repeatedly through the open nostrils.

4. Respiration by lungs is called **pulmonary respiration.** The lungs are a pair of elongated, pink coloured sac-like structures present in the upper part of the trunk region (thorax). Air enters through the nostrils into the buccal cavity and then to the lungs.

5. During aestivation and hibernation gaseous exchange takes place through skin.

2. How respiration takes place in cockroach?

Ans. 1. The respiratory system of cockroach is well developed compared with other terrestrial insects.

2. Branched tubes known as **trachea** open through 10 pairs of small holes called **spiracles** or **stigmata,** present on the lateral side of the body.

3. Terminal branches of tracheal tubes are called **tracheoles** which carry oxygen to the entire body. The spiracles open and close by valves regulated by **sphincter** or **spiracular muscles**. Each tracheole is filled with a watery fluid through which exchange of gases takes place.

4. During high muscular activity, a part of the fluid is drawn into the tissues to enable more oxygen intake and rapid diffusion.

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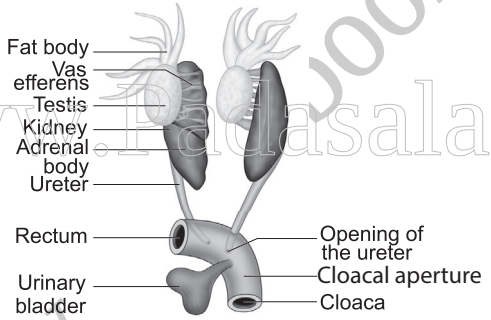
2. There is a pair of coiled oviducts lying on the sides of the kidney.
3. Each oviduct opens into the body-cavity at the anterior end by a funnel like opening called **ostia.**
4. Unlike the **male frog,** the **female frog** has separate genital ducts distinct from ureters. Posteriorly the oviducts dilated to form ovisacs before they open into cloaca.
5. Ovisacs store the eggs temporarily before they are sent out through the cloaca. Fertilization is external.

In-Text Questions

1. Draw the male reproductive system of frog & label the parts.

Ans.

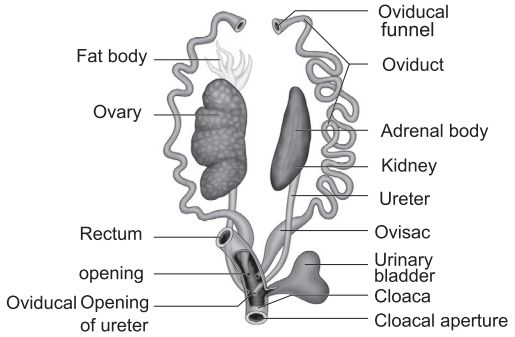
Male Reproductive system of frog



2. Draw the female reproductive system of frog & label the parts.

Ans.

Female Reproductive system of frog



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Higher Order Thinking Skills (HOTS)

1. a) Respiratory system of cockroach is formed of spiracles and tracheal interconnections. Why is it said to be more efficient than that of earthworm?

b) Why inspiration of cockroach is said to be a passive process while it is an active process in man?

Ans. a) **1.** Earthworm has no special respiratory organs. The diffusion of repiratory gases (O_2 and CO_2) takes place through the moist skin only.

2. In cockroach branched tubes known as trachea open through 10 pairs of small holes on the lateral side of the body.

3. The opening and closing is regulated by valves & sphincter muscles. Thus the respiratory system of cockroach is well developed as compared to earthworm.

b) 1. In man inspiration (inhalation of oxygen) is brought about by contraction of intercostal muscles and diaphragm with expenditure of energy. Thus it is said to be an active process.

2. In cockroach the oxygen enters through openings along the body and disappears into the fluid to be circulated throughout the body. The energy required is less since the process is more of a diffusion.

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UNIT-III

5. DIGESTION AND ABSORPTION

Evaluation

1. List the chemical changes that starch molecule undergoes from the time it reaches the small intestine.

Ans. 1. When the food reaches the first part of the small intestine i.e. the duodenum, pancreatic juices and bile juice act on it.

2. Enzymes for starch digestion are present in the pancreatic juice. Pancreatic amylase converts glycogen and starch into maltose.

3. The enzymes in the intestinal juice (succus entericus) act further on the products of pancreatic digestion.

Maltase, Lactase, Sucrase act on the sugars.

Maltose $\xrightarrow{Maltase}$ Glucose + Glucose

Sucrose $\xrightarrow{Sucrase}$ Glucose + Fructose

Lactose $\xrightarrow{Lactase}$ Glucose + Galactose

4. As a result of digestion, all macromolecules of food are converted into their corresponding monomeric units.

Carbohydrates $\longrightarrow$ Monosaccharides

(Glucose, Fructose, Galactose)

The simple substances thus formed are absorbed in the jejunum and ileum region of the small intestine.

2. How do proteins differ from fats in their energy value and their role in the body?

Ans.

S. No.	Proteins Energy value	Fats Energy value
1.	The caloric value and physiological fuel value of 1 gram of protein is 5.65 Kcal and 4 Kcal respectively.	Fat has a caloric value of 9.45 Kcal and a physiological fuel value of 9 Kcal per gram.

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	Role in the body	Role in the body
1.	Proteins are required for growth and repair of body cells.	Fats are their derivatives are the best reserve food stored in our body which is used for production of energy.
2.	They are stored in the body only to a certain extent. The body requires 65 - 75 gm of proteins per day.	The body requires 60 - 70 gm of fats per day.

In-Text Questions

1. Write a note on any two nutritional and digestive disorders.

Ans. Jaundice :

1. It is the condition in which liver is affected and the defective liver fails to break down haemoglobin and to remove bile pigments from the blood.
2. Deposition of these pigments changes the colour of eye and skin yellow.
3. Sometimes, jaundice is caused due to hepatitis viral infections.

Liver cirrhosis :

1. Chronic disease of liver results in degeneration and destruction of liver cells resulting in abnormal blood vessel and bile duct leading to the formation of fibrosis.
2. It is also called deserted liver or scarred liver.
3. It is caused due to infection, consumption of poison, malnutrition and alcoholism.

2. Explain digestion of fats.

Ans. 1. Digestion of fats begin in the small intestine only.
2. The bile, pancreatic juice and intestinal juice are the secretions released into the small intestine.
3. Bile contains bile Pigments **(bilirubin** and **biliverdin)** and helps in the emulsification of fats. Bile salts reduce the surface tension of fat droplets and break then into small globules.

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3. Symptoms are dry skin, pot-belly, oedema in the legs and face, stunted growth, changes in hair colour, weakness and irritability. Marasmus is an acute from of protein malnutrition.

(ii) Role of pancreatic enzymes in digestion :

1. Pancreatic juice contains enzymes such as trypsinogen, chymotrypsinogen, carboxypeptidases, for protein digestion.
2. Trypsinogen is activated by an enzyme, enterokinase, secreted by the intestinal mucosa into active trypsin.
3. This in turn activates the enzyme chymotrypsinogen in the pancreatic juice.
4. The proteins and partially digested proteins in the chyme from the stomach are acted upon by the proteolytic enzymes of pancreatic juice in the small intestine.
5. Proteins $\xrightarrow[\text{(hydrolysis)}]{\text{Trypsin}}$ Pelypeptides + peptones
6. Chymotrypsin hydrolyses peptide bonds associated with specific amino acids.

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Higher Order Thinking Skills (HOTS)

1. What happen when the colon is infected? Explain.

Ans. Diarrhoea :

1. It is the most common gastrointestinal disorder worldwide.
2. It is sometimes caused by bacteria or viral infections through food or water.
3. When the colon is infected, the lining of the intestine is damaged by the pathogens, thereby the colon is unable to absorb fluid.
4. The abnormal frequency of bowel movement and increased liquidity of the faecal discharge is known as diarrhoea.
5. Unless the condition is treated, dehydration can occur. Treatment is known as oral hydration therapy.
6. This involves drinking plenty of fluids – sipping small amounts of water at a time to rehydrate the body.

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6. RESPIRATION

Evaluation

1. Diffusion of gases occurs in the alveolar region only and not in any other part of the respiratory system. Discuss.

Ans. 1. The primary site for the exchange of gases in the alveoli.

2. The uptake of O_2 and the release of CO_2 occur between the blood and tissues by simple diffusion driven by partial pressure gradient of O_2 and CO_2.

3. Partial pressure is the pressure contributed by an individual gas in a mixture of gases. It is represented as pO_2 for oxygen and pCO_2 for carbon– dioxide.

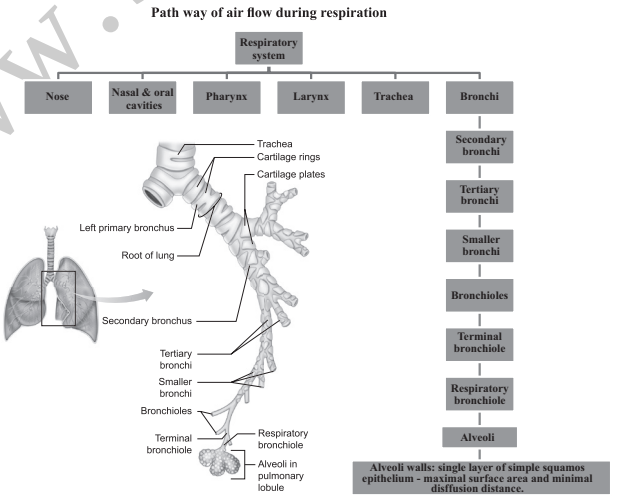
4. Due to pressure gradients, O_2 from the alveoli enters into the blood and reaches the tissues.

5. CO_2 enters into the blood from the tissues and reaches alveoli for elimination.

6. As the solubility of CO_2 is 20–25 times higher than that of O_2, the partial pressure of CO_2 is much higher than that of O_2.

2. Sketch a flow chart to show the path way of air flow during respiration.

Ans.



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3. Explain the conditions which creates problems in oxygen transport.

Ans. (a) Higher Altitudes :

When a person travels quickly from sea level to elevations above 8000 ft. The individual responds with symptoms of acute mountain sickness (AMS) - headache, shortness of breath, nausea and dizziness due to poor binding of O_2 with haemoglobin. This is because the atmospheric pressure and partial pressure of oxygen are low at high altitudes. This situation is overcome by the body by making respiratory and haematopoietic adjustments. Bone marrow produces more RBC.

(b) Deep Sea :

When a person descends deep into the sea, the pressure in the surrounding water increases which causes the lungs to decrease in volume. This increases the partial pressure of the gases within the lungs. It also tends to drive additional oxygen into the circulation. The risk is that increased pressure can also drive nitrogen gas into the circulation. This increase in blood nitrogen content can lead to nitrogen narcosis.

When the diver ascends to the surface too quickly a condition called 'bends' occurs. Nitrogen comes out of solution while still in blood forming bubbles. If large bubbles are formed, they can block blood flow or press on nerve endings. This is associated with joint pains and neurological problems.

Carbon di oxide poisoning :

During carbon–dioxide poisoning, the demand for oxygen increases. As the O_2 level in the blood decreases it leads to suffocation and the skin turns bluish black.

In-Text Questions

1. List the functions of the respiratory system.

Ans. The five primary functions of the respiratory system are,

1. To exchange O_2 and CO_2 between the atmosphere and the blood.
2. To maintain homeostatic regulation of body pH.

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Higher Order Thinking Skills (HOTS)

1. Compare the events in inspiration and expiration..

Ans.

Inspiration	Expiration
Respiratory centre initiates the stimuli during inspiration.	Respiratory centre terminates the stimuli during expiration.
↓	↓
Impulses are carried to the inspiratory muscles through nerves.	The diaphragm and inspiratory muscles relax.
↓	↓
Diaphragm and inspiratory muscles contract.	Chest wall contracts and the thoracic volume gets reduced.
↓	↓
The thoracic volume increases as the chest wall expands.	The intra pulmonary pressure is reduced.
↓	↓
The intra pulmonary pressure is reduced.	The alveolar pressure increases than the atmospheric pressure.
↓	↓
The alveolar pressure increases than the atmospheric pressure.	Air is sent out due to the contraction of alveoli.
↓	↓
Air flows into the alveoli until the alveolar pressure equalizes the atmospheric pressure and the alveoli get inflated.	Air flows into the alveoli until the alveolar pressure equalizes the atmospheric pressure and the alveoli get inflated.

2. Explain the ill effects of smoking.

Ans. Effects of Smoking

1. Today due to curiosity, excitement or adventure youngsters start to smoke and later get addicted to smoking. Research says about 80% of the lung cancer is due to cigarette smoking.

2. Smoking is inhaling the smoke from burning tobacco. Th ere are thousands of known chemicals which includes nicotine, tar, carbon monoxide, ammonia, sulphur– dioxide and even small quantities of arsenic.

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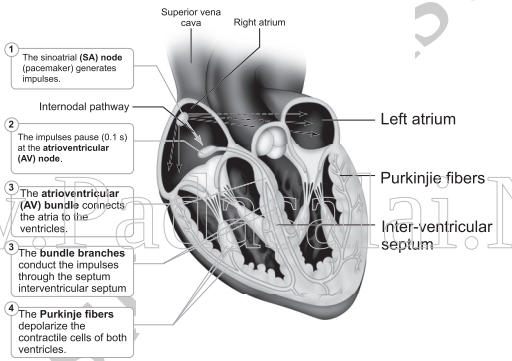
UNIT-III

7. BODY FLUIDS AND CIRCULATION

Evaluation

1. Describe the mechanism by which the human heart beat is initiated and controlled.

Ans. The heart in human is **myogenic** (cardiomyocytes can produce spontaneous rhythmic depolarisation that initiates contractions). The sequence of electrical conduction of heart is shown below.



1. The cardiac cells with fastest rhythm are called the **Pacemaker cells,** which are located in the right sinuatrial (SA) node/ Pacemaker.

2. On the left side of the right atrium is a node called **auriculo ventricular node (AV node).**

3. Two special cardiac muscle fibres originate from the auriculo ventricular node and are called the **bundle of His** which runs down into the interventricular septum and the fibres spread into the ventricles. These fibres are called the **Purkinjie fibres.**

4. Pacemaker cells produce excitation through depolarisation of their cell membrane. Early depolarisation is slow and takes place by sodium influx and reduction in potassium efflux.

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(m) Pulmonary Vein **(n)** Ventricles
(o) Semilunar Valve **(p)** Cardiac cycle
(q) Tricuspid Valve **(r)** Systole
(s) Capillaries

In-Text Questions

1. Write a note on ABO blood grouping.

Ans. 1. Depending on the presence or absence of surface antigens on the RBCs, blood group in individual belongs to four different types namely, A, B, AB and O.

2. The plasma of A, B and O individuals have natural antibodies (agglutinins) in them. Surface antigens are called **agglutinogens.**

3. The antibodies (agglutinin) acting on agglutinogen A is called anti A and the agglutinin acting on agglutinogen B is called anti B. Agglutinogens are absent in O blood group.

4. Agglutinogens A and B are present in AB blood group and do not contain anti A and anti B in them. A, B and O are major allelic genes in ABO systems.

5. All agglutinogens contain sucrose, D-galactose, N-acetyl glucosamine and 11 terminal amino acids. The attachments of the terminal amino acids are dependent on the gene products of A and B. The reaction is catalysed by glycosyl transferase.

Distribution of antigens and antibodies in different blood groups

Blood group	Agglutinogens (antigens) on the RBC	Agglutinin (antibodies) in the plasma
A	A	Anti B
B	B	Anti A
AB	AB	No antibodies
O	No antigens	Anti A and Anti B

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2. The nervous and endocrine systems work together with paracrine signals (metabolic activity) to influence the diameter of the arterioles and alter the blood flow.
3. The neuronal control is achieved through autonomic nervous system (sympathetic and parasympathetic). Sympathetic neurons release nor-epinephrine and adrenal medulla releases epinephrine.
4. The two hormones bind to β – adrenergic receptors and increase the heart rate.
5. The parasympathetic neurons secrete acetylcholine that binds to muscarinic receptors and decreases the heart beat.
6. Vasopressin and angiotensin II, involved in the regulation of the kidneys, results in vasoconstriction while natriuretic peptide promotes vasodilation.
7. Vagus nerve is a parasympathetic nerve that supplies the atrium especially the SA and the AV nodes.

Higher Order Thinking Skills (HOTS)

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1. How many times that heart normally beats? How will you hear a heart beat?

Ans. 1. HEART BEAT- Rhythmic contraction and expansion of heart is called heart beat.
2. The contraction of the heart is called systole and the relaxation of the heart is called diastole.
3. The heart normally beats 70-72 times per min in a human adult.
4. During each cardiac cycle two sounds are produced that can be heard through a stethoscope.
5. The first heart sound (lub) is associated with the closure of the tricuspid and bicuspid valves whereas second heart sound (dub) is associated with the closure of the semilunar valves.
6. These sounds are of clinical diagnostic significance. An increased heart rate is called tachycardia and decreased heart rate is called bradycardia.

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Bio-Zoology (Vol-II)

8. Excretion

Evaluation

1. Identify the following structures and explain their significance in renal physiology?

(a) Juxtaglomerular apparatus

(b) Podocytes

(c) Sphincters in the bladder

(d) Renal cortex

Ans. (a) Juxtaglomerular apparatus :

1. Juxta glomerular apparatus (JGA) is a specialized tissue in the afferent arteriole of the nephron that consists of macula densa and granular cells.

2. The macula densa cells sense distal tubular flow and affect afferent arteriole diameter, whereas the granular cells secrete an enzyme called renin.

3. A fall in glomerular blood flow, glomerular blood pressure and glomerular filtration rate, can activate JG cells to release renin which converts a plasma protein, angiotensinogen (synthesized in the liver) to angiotensin I.

4. This starts off a series of events known as Renin - Angiotensin - Aldosterone system which finally increases the **glomerular blood pressure** and **glomerular filtration rate**.

(b) Podocytes:

1. In a nephron, the external parietal layer of the glomerulus is made up of simple squamous epithelium and the visceral layer is made of epithelial cells called **podocytes**.

2. The podocytes end in foot processes which cling to the basement membrane of the glomerulus. The openings between the foot processes are called filtration slits. This acts as a filter to retain blood cells and large protein in plasma while permitting the passage of fluids.

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8. What is the function of antidiuretic hormone? Where is it produced and what stimuli increases or decreases its secretion?

Ans. **1.** When there is excessive loss of fluid from the body or when there is an increase in the blood pressure, the osmoreceptors of the hypothalamus respond by stimulating the neurohypophysis to secrete the **antidiuretic hormone (ADH)** or **vasopressin** (a positive feedback).

2. ADH facilitates reabsorption of water by increasing the number of aquaporins on the cell surface membrane of the distal convoluted tubule and collecting duct. This increase in **aquaporins** causes the movement of water from the lumen into the interstitial cells, thereby preventing excess loss of water by diuresis.

3. When you drink excess amounts of your favourite juice, osmoreceptors of the hypothalamus is no longer stimulated and the release of ADH is suppressed from the neurohypophysis (negative feedback) and the aquaporins of the collecting ducts move into the cytoplasm.

4. This makes the collecting ducts impermeable to water and the excess fluid flows down the collecting duct without any water loss. Hence dilute urine is produced to maintain the blood volume. Vasopressin secretion is controlled by positive and negative feedback mechanism.

5. Defects in ADH receptors or inability to secrete ADH leads to a condition called diabetes insipidus, characterized by excessive thirst and excretion of large quantities of dilute urine resulting in dehydration and fall in blood pressure.

In-Text Questions

1. Write a note on

a) Uremia b) Renal Calculi

Ans. Uremia :

1. Uremia is characterized by increase in urea and other non-protein nitrogenous substances like uric acid and creatinine in blood.

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3. Reabsorption takes place by the tubular epithelial cells in different segments of the nephron either by active transport or passive transport, diffusion and osmosis.
4. **Proximal convoluted Tubule (PCT)-** Glucose, lactate, amino acids, Na^+ and water in the filtrate is reabsorbed in the PCT. Sodium is reabsorbed by active transport through sodium- potassium (Na^+ - K^+) pump in the PCT. Small amounts of urea and uric acid are also reabsorbed.
5. **Descending limb of Henle's loop** is permeable to water due the presence of aquaporins, but not permeable to salts. Water is lost in the descending limb, hence Na^+ and Cl^- gets concentrated in the filtrate.
6. Ascending limb of Henle's loop is impermeable to water but permeable to solutes such as Na^+, Cl^- and K^+.
7. **The distal convoluted tubule** recovers water and secretes potassium into the tubule. Na^+, Cl^- and water remains in the filtrate of the DCT.
8. Most of the reabsorption from this point is dependent on the body's need and is regulated by hormones. Reabsorption of bicarbonate (HCO_3^-) takes place to regulate the blood pH. Homeostasis of K^+ and Na^+ in the blood is also regulated in this region.
9. Collecting duct is permeable to water, secretes K^+ (potassium ions are actively transported into the tubule) and reabsorbs Na^+ to produce concentrated urine. The change in permeability to water is due to the presence of number of water-permeable channels called aquaporins.

Higher Order Thinking Skills (HOTS)

1. Write about renal colic pain.

Ans. 1. Renal calculi–Renal calculi, also called renal stone or nephrolithiasis, is the formation of hard stone like masses in the renal tubules of renal pelvis.

2. It is mainly due to the accumulation of soluble crystals of salts of sodium oxalates and certain phosphates.

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Unit-IV

9. Locomotion and Movement

Evaluation

1. Name the bones of the skull.

Ans. The Skull is composed of two sets of bones – **Cranial bones** and **Facial bones**.

Cranial bones:

1. It consists of 22 bones of which 8 are cranial bones and 14 are facial bones.
2. The cranial bones form the brain box. They are a **paired parietal, paired temporal** and **individual bones** such as the **frontal, sphenoid, occipital** and **ethmoid**.

Facial bones:

1. In the facial bones **maxilla, zygomatic, palatine, lacrimal, nasal** are paired bones whereas mandible or lower jaw and vomer are unpaired bones. They form the front part of the skull. A single U-shaped hyoid bone is present at the base of the buccal cavity.
2. Each middle ear contains three tiny bones- **malleus, incus** and **stapes** collectively called **ear ossicles**.
3. The upper jaw is formed of the maxilla and the lower jaw is formed of the mandible.
4. The upper jaw is fused with the cranium and is immovable. The lower jaw is connected to the cranium by muscles and is movable.

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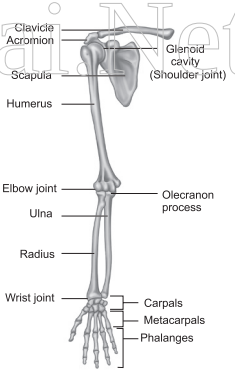
Regular exercises can produce the following beneficial physiological changes:

1. The muscles used in exercise grow larger and stronger.
2. The resting heart rate goes down.
3. More enzymes are synthesized in the muscle fibre.
4. Ligaments and tendons become stronger.
5. Joints become more flexible.
6. Protection from heart attack.
7. Influences hormonal activity.
8. Improves cognitive functions.
9. Prevents Obesity. Promotes confidence, esteem.
10. Prevents depression, stress and anxiety.

In-Text Questions

1. List the bones of the Pectoral girdle.

Ans. The upper limbs are attached to the pectoral girdles. The girdle is formed of two halves. Each half of the pectoral girdle consists of a **clavicle** or **collar bone** and a **scapula**. Scapula has a slightly elevated ridge called the **spine** which projects as a flat, expanded process called the **acromion**. The clavicle articulates with this process. Below the acromion is a depression called the **glenoid cavity** which articulates with the head of the humerus to form the shoulder joint.



Pectoral girdle with upper limb

The Upper limb:

The upper limb consists of 30 separate bones and is specialized for mobility. The skeleton of the arm is the **humerus**. The head of humerus articulates with the **glenoid cavity** of the scapula and forms the shoulder joint. The distal end of humerus articulates with the two forearm bones the **radius** and **ulna**. The forearm is the region between the elbow and the wrist. **Olecranon process** is situated at the upper end of the ulna which forms the pointed portion of the elbow. The hand consists of **carpals, metacarpals** and **phalanges**.

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3. Write a note on the structure of contractile protein.

Ans. 1. Contraction of the muscle depends on the presence of contractile proteins such as actin and myosin.

2. The thick filament of muscle fibres are composed of the protein myosin. The thin filaments are formed of three types of proteins called actin, tropomyosin and troponin. These four proteins are know as contractile proteins.

Thick myofilament:

3. Each myosin filament is made up of a monomer called meromyosin which has two regions, a globular head, a short arm called heavy meromyosin (HMM) and a tail called light meromyosin (LMM).

The globular head is an ATPase enzyme which has binding sites for ATP and actin - binding site.

Thin myofilament:

4. It is composed of two interwined actin molecules. Actin has polypeptide subunits called G-actin (globular actin) and F - actin (Filamentous actin).

F- actin is an polymer of monomeric G-Actin and also has a myosin - binding site.

5. The thin filaments also contain several regulatory proteins like tropomyosin and troponin which help in regulating muscles constraction.

Higher Order Thinking Skills (HOTS)

1. List the functions of the skeletal system.

Ans. Functions of skeletal system:

1. Support - It forms a rigid framework and supports the weight of the body against gravity.

2. Shape - It provides and maintains the shape of the body.

3. Protection - It protects the delicate internal organs of the body.

4. Acts as reservoir - It stores minerals such as calcium and phosphate. Fat (Triglyceride) is stored in yellow bone marrow and represents a source of stored energy for the body.

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10. Neural Control And Coordination

Evaluation

1. At the end of repolarization, the nerve membrane gets hyperpolarized. Why?

Ans. 1. In a neuron the reversal of membrane potential inside the axolemma to negative occurs due to the efflux of K^+ ions which is called **Repolarisation**.

2. If repolarization becomes more negative than the resting potential -70 mV to about -90 mV, it is called **Hyperpolarization**.

3. During this, K^+ ion gates are more permeable to K^+ even after reaching the threshold level as it closes slowly; hence called Lazy gates.

4. The membrane potential returns to its original resting state when K^+ ion channels close completely.

5. During hyperpolarization the Na^+ voltage gate remains closed.

2. The sense of taste is considered to be the most pleasurable of all senses.

Describe the structure of the receptor involved with a diagram.

Ans. 1. The sense of taste is considered to be the most pleasurable of all senses.

2. The tongue is provided with many small projections called **papillae** which give the tongue an abrasive feel.

3. Taste buds are located mainly on the papillae which are scattered over the entire tongue surface.

4. Most taste buds are seen on the tongue few are scattered on the soft palate, inner surface of the cheeks, pharynx and epiglottis of the larynx.

5. Taste buds are flask-shaped and consist of 50 – 100 epithelial cells of two major types.

6. **Gustatory epithelial cells** (taste cells) and **Basal epithelial cells** (Repairing cells) Long microvilli called **gustatory hairs** project from the tip of the gustatory cells and extends through a taste pore to the surface of the epithelium where they are bathed by saliva.

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In-Text Questions

1. Explain Depolarization in conduction of nerve impulse.

Ans. Depolarization – Reversal of polarity:

1. When a nerve fibre is stimulated, sodium voltage-gate opens and makes the **axolemma** permeable to Na^+ ions; meanwhile the potassium voltage gate closes.
2. As a result, the rate of flow of Na^+ ions into the **axoplasm** exceeds the rate of flow of K^+ ions to the outside fluid [ECF].
3. Therefore, the axolemma becomes positively charged inside and negatively charged outside. This reversal of electrical charge is called **Depolarization**.
4. During depolarization, when enough Na^+ ions enter the cell, the action potential reaches a certain level, called **threshold potential** [–55mV].
5. The particular stimulus which is able to bring the membrane potential to threshold is called **threshold stimulus**.
6. The action potential occurs in response to a threshold stimulus but does not occur at subthreshold stimuli. This is called **all or none principle.**
7. Due to the rapid influx of Na^+ ions, the membrane potential shoots rapidly up to +45mV which is called the **Spike potential**. This is followed by Repolarization.

2. How are reflex actions classified?

Ans. 1. **Unconditional reflex** is an inborn reflex for an unconditioned stimulus. It does not need any past experience, knowledge or training to occur; **Eg:** Blinking of an eye when a dust particle about to fall into it, sneezing and coughing due to foreign particle entering the nose or larynx.

2. **Conditioned reflex** is a respone to a stimulus that has been acquired by learning. This does not naturally exists in animals. Only an experience makes it a part of the behaviour.

Eg: Excitement of salivary gland on seeing and smelling a food. The conditioned reflex was first demonstrated by the Russian physiologist Pavlov in his classical conditioning experiment in a dog. The cerebral cortex controls the conditioned reflex.

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6. The canals that lie posterior and lateral to the vestibule are semicircular canals; they are anterior, posterior and lateral canals oriented at right angles to each other.
7. At one end of each semicircular canal, at its lower end has a swollen area called **ampulla**.
8. Each ampulla has a sensory area known as **crista ampullaris** which is formed of sensory hair cells and supporting cells. The function of these canals is to detect rotational movement of the head.

Higher Order Thinking Skills (HOTS)

1. Write a note on chemoreceptors?

Ans. 1. The receptors for taste and smell are the chemoreceptors.
2. The smell receptors are excited by air borne chemicals that dissolve in fluids.
3. The yellow coloured patches of olfactory epithelium form the olfactory organs that are located on the roof of the nasal cavity.
4. The olfactory epithelium is covered by a thin coat of mucus layer below and olfactory glands bounded connective tissues, above.
5. It contains three types of cells: supporting cells, Basal cells and millions of pin shaped olfactory receptor cells (which are unusual bipolar cells).
6. The olfactory glands and the supporting cells secrete the mucus.
7. The unmyelinated axons of the olfactory receptor cells are gathered to form the filaments of olfactory nerve [cranial nerve I] which synapse with cells of olfactory bulb.
8. The impulse, through the olfactory nerves, is transmitted to the frontal lobe of the brain for identification of smell and the limbic system for the emotional responses to odour.

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11. Chemical Coordination and Integration

Evaluation

1. Hormones are known as chemical messenger. Justify.

Ans. 1. The endocrine system influences the metabolic activities of the body by means of **hormones.**

2. The hormones are chemical messengers released into the blood and circulated as chemical signals.

3. They act as organic catalyst and coenzymes to perform specific functions on the target organs.

4. They slowdown or speed up or alter the activity of the target organ.

5. Deficiency or excess secretion of hormones will lead to disorders.

6. Thus hormones as chemical messengers co-ordinate different physical, physiological mental activities and maintain homeostasis.

2. Comment on Acini of thyroid gland.

Ans. Acini of Thyroid gland :

1. The butterfly shaped thyroid gland is a bilobed gland located below the larynx on each side of upper trachea. Its two lateral lobes are connected by a median tissue mass called **isthmus.**

2. Each lobe is made up of many lobules .The lobules consist of follicles called **acini (acinus in singular).**

3. Each acinus is lined with glandular, cuboidal or squamous epithelial cells.

4. The lumen of acinus is filled with colloid, a thick glycoprotein mixture consisting of thyroglobulin molecules.

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In-Text Questions

1. Endocrine glands control and coordinate the body functions through secreting certain chemical messengers called hormones. Due to certain physiological reasons, the blood glucose level increases.

a. Give the possible reason for the increased in blood glucose level.

b. What is the chemical nature of the hormone involved here? Discuss its role in the body.

c. How can this condition be reversed?

Ans. a. Blood glucose levels increase when there is a reduced secretion of insulin in the body. This is called **Hyperglycaemia** or **Diabetes mellitus.**

b. Insulin:

1. It is a peptide hormone and plays an important role in glucose homeostasis.
2. It's main effect is to lower blood glucose levels by increasing the uptake of glucose into the body cells, especially muscle and fat cells. Insulin also inhibits the breakdown of glycogen to glucose, the conversion of amino acids or fats to glucose, so insulin is rightly called a hypoglycemic hormone.

Glucagon:

1. It is a polypeptide hormone. It is a potent hyperglycaemic hormone that acts on the liver and promotes the breakdown of glycogen to glucose (Glygogenolysis), synthesis of glucose from lactic acid and from non-carbohydrate molecules (gluconeogenesis). It also releases glucose from the liver cells, increasing the blood glucose levels.
2. Since glucagon reduces the cellular uptake and utilisation of glucose it is called a hyperglycemic hormone. Prolonged hyperglycemia leads to the disorder called diabetes mellitus.

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Higher Order Thinking Skills (HOTS)

1. Write a note on STH.

Ans. Growth hormone (GH):

1. It is also known as somatotropic hormone (STH) or Somatotropin.
2. It is a peptide hormone.
3. Growth hormone promotes growth of all the tissues and metabolic process of the body.
4. It influences the metabolism of carbohydrates, proteins and lipids and increases the rate of protein biosynthesis in the cells.
5. It stimulates chondrogenesis (cartilage formation), osteogenesis (bone formation) and helps in the retention of minerals like nitrogen, potassium, phosphorus, sodium etc., in the body.
6. GH increases the release of fatty acid from adipose tissue and decreases the rate of glucose utilization for energy by the cells.
7. Thus it conserves glucose for glucose dependent tissues, such as the brain.

2. What is glycoprotein hormone? Explain its role.

Ans. Thyroid stimulating hormone (TSH) or thyrotropin:

1. TSH is a glycoprotein hormone, which stimulates the thyroid gland to secrete Tri-iodothyronine (T_3) and thyroxine (T_4).
2. TSH secretion is regulated by negative feedback mechanism. It's release from the anterior pituitary is induced by the thyrotropin releasing hormone (TRH).
3. When thyroxine level in the blood increases, TRH acts on both the pituitary and hypothalamus to inhibit TSH secretion.

Follicle stimulating hormone FSH):

1. FSH is a glycoprotein hormone which regulates the functions of the gonads (ovary and testis).

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UNIT-V

12. TRENDS IN ECONOMIC ZOOLOGY

Evaluation

1. Animal husbandry is the science of rearing, feeding and caring, breeding and disease control of animals. It ensures supply of proper nutrition to our growing population through activities like increased production and improvement of animal products like milk, eggs, meat, honey, etc.

a. Poultry production depends upon the photo period. Discuss

b. Polyculture of fishes is of great importance.

Ans. (a) Light has three important functions in poultry farming

1. Facilitate sight of birds.
2. Stimulate internal cycles due to day-length changes.
3. Initiate hormone release.

Light can influence the growth, development and production of chickens.

Light colour, duration and intensity plays a role.

Light colour: Blue light has a calming effect on chickens. Blue green light is said to stimulate growth. Orange red light stimulates reproduction.

Duration: New born chicks need 21-23 hours of continuous light for few days(3-4days). It should be reduced to 15-16 hours by the time the chicks are about 3 weeks old following which 10-12 hours /Natural day light length would suffice for growth & development.

Intensity: The intensity of light is also linked to temperature. The lamps/lights giving light with a cooling effect is preferred over lamps which generate lot of heat.

Thus photoperiod(length of exposure to light) has a impact on growth of chicks along with light colour and intensity of the incident light.

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3. Artificial insemination :

i. Artificial insemination is a technique in which the semen collected from the male is injected to the reproductive tract of the selected female.

ii. Artificial insemination is economical measure where fewer bulls are required and maximum use can be made of the best sire.

Multiple ovulation embryo transfer technology (MOET) :

i. It is another method of propagation of animals with desirable traits. This method is applied when the success rate of crossing is low even after artificial insemination.

ii. In this method Follicle stimulating hormone (FSH) is administered to cows for inducing follicular maturation and super ovulation.

iii. Instead of one egg per cycle, 6-8 eggs can be produced by this technology. The eggs are carefully recovered non-surgically from the genetic mother and fertilized artificially.

iv. The embryos at 8-32 celled stages are recovered and transferred to a surrogate mother. For another round of ovulation, the same genetic mother is utilized.

v. This technology can be applied to cattle, sheep and buffaloes. Advantage of this technology is to produce high milk yielding females and high-quality meat yielding bulls in a short time.

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In-Text Questions

1. Write a note on the characteristics of cultivable fishes.

Ans. Characteristics of cultivable fishes :

The special characteristic features of cultivable fishes are:

1. Fishes should have high growth rate in short period for culture.

2. They should accept supplementary diet.

3. They should be hardy enough to resist some common diseases and infection of parasites.

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4. **Game breeds:** Since ancient times, special breed of roosters have been used for the sport of cockfighting.

   Aseel: This breed is white or black in colour. The hens are not good egg layers but are good in incubation of eggs. It is found in all states of India. Aseel is noted for its pugnacity, high stamina, and majestic gait and dogged fighting qualities. This breed is well-known for their meat qualities.

5. **Ornamental breeds:** Ornamental chicken are reared as pets in addition to their use for egg production and meat.

   Silkie: It is a breed of chicken has a typical fluffy plumage, which is said to feel like silk and satin. The breed has numerous additional special characters, such as black skin and bones, blue earlobes, and five toes on each foot, while the majority chickens only have four. They are exhibited in poultry shows, and come out in various colours. Silkie chicken is especially simple to maintain as pets.

Higher Order Thinking Skills (HOTS)

1. Write the advantages of using vermicompost.

Ans. 1. People are aware about benefits of organic inputs in farming.

2. Vermicompost is excellent organic manure for sustainable agro-practices.

3. So, marketing vermicompost is now a potential and flourishing industry. Retail marketing of vermicompost in urban areas is most promising. Vermicompost is neatly packed in designed and printed packets for sale.

4. People of different age groups are involved in the production and selling of vermicompost. Marketing of vermicompost can provide a supplementary income.

i. Vermicompost is rich in essential plant nutrients.

ii. It improves soil structure texture, aeration, and water holding capacity and prevents soil erosion

iii. Vermicompost is a rich in nutrients and an eco-friendly amendment to soil for farming and terrace gardening.

iv. It enhances seed germination and ensures good plant growth.

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