11th STD. **PUBLIC EXAM - MARCH 2024**

PART - III

Reg. No.

Time Allowed : 3.00 Hours] **BIOLOGY (with Answers)** **[Maximum Marks : 70**

Instructions: (1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

(2) Use **Blue** or **Black** ink to write and underline and pencil to draw diagrams.

PART - I

(BIO - BOTANY) (Marks : 35)

SECTION - 1

Note : (i) Answer **all** the questions. **(8 × 1 = 8)**

(ii) Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

1. If the diameter of the pulley is 12 inches, length of pointer is 10 inches and distance travelled by pointer is 5 inches, calculate the actual growth in length of plant :

(a) 12 inches (b) 3 inches
(c) 30 inches (d) 6 inches

2. Aggregate fruit develops from :

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

3. The element which is **not** remobilized :

(a) Calcium (b) Phosphorus
(c) Nitrogen (d) Potassium

4. Which one of the following cell organelles is used to trace human origins?

(a) Chloroplast (b) Golgi body
(c) Ribosome (d) Mitochondria

5. Which one of the following algae is used for sewage treatment?

(a) Laminaria (b) Ascophyllum
(c) Chlorella (d) Fucus

6. Grafting is successful in Dicots but not in Monocots because the dicots have :

(a) Vascular bundles arranged in a ring
(b) Cork Cambium
(c) Vessels with elements arranged end to end
(d) Cambium for secondary growth

7. What type of transpiration is possible in the Xerophyte *Opuntia*?

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

8. Identify the true statement regarding light reaction of photosynthesis :

(a) The reaction center of PS I is chlorophyll 'a' with absorption peak at 680 nm
(b) Photolysis of water is associated with PS I
(c) The reaction center of PS II is Chlorophyll 'a' with absorption peak at 700 nm.
(d) PS I and PS II involved in the formation of NADPH + H+.

SECTION - 2

Note: Answer **any four** questions. **(4 × 2 = 8)**

9. Differentiate - dendrochronology and dendroclimatology.

10. Write any two non-living characters of virus.

11. Define - 'Synapsis'.

12. Respiratory quotient is zero in succulent plants. Why?

13. Give the technical terms for the following :

(a) A sterile stamen
(b) Stamens are united in one bundle.

14. What are the parameters which control Water Potential?

SECTION - 3

Note: Answer **any three** questions. Question No. **19** is **Compulsory.** **(3 × 3 = 9)**

15. Write short notes about Hydroponics or soilless culture.

16. Draw and label the parts of regions of root.

17. Differentiate - haplontic and diplontic life cycle.

18. Write the properties of water.

19. Write the functions of Nucleus.

Section - 4

Note: Answer **all** the questions **(2 × 5 = 10)**

20. (a) Write the botanical description of Allium cepa.

(OR)

(b) Write the characteristic features of DNA.

21. (a) Explain the Krebs Cycle. (Explanation (or) Flow Chart) **(OR)**

(b) Give a general account of lichens.

Answers

PART - I ; Section - 1

1. (b) 3 inches

2. (d) Multicarpellary, apocarpous ovary

3. (a) Calcium

4. (d) Mitochondria

5. (c) Chlorella

6. (d) Cambium for secondary growth

7. (b) Cuticular

8. (d) PS I and PS II involved in the formation of NADPH + H+

Section - 2

9.

Dendrochronology	Dendroclimatology
Each annual ring corresponds to one year's growth and on the basis of these rings, the age of a particular plant can easily be calculated. The determination of the age of a tree by counting the annual rings is called dendrochronology.	It is a branch of dendrochronology concerned with constructing records of past climates and climatic events by analysis of tree growth characteristics, especially growth rings.

10. Non-living characters of virus:

1. Can be crystallized.
2. Absence of metabolism.

11. Pairing of homologous chromosomes takes place and it is known as synapsis.

12. In some succulent plants like *Opuntia*, *Bryophyllum*, carbohydrates are partially oxidised to organic acid, particularly malic acid without corresponding release of CO_2 but O_2 is consumed hence the RQ value will be zero.

$$2C_6H_{12}O_6 + 3O_2 \longrightarrow 3C_4H_6O_5 + 3H_2O + \text{Energy}$$

Glucose malic acid

RQ of glucose in succulents $= \frac{\text{Zero molecule of } CO_2}{\text{3 molecules of } CO_2} = 0$ (Zero)

13. **(a)** Staminode **(b)** Monadelphous

14. 1. Water potential 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).

2. At standard temperature, the water potential of pure water is zero.

3. 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,

$$\Psi_W = \Psi_S + \Psi_P$$

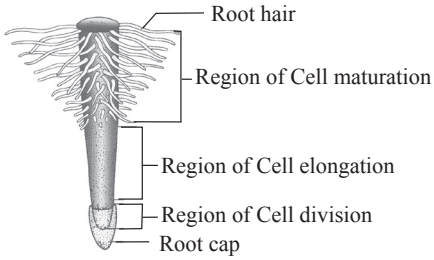
Water Potential = Solute potential + Pressure potential

Section - 3

15. Hydroponics or Soilless culture:

1. Von Sachs developed a method of growing plants in nutrient solution.
2. The commonly used nutrient solutions are Knop solution (1865) and Arnon and Hoagland Solution (1940).
3. Later the term Hydroponics was coined by Goerick (1940) and he also introduced commercial techniques for hydroponics.
4. In hydroponics, roots are immersed in the solution containing nutrients and air is supplied with help of tube.

16. Regions of root



17.

No.	Haplontic life cycle	Diplontic life cycle
1.	Gametophytic phase is dominant, photosynthetic and independent.	Sporophytic phase (2n) is dominant, photosynthetic and independent.
2.	Sporophytic phase is represented by the zygote. Eg : *Volvox*	The gametophytic phase is represented by the single to few celled gametophyte. Eg: *Fucus sps*.

18. Properties of water:

1. Adhesion and cohesion property.
2. High latent heat of vaporisation.
3. High melting and boiling point.
4. Universal solvent.
5. Specific heat capacity

19. Functions of the nucleus:

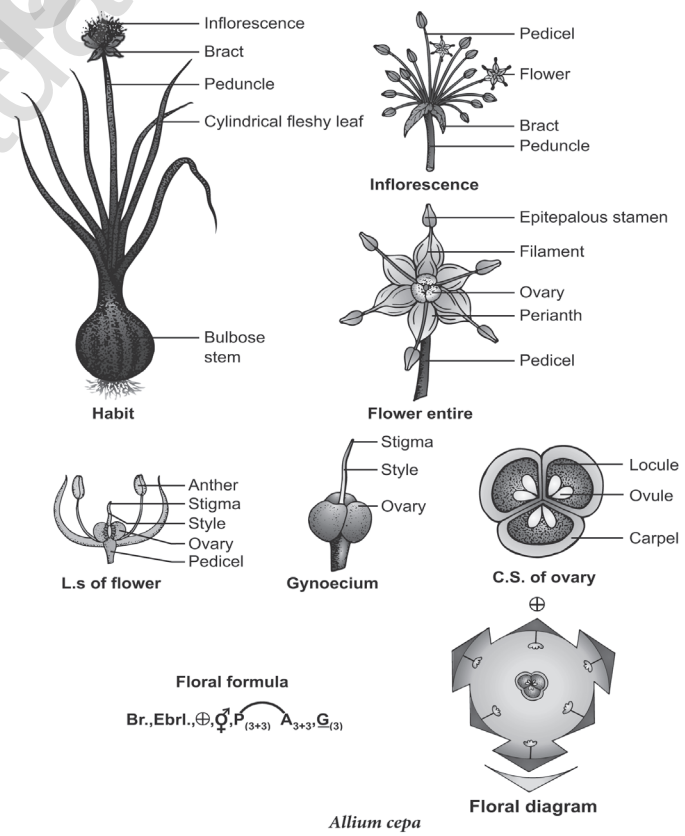
1. Controlling all the cellular activities.
2. Storing the genetic or hereditary information.
3. Coding the information in the DNA for the production of enzymes and proteins.
4. DNA duplication and transcription takes place in the nucleus.
5. In nucleolus ribosomal biogenesis takes place.

Section - 4

20. (a) Botanical description of Allium cepa :

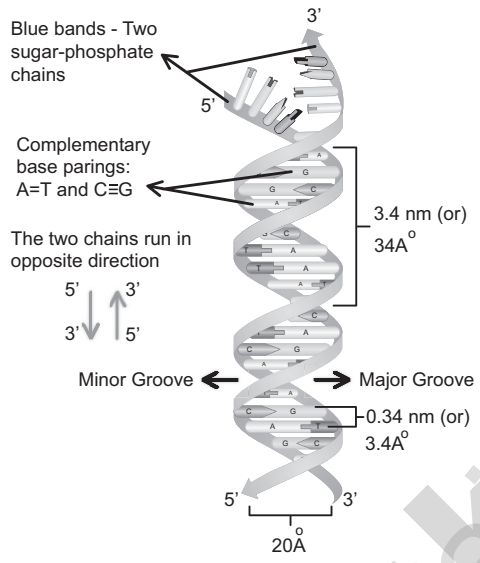
1. **Habit:** Perennial herb with bulb.
2. **Root:** Fibrous adventitious root system
3. **Stem:** Underground bulb
4. **Leaf:** A cluster of radical leaves emerges from the underground bulb, cylindrical and fleshy having sheathy leaf bases with parallel venation.
5. **Inflorescence:** Scapigerous i.e. the inflorescence axis (peduncle) arising from the ground bearing a cluster of flowers at its apex. Pedicels are of equal length, arising from the apex of the peduncle which brings all flowers at the same level.
6. **Flower:** Small, white, bracteate, ebracteolate, pedicellate, complete, trimerous, actinomorphic and hypogynous. Flowers are protandrous.
7. **Perianth:** Tepals 6, white, arranged in two whorls of three each, syntepalous showing valvate aestivatikon.
8. **Androecium:** Stamens 6, arranged in two whorls of three each, epiphyllous, apostamenous /free and opposite to tepals. Anthers dithecous, basifixed, introse, and dehiscing longitudinally.
9. **Gynoecium:** Tricarpellary and syncarpous. Ovary superior, trilocular with two ovules in each locule on axile placentation. Style simple, slender with simple stigma.
10. **Fruit:** A loculicidal capsule.
11. **Seed:** Endospermous.
12. **Floral Formula:**

Br., Ebrl., ⊕, ♀ , $\overset{\frown}{P_{(3+3)}}$, A_{3+3}, $\underline{G}_{(3)}$.



(OR)

(b) Features of DNA:



i. 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.

ii. 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.

iii. The narrow angle between the sugars generates a minor groove and the large angle on the other edge generates major groove.

iv. Each base is 0.34 nm 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.

v. DNA helical structure has a diameter of 20 Å and a pitch of about 34 Å. X-ray crystal study of DNA takes a stack of about 10 bp to go completely around the helix (360°).

vi. Thermodynamic stability of the helix and specificity of base pairing includes
   (i) The hydrogen bonds between the complementary bases.
   (ii) Stacking interaction between bases. Electron cloud interactions (Π – Π) between the bases.

vii. The phosphodiester linkages gives an inherent polarity to the DNA helix, form strong covalent bonds, gives the strength and stability to the polynucleotide chain.

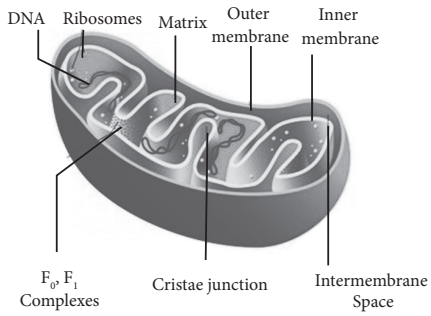
viii. **Plectonemic coiling** - the two strands of the DNA are wrapped around each other in a helix, making it impossible to simply move them apart without breaking the entire structure.

ix. **Paranemic coiling** - the two strands simply lie alongside one another, making them easier to pull apart.

x. Based on the helix and the distance between each turns, the DNA is of 3 forms – A-DNA, B-DNA and Z-DNA.

21. (a) Krebs cycle or Citric acid cycle or TCA cycle - Third stage of Aerobic Respiration:

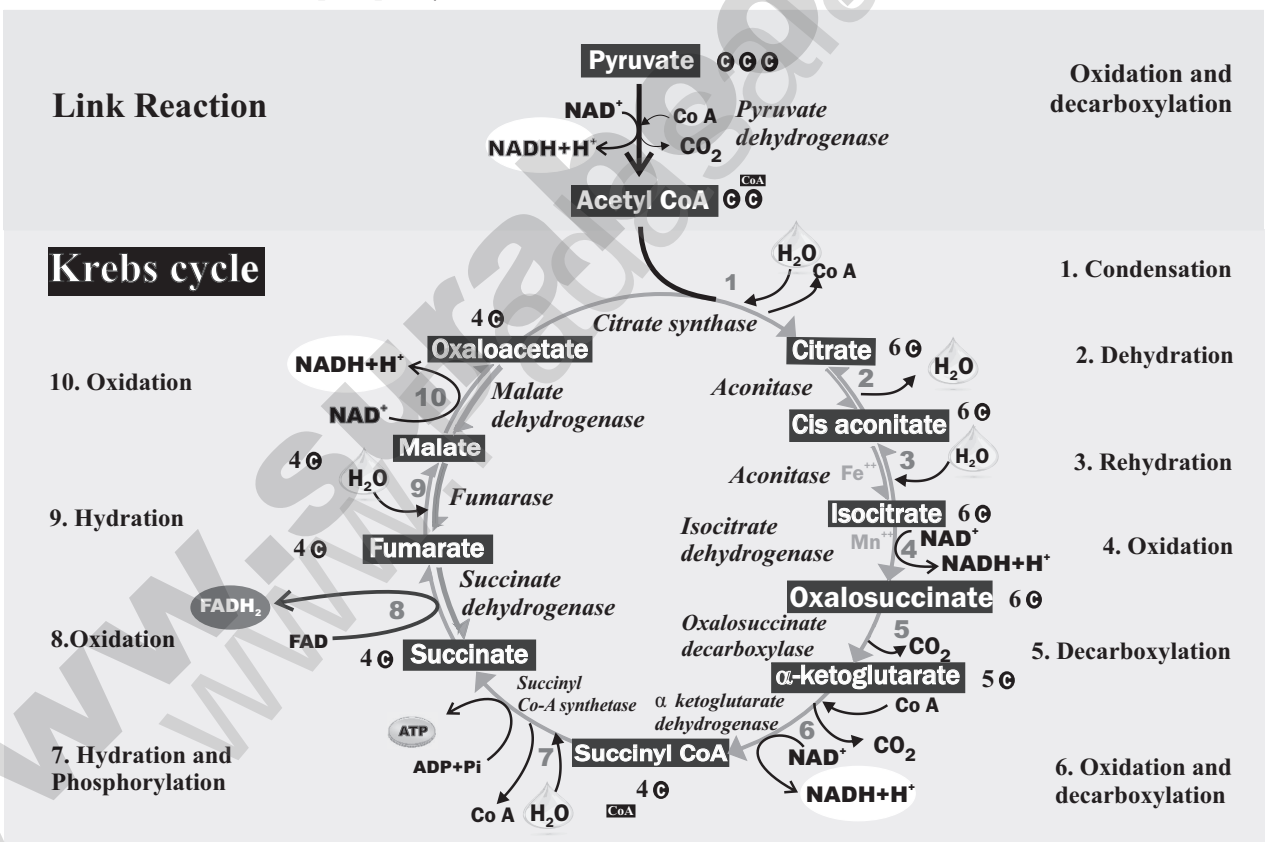
Two molecules of acetyl CoA formed from link reaction now enter into Krebs cycle. It is named after its discoverer, German Biochemist Sir Hans Adolf Krebs (1937). The enzymes necessary for TCA cycle are found in mitochondrial matrix except *succinate dehydrogenase* enzyme which is found in mitochondrial inner membrane



(i) 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.

(ii) It is followed by the action of different enzymes in cyclic manner.

(iii) 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.



Krebs cycle or Citric acid cycle

(iv) In animals a molecule of GTP is synthesized from GDP + Pi. In a coupled reaction GTP is converted to GDP with simultaneous synthesis of ATP from ADP + Pi.

(v) In three steps (4, 6, 10) in this cycle NAD^+ is reduced to $NADH^+ + H^+$ and at step 8 where FAD is reduced to $FADH_2$.

(vi) The summary of link reaction and Krebs cycle in mitochondria is

$$\text{Pyruvic acid} + 4NAD^{+} + FAD + 4H_2O + ADP + Pi$$

$$\downarrow \text{ Mitochondrial matrix.}$$

$$3CO_2 + 4NADH + 4H^{+} + FADH_2 + H_2O + ATP.$$

(vii) Two molecules of pyruvic acid formed at the end of glycolysis enter into the mitochondrial matrix. Therefore, Krebs cycle is repeated twice for every glucose molecule where two molecules of pyruvic acid produces six molecules of CO_2, eight molecules of $NADH + H^{+}$, two molecules of $FADH_2$ and two molecules of ATP.

(OR)

(b) General account on 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. Asexual reproduction takes place through fragmentation, Soredia and Isidia. Phycobionts 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)
- (v) Marine(on siliceous rocks of sea)
- (vi) Fresh water(on siliceous rock of fresh water).

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

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 basidiomycetes

Economic importance :

1. Lichens secrete organic acids like **Oxalic acids** which corrodes the rock surface and helps in weathering of rocks, thus acting as pioneers in Xerosere.
2. Sensitive to air pollutants (sulphur-di oxide) and 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*.
5. *Cladonia rangiferina* (Reindeer mose) is used as food for animals living in Tundra regions.

11th STD.

PUBLIC EXAM - MARCH 2024

PART - III

BOTANY (with Answers)

Reg. No.

Time Allowed : 3.00 Hours] **[Maximum Marks : 70**

Instructions: (1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

(2) Use **Blue** or **Black** ink to write and underline and pencil to draw diagrams.

PART - I

Note : (i) Answer **all** the questions. **(15 × 1 = 15)**

(ii) Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

1. In meiosis crossing over is initiated at :
(a) Leptotene (b) Diplotene (c) Zygotene (d) Pachytene

2. The compound which links glycolysis and Krebs Cycle is :
(a) Acetyl CoA (b) Succinic acid (c) Citric acid (d) Pyruvic acid

3. What type of transpiration is possible in the Xerophyte Opuntia?
(a) Lenticular (b) Cuticular (c) Stomatal (d) All the above

4. A quantasome is present in _____.
(a) Golgi bodies (b) Mitochondria
(c) Endoplasmic reticulum (d) Chloroplast

5. Which of the following components provides sticky character to the bacterial cell?
(a) Plasma membrane (b) Cell wall
(c) Glycocalyx (d) Nuclear membrane

6. Bryophyllum and Dioscorea are examples for :
(a) Cauline bud, apical bud (b) Foliar bud, apical bud
(c) Cauline bud, foliar bud (d) Foliar bud, cauline bud

7. How many families were described by Bentham and Hooker classification?
(a) 202 (b) 204 (c) 102 (d) 212

8. The reserve food of Rhodophyceae is :
(a) Floridean starch (b) Paramylon (c) Mannitol (d) Laminarin

9. Cytochrome oxidase contains _____ mineral.
(a) Zinc (b) Iron (c) Copper (d) Magnesium

10. Select long day plants from the following :
(a) Potato, Tomato, Cotton (b) Pea, Barley, Oats
(c) Oats, Cocklebur, Rhododendron (d) Tobacco, Rice, Soyabean

11. Phosphoenol pyruvate is the primary CO_2 acceptor in:
(a) C_2 plants (b) C_3 plants (c) C_3 and C_4 plants (d) C_4 plants

12. Inner, darker & harder portion of secondary Xylem that cannot conduct water in an older dicot stem is called :
(a) Wood (b) Alburnum (c) Duramen (d) Bast

13. Thyrsus is a type of :
(a) Special inflorescence (b) Mixed inflorescence
(c) Cymose inflorescence (d) Racemose inflorescence

14. Bicollateral vascular bundles are present in :
(a) Dracaena (b) Cucurbitaceae (c) Yucca (d) Liliaceae

15. Watson and Crick model of DNA double helix is _____ form.
(a) H (b) A (c) B (d) C

Part - II

Note: Answer **any six** questions. Question No. **24** is **Compulsory**. **(6 × 2 = 12)**

16. What is apical dominance?
17. Name the four types of Ascocarps.
18. In which season the vessels of Angiosperms are larger in size, why?
19. What is Nucule?
20. Plant A shows Whiptail disease, plant B shows a Little Leaf disease. Identify mineral deficiency of plant A and B.
21. Write two Binomial names of food plants in Solanaceae family.
22. Wtite the equation of overall process of Respiration.
23. What are the parameters which control water potential ?
24. How do mangrove plants respire?

Part - III

Note: Answer **any six** questions. Question No. **33** is **Compulsory.** **(6 × 3 = 18)**

25. Write the importance of studying growth rings.
26. How root climbers differ from stem climbers?
27. Draw and label the parts of structure of chloroplast.
28. How does phosphorylase enzyme open the stomata in starch sugar interconversion theory?
29. Name any 3 human diseases caused by bacteria and their pathogens.
30. What is Respiratory Quotient? What is the RQ value of organic acid (Malic acid)?
31. What is wood botanically?
32. What are the three phases of Dark reaction?
33. Write any three living characters of viruses.

Part - IV

Note: Answer **all** the questions **(5 × 5 = 25)**

34. (a) Write the physiological effects of Cytokinins.

(OR)

(b) Draw and explain the structure of Marchantia Sporophyte.

35. (a) Explain the different types of placentation with example.

(OR)

(b) Differentiate Mitosis from Meiosis.

36. (a) Explain the structure of DNA.

(OR)

(b) Write the schematic representation of Glycolysis.

37. (a) Draw and lable the T.S. of dicot leaf.

(OR)

(b) Write the differences between C_3 plants and C_4 plants.

38. (a) Write the floral characters of Ricinus communis. Draw any one of the floral diagram and write its floral formula.

(OR)

(b) Explain the tap root modifications with examples.

Answers

PART - I

1. (d) Pachytene

2. (a) Acetyl CoA

3. (b) Cuticular

4. (d) Chloroplast

5. (c) Glycocalyx

6. (d) Foliar bud, cauline bud

7. (a) 202

8. (a) Floridean starch

9. (c) Copper

10. (b) Pea, Barley, Oats

11. (d) C_4 plants

12. (c) Duramen

13. (b) Mixed inflorescence

14. (b) Cucurbitaceae

15. (c) B

PART - II

16. Suppression of growth in lateral bud by apical bud due to auxin produced by apical bud is termed as apical dominance.

17. Cleistothecium, Perithecium, Apothecium and Pseudothecium.

18. In the spring season, cambium is very active and produces a large number of xylary elements having vessels / tracheids with wide lumen. This is because in spring season the climatic conditions are favorable for the growth of plants with optimum temperature, light and photosynthesis is at the peak. This requires the uptake and transport of large quantities of water. Further the soil has good water content in spring unlike in summer / winter.

19. In the *alga chara*, the female sex organ is called Oogonium or Nucule. It is located above the male sex organ called Antheridium or Globule.

20. **Plant A** in nutrient medium shows whiptail disease: Mineral deficiency is due to Molybdenum.
Plant B in a nutrient medium shows little leaf disease: Mineral deficiency is due to zinc.

21. 1. *Lycopersicon esculentum* (tomato) 2. *Solanum tuberosum* (potato)

22. **Overall equation for respiration** :

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ + Energy
(686 K cal or 2868 KJ)
(1K cal = 4.184 KJ

23. 1. Water potential 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).
2. At standard temperature, the water potential of pure water is zero.
3. 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

24. Some mangrove plants like *Avicennia, Rhizophora, Bruguiera* develop special kinds of roots (Negatively geotropic) for respiration because the soil becomes saturated with water and aeration is very poor. They have a number of breathing pores on pneumatophores for exchange of gases.

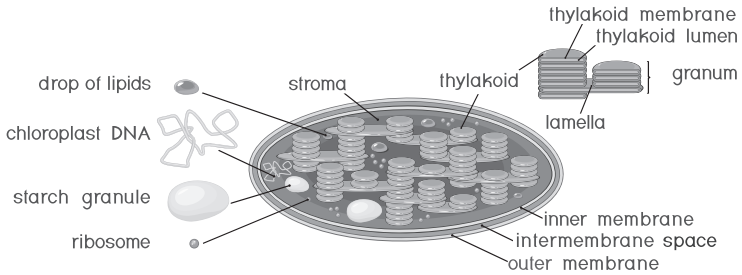
PART - III

25. **Importance of Studying Growth Rings :**
(i) Age of wood can be calculated.
(ii) Th e quality of timber can be ascertained.
(iii) Radio-Carbon dating can be verifi ed.
(iv) Past climate and archaeological dating can be made.
(v Provides evidence in forensic investigation.

26.

No.	Root Climbers	Stem Climbers
1.	Plants climbing with the help of adventitious roots arising from nodes are called Root climbers.	Stem part of the plant coils round a support for climbing.
2.	Eg: ***Piper nigrum.***	Eg: ***Ipomoea.***

27.



Structure of Chloroplast

28. 1. The discovery of enzyme phosphorylase in guard cells by Hanes (1940) greatly supports the starch-sugar interconversion theory.

2. The enzyme *phosphorylase* hydrolyses starch into sugar and high pH followed by endosmosis and the opening of stomata during light. The vice versa takes place during the night.

29.

Human diseases		
No.	**Name of the disease**	**Name of the pathogen**
1.	Cholera	*Vibrio cholerae*
2.	Typhoid	*Salmonella typhi*
3.	Tuberculosis	*Mycobacterium tuberculosis*

30. The ratio of volume of carbon dioxide given out and volume of oxygen taken in during respiration is called Respiratory Quotient or Respiratory ratio.

When respiratory substrate is an organic acid the value of RQ will be more than unity.

$C_4H_6O_5 + 3O_2 \longrightarrow 4CO_2\uparrow + 3H_2O + \text{Energy}$

Malic acid

$$\text{RQ of malic acid} = \frac{\text{4 molecules of } CO_2}{\text{3 molecules of } O_2}$$

$$= 1.33 \text{ (more than unity}$$

31. Botanically wood is secondary xylem. It is formed by a relatively complex meristem, the vascular cambium, consisting of vertically (axial) elongated fusiform initials and horizontally (radially) elongated ray initials.

32. **Dark reaction consists of three phases:**

1. Carboxylation (fixation)
2. Reduction (Glycolytic Reversal)
3. Regeneration

33. **Living characters of viruses :**

1. Presence of nucleic acid and protein.
2. Capable of mutation.
3. Ability to multiply within living cells.

PART - IV

34. a) The physiological effects of Cytokinins :

1. Cytokinin promotes cell division in the presence of auxin (IAA).
2. It can break the dormancy of certain light-sensitive seeds like tobacco and induces seed germination.
3. It promotes the growth of lateral bud in the presence of apical bud.
4. Application of cytokinin delays the process of aging by nutrient mobilization. It is known as Richmond Lang effect.
5. Cytokinin (i) increases rate of protein synthesis (ii) induces the formation of inter-fascicular cambium, (iii) overcomes apical dominance (iv) induces formation of new leaves, chloroplast and lateral shoots.
6. Plants accumulate solutes very actively with the help of cytokinins.

(OR)

b) Structure of Marchantia Sporophyte :

1. In some forms small detachable branches or brood bodies are formed, they help in vegetative reproduction as in Bryopteris fruticulosa. In Marchantia propagative organs called gemmae are formed and help in reproduction.

Gemmae- *Marchantia*

2. The zygote is the first cell of the sporophyte generation. It undergoes mitotic division to form multicellular undifferentiated embryo. The embryogeny is exoscopic (the first division of the zygote is transverse and the apex of the embryo
3. In some sporophytes elaters are present and help in dispersal of spores (Example: Marchantia). The spores germinate to produce gametophyte.
4. The zygote, embryo and the sporogonium constitute sporophytic phase. The green long living haploid phase is called gametophytic phase. The haploid gametophytic phase alternates with diploid sporophyte and shows heterologous alternation of generation.

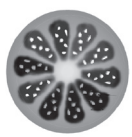
35. a) The mode of distribution of placenta inside the ovary is called placentation. Placenta bears the ovules.

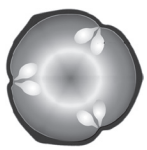
Different types as follows:

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: Nymphaeaceae.



4.  **Parietal:** It is the placentae on the ovary walls or upon intruding partitions of a unilocular, compound ovary. Eg: Mustard, Argemone, cucumber.

5. **Basal:** It is the placenta at the base of the ovary. Eg: Sunflower, Marigold.

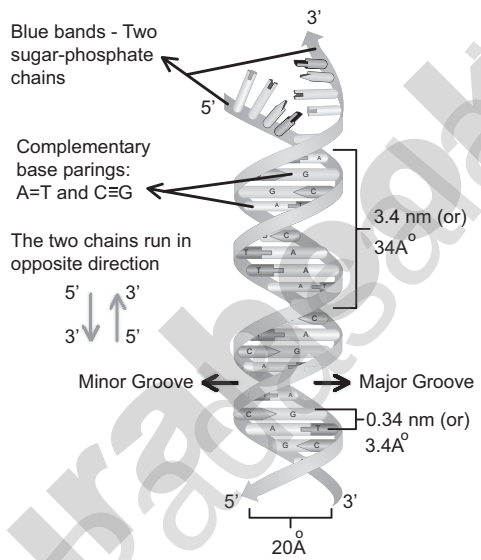
6.  **Free-central:** It is with the placentae along the column in a compound ovary without septa. Eg: Caryophyllaceae, Dianthus, Primrose.

(OR)

b)

No.	Mitosis	Meiosis
1.	One division.	Two divisions.
2.	Number of chromosome remain 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.	Two daughter cells are formed.	Four daughter cells are formed.

36. a) 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.
7. Adenine (A) always pairs with Thymine (T) by double bond and Guanine (G) always pairs with Cytosine (C) by triple bond.

(OR)

b) Glycolysis / EMP Pathyway:

Glycolysis:

Glycolysis is a linear series of reactions in which 6-carbon glucose is split into two molecules of 3-carbon pyruvic acid. The enzymes which are required for glycolysis are present in the cytoplasm. The reactions of glycolysis were worked out in yeast cells by three scientists Gustav Embden (German), Otto Meyerhoff (German) and J Parnas (Polish) and so it is also called as EMP pathway. It is the first and common stage for both aerobic and anaerobic respiration. It is divided into two phases.

(1) Preparatory phase or endergonic phase or hexose phase (steps 1-5).

(2) Pay off phase or oxidative phase or exergonic phase or triose phase (steps 6-10).

1. Preparatory phase:

(i) Glucose enters the glycolysis from sucrose which is the end product of photosynthesis.

(ii) Glucose is phosphorylated into glucose-6-phosphate by the enzyme hexokinase, and subsequent reactions are carried out by different enzymes.

(iii) At the end of this phase fructose-1, 6 - bisphosphate is cleaved into glyceraldehyde-3- phosphate and dihydroxy acetone phosphate by the enzyme aldolase.

(iv) During preparatory phase two ATP molecules are consumed in step-1 and step-3.

2. Pay off phase

(i) Two molecules of glyceraldehyde- 3-phosphate oxidatively phosphorylated into two molecules of 1,3 - bisphospho glycerate.

(ii) During this reaction $2NAD^+$ is reduced to $2NADH + H^+$ by glyceraldehyde- 3- phosphate dehydrogenase at step 6. Further reactions are carried out by different enzymes and at the end two molecules of pyruvate are produced.

(iii) In this phase, 2ATPs are produced at step 7 and 2 ATPs at step10. Direct transfer of phosphate moiety from substrate molecule to ADP and is converted into ATP is called substrate phosphorylation or direct phosphorylation or trans phosphorylation.

(iv) During the reaction at step 9, 2phospho glycerate dehydrated into Phospho enol pyruvate a water molecule is removed by the enzyme enolase.

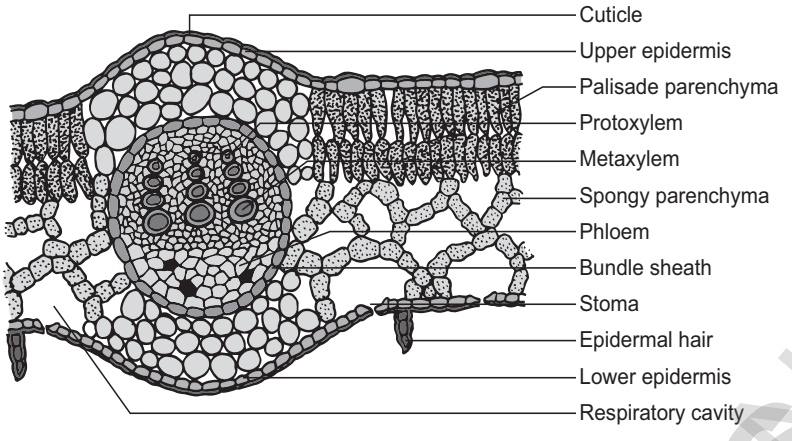
3. Energy Budget:

In the pay off phase totally 4ATP and $2NADH + H^+$ molecules are produced. Since 2ATP molecules are already consumed in the preparatory phase, the net products in glycolysis are 2ATPs and $2NADH + H^+$.

The overall net reaction of glycolysis

$$C_6H_{12}O_6 + 2ADP + 2Pi + 2NAD^+ \rightarrow 2x\ CH_3COCOOH + 2ATP + 2NADH + 2H^+$$

37. a) **T.S. of dicot leaf**



(OR)

b)

	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

38. a) **Floral characters of Ricinus communis :**

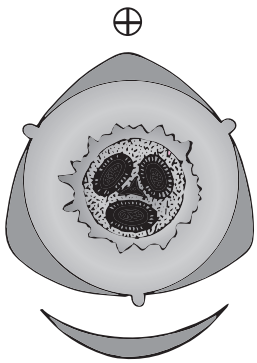
(i) Female Flower Bracteate, ebracteolate, pedicellate, female flowers (open for fourteen days) found towards the apical portion of inflorescence, actinomorphic, incomplete and hypogynous.

(ii) **Perianth:** Tepals 3, apophyllous, green valvate.

(iii) **Androecium:** Absent but staminode is present.

(iv) **Gynoecium:** Tricarpellary, syncarpous, ovary superior, distinctly trilobed, trilocular, covered with spiny outgrowth, single large ovule in each locule on axile placentation, style three with three bifid stigma.

(v) **Fruit:** A schizocarp with spiny outgrowth, splits into three one seeded cocci.



Floral diagram of female flower

(vi) **Seed:** Endospermous, knob-like caruncle develops from the micropyle, that absorbs and temporarily retains water enabling germination.

(vii) **Floral Formula:**

Female flower: Br., Ebrl., ⊕, ♀, $P_{(3)}$,A_0,$\underline{G}_{(3)}$

(OR)

b) Tap root modification :

a. Storage roots :

1. **Conical Root :** These are cone like, broad at the upper end and gradually tapering towards the lower end. Example: *Daucus carota.*
2. **Fusiform Root :** These roots are swollen in the middle and tapering towards both ends. Example: *Raphanus sativus*
3. **Napiform Root :** These roots are very broad at the upper end and suddenly tapers like a tail at the lower end. Example: *Beta vulgaris.*

4. **Breathing root :** Some mangrove plants like Avicennia, Rhizophora, Bruguiera develop special kinds of roots (Negatively geotropic) for respiration because the soil becomes saturated with water and aeration is very poor. They have a number of breathing pores on pneumatophores for exchange of gases.