



Karanjia Auto College, Karanjia, Mayurbhanj

GE-IIA : Plant physiology and metabolism

Unit-1(I)

Q1. Fill in the blanks (1 mark each)

- a) The Soil water available for root is _____
- b) Jamming of wooden doors and windows during rainy season is due to _____
- c) Wilting of differ from epidermal cells in having _____
- d) Loss of water in liquid form is _____
- e) Water potential and solute potential of pure water is _____ & _____
- f) Upward transport of water is achieved due to _____
- g) The movement of water across root endodermis is _____

Q2. Short Answer type : Within 2 to 3 sentences

- a) Name the solution of lower concentration than the one under consideration
- b) Who discovered aquaporins?
- c) What is Turgor pressure?
- d) What is the sign & unit of water potential?
- e) What is Imbibition pressure?
- f) What is Exo- osmosis?
- g) What is DPD?
- h) What is Osmotic pressure?

Q3. Short Answer type : (Within 75 words) a)

Guttation

- b) Root pressure Theory
- c) Osmosis
- d) Diffusion

- e) Plasmolysis
- f) Solute / osmotic potential
- g) Imbibition
- h) Transpiration pull theory

Q4. Long Answer type : (With 500 words) a)

Water is the solvent of life; Justify?

- b) Describe the important physical properties of water?
- c) What is Transpiration? Describe its various components?
- d) Transpiration is a necessary evil, Discuss?
- e) Give an account of guttation and how it is different from transpiration
- f) What is water potential? Describe its various components?
- g) Narrate in brief different hypothesis of stomatal opening & closing
- h) Describe various factors affecting transpiration.

Unit-1(I)

Answer the following questions:(1×8)

(1)The osmotic potential of a cell is -10 bar and it's pressure potential is 5 bars,its water potential would be_____.

(2)In a fully turgid cell,_____ equal to zero.

(3)The difference in the diffusion pressure of a solution and a pure solvent at same atmospheric pressure is known as_____.

(4)_____water is available to the plant in maximum amount.

(5)Apoplastic movement of water occurs through ____ and_____.

(6)Ascent of sap is due to ____ and ____ properties of water molecules?

(7)In many thin leaved mesophytes ,stomata open during day and close at night,this comes under____type stomata.

(8)In old trees or woody plants transpiration occurs through_____.

(9)_____ ion helps in opening of stomata. **2**

.Answer the following questions:(1.5×8)

(1) Explain briefly Plasmolysis?

- (2) What conditions are necessary for inhibition?
- (3) What is the significance of osmosis for plants?
- (4) Define apoplast?
- (5) Define Capillary water?
- (6) Define root pressure theory?
- (7) Name the process in which Hydathodes are helpful?
- (8) Why grass leaves roll up during hot and dry season?
- (9) What is wilting?

3. Answer the following questions:(2×8)

- (1) Differentiate between transpiration and Guttation?
- (2) What are antitranspirant? How do they work?
- (3) Define cohesion-tension theory?
- (4) Differentiate between symplastic and Apoplastic movement of water?
- (5) How active absorption of water is different from passive absorption?
- (6) Explain why the waterlogged soil is said to be physiologically dry?
- (7) Name the important source of water available to the plant?
- (8) Explain how $DPD = OP - TP$?
- (9) what is aquaporins?

4. Answer the following questions:(6×4)

- (1) What do you understand by water potential? Give parameters involved in its determination and its significance?
- (2) Explain the process of the absorption of water and factors affecting the rate of absorption?
- (3) Define transpiration? Explain how stomatal movements are regulated?
- (4) Comment upon the statement that 'transpiration is necessary evil'?

(5) Describe the process which explain both photoactive and scotoactive stomatal opening?

(6) What is ascent of sap? Demonstrate the path of ascent of sap by using any two appropriate experiments?

(7) Describe Dixon's theory of ascent of sap in plants?

Unit-(3)

1. Answer the following questions:(1×8)

(1) Carrier proteins take part in ____.

(2) The resting potential membrane potential is mainly determined by ____.

(3) Na⁺ glucose transporter is an example of ____.

(4) ____ transport is energy independent.

(5) HCO₃⁻-Cl⁻ transporter is an example of ____.

(6) ____ transports only one kind of substrate.

(7) ____ is concerned with photolysis of water.

(8) The maximum nutrient deficiency in plants is due to ____ and ____.

2. Answer the following questions:(1.5×8)

(1) Name four trace or micronutrients required by plants?

(2) Deficiency of which element causes die back disease?

(3) Which mineral element is common in cytochrome and ferredoxin?

(4) Define symport and antiport?

(5) Define Facilitated diffusion?

(6) Write short note on trace element and tracer elements?

(7) Role of K in plants

(8) Symptoms of Zn deficiency

3. Answer the following questions

- (1) Describe symptoms of N,P,K deficiency?**
- (2) Distinguish between macronutrient and micronutrient?**
- (3) Distinguish between active and passive absorption?**
- (4) Define electrochemical gradient?**
- (5) Define carriers and pumps?**
- (6) What is ABC transporter?**
- (7) Write note on Donnan's equilibrium?**
- (8) Define proton -ATPase pumps?**

4. Answer the following questions:(6×4)

- (1) Describe principles involved in the mechanism of absorption of mineral salts by plants?**
- (2) Give concise account of the mechanism of ion uptake in plants?**
- (3) What do you understand by active salt absorption? Explain the mechanism of active absorption of salts by plants?**
- (4) What do you mean by macro and micro-nutrients? Describe the role of nitrogen, potassium and iron in plant nutrition?**
- (5) Write short note on mineral deficiency in plants?**
- (6) Describe the mechanism of absorption of mineral salts by plants? HOW does it differ from absorption of water?**
- (7) What are trace elements? Explain their role in plant nutrition?**

Unit-2

1.Objective Questions (1 mark)

- 1. _____ is the photosynthetic unit.**
- 2. _____ is the photosynthetic apparatus.**
- 3. _____ is the universal photosynthetic Pigment.**

Sunlight

4. _____ 6CO_2 + _____ Chlorophylls $\text{C}_6\text{H}_{12}\text{O}_6$ + _____ + $6\text{H}_2\text{O}$.
5. Is photosynthesis _____ is Oxidised into _____ and _____ is reduced into _____
6. Oxygenated carotenoids are called _____.
7. _____ is present at the centre of the chlorophyll molecule.
8. Phycobillins are _____ soluble Pigments.
9. _____ is the reaction centre in PS-I and _____ PS-II.
10. Photolysis of water takes place in the presence of _____ & _____ ion.
11. Photolysis of water takes place near _____
12. All other Pigments except Chlorophyll-a are called _____.
13. The amount of light absorbed when plotted as a function of wavelength is called _____.
14. The amount of photon required to yield one molecule of oxygen is called _____.
15. When one molecule of photon is given then the number of O_2 produced is called _____.
16. The immediate acceptor of electron from PS-II is _____.
17. In Noncyclic ETS _____ ATP & _____ NADPH_2 are formed.
18. In Cyclic ETS only _____ are produced.
19. _____ & _____ are called Assimilatory Power.
20. The 1st Product of photosynthesis is _____.
21. For the production of one molecule of Glucose _____ ATP & _____ NADPH_2 molecules are wed through C_3 cycle.
22. In C_3 Plants CO_2 is fixed in the presence of enzyme _____.
23. Kranz anatomy is found in _____ plants.
24. In C_4 plants the CO_2 fixed from the atmosphere in the presence of enzyme _____.
25. In Sugarcane the 1st product of photosynthesis is _____.

26. In sugar cane for the production of molecule of Glucose _____ ATP & _____ NADPH₂ are required.
27. Agranal chloroplast is found in _____.
28. In C₄ plants C₃ cycle occur in _____ cell
29. In CAM plants stomata shows _____ movement.
30. In CAM plants CO₂ fixation occur during _____.
31. In CAM plants Acidification occur during _____ in which malic acid is stored in _____ of Mesophytes cell.
32. C₄ cycle is also called as _____ path way.
33. Calvin Cycle is also called as _____ cycle.
34. _____ is also called as Primary photo chemical reaction.
35. _____ is also called as E-MP path ways.
36. Kreb's cycle also called as TCA cycle or _____ cycle.
37. Glycolysis occur in _____ of the cell.
38. In photosynthesis Light reaction occur in _____ and Dark reaction occur in _____.
39. In Glycolysis 1 molecule Glucose is converted into 2 molecules of _____.
40. In Glycolysis the net gain of ATP is _____.
41. In Anaerobic respiration the net gain of ATP is _____.
42. In Glycolysis the number of ATP produced through substrate levels phosphorylation is _____.
43. _____ is the connecting link between Glycolysis & Kreb's cycle .
44. The reaction that links Glycolysis and Kreb's cycle is catalysed by the enzyme _____ .
45. The no. of ATP molecules produced in Kreb's cycle is _____.
46. The no. of ATP molecules produced through ETS during Aerobic respiration is _____.
47. Kreb's cycle occur in _____ of mitochondria.

48. Oxidative phosphorylation occur in _____ of mitochondria.
49. Complex- IV is also called as _____.
50. _____ is the final electron acceptor in oxidative phosphorylation.
51. During ETS in Proton Gradient is formed across _____ of mitochondria.
52. _____ is the only membrane bound enzyme of the Krebs's cycle.

Answer in 1 to 2 sentence (1.5 marks)

1. What is Quanta? *
2. What is Absorption spectrum?
3. What is Action Spectrum?
4. What is Quantum yield?
5. What is Quantum requirement?
6. Write the equation of photosynthesis?
7. What is Oxidative decarboxylation?
8. What is Oxidative photophosphorylation?
9. What is the name of complex I & II?
10. What is the name of complex III & complex-IV.

Answer in 75 words (2 marks)

1. Write a note on Photosynthetic Pigment.
2. Write a note on chlorophyll.
3. Write a note on Photolysis of water.
4. Briefly describe chemiosmotic mechanism.
5. Make a Brief note on Anaerobic respiration.
6. Briefly describe CAM pathway.
7. Write a note on PS-I & PS-II. 8. What are antenna molecules?

Answer in 500 words (6 marks)

1. Describe the Z-scheme of photosynthesis

2. Describe C₃ cycle of photosynthesis
3. Describe Hatch & Slack pathway & photosynthesis.
4. Describe the Process of Light reaction
5. Describe Glycolysis & it's Significance.
6. Describe Mitochondrial electron transport chain with the chemiosmotic mechanism of ATP synthesis.
7. Discuss TCA cycle with it's energy Budget.

Unit-3 1. Answer the following questions (1×8)

- (1) ____ trace elements is associated with posthetic group of nitrite reductase.
- (2) Prosthetic groups of nitrite reductase are ____.
- (3) Reddish pigment in functional root nodules of Leguminosae is ____.
- (4) The enzyme nitrogenase is extremely sensitive to ____.
- (5) Ammonia is oxidised into nitrite by ____ bacteria.
- (6) Nitrogen is absorbed by the plants ____.
- (7) ____ molecules of ATP are required to fix one molecule of nitrogen.
- (8) Conversion of ammonia to nitrite and then to nitrates is called ____.
- (9) The reaction of glutamate and ammonium ion to yield glutamine is catalyzed by enzyme ____.

2. Answer the following questions:(2×8)

- (1) Nitrogen cycle (2) Ammonification
- (3) Bacteroids (4) Leghaemoglobin
- (5) nif gene (6) Nitrite reductase
- (7) Transamination (8) Rhizobium
- (9) Denitrification

3. Answer the following questions: (6×4)

- (1) Describe the various stages of nitrogen cycle?
- (2) Give an account of biological nitrogen fixation?
- (3) What is nitrogen assimilation? Describe nitrate and ammonia assimilation in plants?
- (4) Describe the biochemistry of nitrogen fixation?
- (5) Give a general catalytic mechanism of nitrogen fixation by nitrogenase enzyme complex? **Unit-4**

Unit-4(a and b)

1. Answer the question in one word

[1 mark each]

- a. The response of plants to relative length & alternation of light and dark period with regard to the initiation of flowering is called -----
- b. Biochemically phytochrome is a protein with a-----
- c. Apoprotein and chromophore together make up the -----
- d. If a plant is exposed to high temperature after the vernalization treatment it does not flower. This reversal is referred to as -----
- e. Dormancy that is caused by an impermeable seed coat is known as ---

- f. Low temperature requirement given to the seeds to break dormancy is called -----
- g. Photoperiodism was discovered by -----
- h. Phytochrome was isolated by -----

2. Answer in two or three sentences

[1.5 marks each]

- | | |
|---------------------------|--------------------|
| a. LDP/Long day plants | i. Vernalin |
| b. SDP/short day plants | j. Devernalization |
| c. Day neutral plants | k. P1 |
| d. Dual day length plants | l. Pfr |
| e. Critical day length | m. Anthesis |
| f. Photoinductive cycle | n. Lysenkoism |
| g. Phytochrome | o. HIR |
| h. Florigen | p. VLFR |
| | q. LFR |

3. Answer in 75 words

[2 marks each]

- | | |
|---|---|
| 1 Discovery of photoperiodism | 16 Rapid action phytochrome |
| 2 Perception of photoperiodic stimulus | 17 Slow action phytochrome |
| 3 Discovery of phytochrome | 18 Primary action phytochrome |
| 4 Structure of phytochrome | 19 Molecular hypothesis |
| 5 Red and far red light response | 20 Gene activation hypothesis |
| | 21 Inhibition of gene expression |
| | |
| of plant | 15 Fluence and irradiation response |
| 6 Discovery of vernalization | |
| 7 Response types of vernalization | |
| 8 Site of vernalization | by phytochrome |
| 9 Site of photoperiodic response | 22 Regulation of phytochrome gene expression |
| 10 Application of vernalization | |
| 11 Phytochrome controlled morphogenetic responses | 23 Role of phytochrome on gene expression |
| 12 Xanthium plant | 24 Role of phytochrome on membrane permeability |
| 13 Biosynthesis of phytochrome | 25 Induction of enzyme activity by phytochrome |
| 14 Phytochrome genes | |

4. Answer the following in 500 words

[6marks each]

- 1 What is photoperiodism. Describe the different type of plants in response to photoperiod?
- 2 What is critical day length. Describe photoinductive cycle and perception of photoperiodic stimulus?
- 3 Describe the discovery and structure of phytochrome.
- 4 Give an account of red and far red light responses on photomorphogenesis.
- 5 What is florigen concept. describe its role in stimulating flowering in different types of photoperiod sensitive plants?
- 6 What is vernalization Describe the sites of vernalization. How plants can be devernalized?
- 7 Give an account of vernalization.
- 8 Describe the role of factors that regulate vernalization.
- 9 What is vernalin Describe its role in the flowering of plants?

- 10 Describe the mechanism of vernalization. Add a note on its applications.**
- 11 Describe the role of phytochrome in photoperiodism.**
- 12 Describe the role of phytochrome in photomorphogenesis.**
- 13 Give an account of phytochrome action.**
- 14 Enumerate various response types of phytochrome.**