Indian Association for the Cultivation of Science
(Deemed to be University under *de novo* Category)
Integrated Bachelor's-Master's Program
End-Semester Examination-Autumn 2024

Subject: Elements of Photobiology ***Subject Code(s): BIS-2101***
Full Marks: 50 ***Time Allotted: 3 h***

Group-A

1. What are the products of the light part of oxygenic photosynthesis of plants? **1**
2. What are the photosystems? **1**
3. What are light harvesting pigments and their constituents? **1**
4. Name the reaction centers of the photosystems and their relation with light harvesting complexes? **1**
5. Write brief notes on the following constituents of photosystems: **1×4=4**

   Pheophytin, mobile quinone, plastocyanin, ferredoxin
6. What is photophosphorylation? Where does it occur in green plants? How is the energy requirement of the process satisfied? **½ + ½ + 1=2**
7. What was Jagendorf's demonstration pertaining photosynthesis? **2**
8. What is the role of Mn_4Ca cluster in one of the photosystems? **2**
9. For production of each mole of oxygen, how many mole-equivalent of H^+ ions are accumulated in the lumen segment of the thylakoid? Explain. **2**
10. What modification of the Miller-Urey experiment is needed for the production of canonical nucleobases under an abiotic condition? **2**
11. How is the production of HCN, which is abundant in the planetary carbon feedstocks, is established to be a link for the formation of adenine in the modified Miller-Urey experiment? **2**
12. What is rhodopsin? **1**
13. Draw the absorption spectrum of rhodopsin and comment on its molar extinction coefficient value. **2**
14. Explain the biochemical mechanism for the signal generation as response of the light exposure on the retinal membrane. **2**

Group-B

15. Define the following (any four): **1×4=4**

a) Heliotherapy

b) Guanophores

c) Glare

d) Melanocytes

e) Segments of ECG

16. Answer the following (any three): **3×3=9**

a) What are the photosensitive region and the bending part of the seedling during phototropism? Design an experiment to identify those parts responsible for their afore-mentioned roles. 1+2 = 3

b) Name largest organ of the human body. Name the structural layer of that organ expressing coloration. How is pigment transferred from one kind of cell to another in that organ? 1+1+1 = 3

c) What are chromatophores? Why is RBC not classified as chromatophores in spite of having red coloration? Why does chameleon change its colour immediately but crustaceans cannot? 1+1+1 = 3

d) What is light pollution? Explain the main categories of it. 1+2 = 3

17. Explain why (any three): **2×3=6**

a) Neonatal jaundice can be physiological or pathological.

b) Deletion of PINOID kinase leads to asymmetric elongation of cells in the stem.

c) Exposure to phototherapy lamps is not always healthy.

d) Visible light can be considered as pollutant.

18. Describe the following (any three): **2×3=6**

a) Skin pigmentation as protective response of skin from UVB of sunlight

b) Involvement of autonomic nervous system in the circadian rhythm of the heart rate

c) An experiment showing involvement of chemical signal in phototropism

d) Mechanism of squid coloration using chromatophores