



ST JOSEPH'S UNIVERSITY, BENGALURU -27
M.Sc. Biotechnology- I SEMESTER
SEMESTER EXAMINATION: OCTOBER 2023
(Examination conducted in November/December 2023)
BT 7222: GENERAL PHYSIOLOGY
(For current batch students only)

Registration Number:

Date & session:

Time: 2 hours

Max Marks: 50

This paper contains TWO printed pages and THREE parts

PART A

Answer any SEVEN of the following:

2m x 7 = 14 marks

1. How were protocells able to function without ATP?
2. Under which circumstances might genetic drift be harmful for the species?
3. Sexual selection does not operate on dimorphic species. Comment.
4. Name two external signals that can trigger signal transduction.
5. Why do some bacteria sporulate?
6. How does abscisic acid affect (i) flowering and (ii) stress responses?
7. With respect to food security, why is it important to understand flower development and transition to flowering in plants?
8. What processes are involved in forming tissues from cells?
9. Define Osmotic Adjustment in plants.

PART B

Answer any FOUR of the following:

5m x 4 = 20 marks

10. The bicoid gradient is an hallmark of *Drosophila* development. How does it set the stage for segmentation of the embryo into distinct functional units? A mutant fly shows a delay in translation of the bicoid mRNA. How will this influence its development pattern?
11. Briefly describe how the resting membrane potential and action potential are generated. Will an anti-depressant influence these processes? Justify.
12. Two single cell yeasts, Gullu and Muji, have evolved independently. Gullu and Muji reproduce exclusively by asexual and sexual means, respectively. Describe the advantages and disadvantages of both. How will they fare if a) there was a shortage of nutrition in the system b) there was a predator species in the mix?
13. Chemotaxis in a bacterium is dictated by the chemistry of its immediate surroundings. Imagine an *E. coli* has swum up the concentration gradient of an attractant and homed in on the highest concentration of said attractant. What prevents it from leaving this region and what will happen if it does?
14. 'Transcription factors are the major regulators of floral morphogenesis.' Justify this statement using the ABC model.

PART C

Answer any TWO of the following:

8m x 2 = 16 marks

15. One ml of bacteria displaying bioluminescence were added to a 10 liter fermenter containing very low density of the same bacteria. After allowing the system to reach equilibrium for 30 minutes, what will be the state of the Lux operon in the bacteria present in the fermenter? Explain with an illustration. Now imagine the bacteria added to the fermenter were of a different species. How will it distinguish self vs non-self? (5+3)
16. Describe in detail the process of cell division in *E. coli*. How does it prevent premature cell division? Explain the phenotypes of a) MinC/D deletion, b) FtsZ deletion and c) in the presence of ampicillin. (3+2+3)
17. The human eye is imperfect, suggest one change you will make with reasoning. Illustrate the signaling in the rod cell when the eyelids are shut. This phase is often called the regeneration phase. What will happen to the retina that is unable to perform this function? (2+4+2)