**ST JOSEPH’S UNIVERSITY, BENGALURU -27**

**M.Sc. BIOTECHNOLOGY – I SEMESTER**

**SEMESTER EXAMINATION: OCTOBER 2022**

**(Examination conducted in December 2022)**

**BT7222 – GENERAL PHYSIOLOGY**

**Time: 2 Hours Max Marks: 50**

**This paper contains TWO printed pages and THREE parts**

**PART-A**

***Answer any seven questions* (2 marks X 7)**

1. Why is the process of ‘double fertilization’ called so? Imagine there is a mutant plant which produces seeds lacking endosperm. Which process do you think would not be happening in this plant?
2. State two conditions under which genetic drift can occur.
3. In which situations would the body prefer to use the endocrine system over the nervous system?
4. Draw a simple schematic diagram to represent abscisic acid signaling in response to abiotic stresses in plants.
5. What is symmetry breaking and why is it important for development?
6. Which was the single most important property that allowed protocells to evolve quickly? Explain.
7. State the Oparin-Haldane hypothesis and why was it remarkable for its time?
8. State four conditions that can upset the Hardy-Weinberg equilibrium.
9. What receptors are used in the human tongue to generate taste? What are their ligands?

**PART-B**

***Answer any four questions* (5 marks X 4)**

1. If 9% of an African population is born with a severe form of sickle-cell anemia (ss), what percentage of the population will be more resistant to malaria because they are heterozygous (Ss) for the sickle-cell gene? Is the African population in Hardy-Weinberg equilibrium given that region has endemic malaria?
2. How can a *Synechocystis* bacterium“see”? What might happen to a colony of these bacteria if some of them fail to detect light?
3. Sea gulls do not show sexual dimorphism nor do they show paternal care. Are they more likely to undergo natural selection or sexual selection? Justify.
4. You have discovered a new gene in Drosophila that you suspect is a hox gene. How would you confirm your findings? What might be its upstream cascade?
5. Mechanotransduction is critical for our ability to hear. How is it so fast and sensitive? Explain. Why is it disturbed when man travels to outer space?
6. Briefly explain the ABC model of flower development. How does abscisic acid affect flowering? Mention the important transcription factor involved in this effect. Based on this effect, how could abiotic stress influence flowering?

**PART-C**

***Answer the following questions* (8 marks X 2)**

1. Draw the structure of a typical steroid receptor and its downstream signaling cascade. How can this signaling be terminated a) in normal conditions b) during cancer therapy.

**OR**

Speciation is the creation of new species over time and was studied in detail by Darwin. Using any example, demonstrate how this might happen. The reverse is also true, whereby certain species die out. What are the genetic and evolutionary reasons for this?

1. Describe how you would test if an autoinducer is detected by a membrane bound receptor or a cytoplasmic receptor. In general terms, how would you use your understanding of quorum sensing to help prevent the virulence of pathogenic bacteria?

**OR**

Generating asymmetry within a micron-scaled cell poses a significant challenge. How has *Caulobactor* managed to achieve this successfully for its reproduction? What use is this asymmetry to the bacterium?