09.20.2019/14:00-16:00/BSBE/Elective

Indian Institute of Technology Guwahati
BT 615 Cell Signaling and Development
Mid-Semester Examination

Total Marks: 45 **Time: 2 hours**

Q1. Two typical cells A and B are located very far away from each other and connected together via a specific signaling type. What is the name of this type of signaling? Elaborate with a figure. **1 + 2 = 3 Marks**

Q2. .....signaling controls nerve cell product in the fruit fly Drosophila (fill up the blank). **1 Mark**

Q3. The signals A, B, and C are required for survival, D and E are required for division, whereas F and G are required for differentiation of a test cell X. In order to induce apoptosis in this cell, which signals are most likely to be withdrawn out these seven (A to G) signals? **2 marks**

Q4. A.....protein is essential for receiving the extracellular signal on the plasma membrane (fill in the blank). **1 Mark**

Q5. How will you demonstrate that proteins X and Y act, respectively, upstream and downstream of Ras signaling (show with labelled figures)? **2 + 2 = 4 Marks**

Q6. Write the equation relating the force (F), a pair of charge (q_1 and q_2) separated in a water environment by a distance (r). What is the consequence of high dielectric constant of water? **$1^1/_2$ + $1^1/_2$ = 3 Marks**

Q7. The components of a signaling pathway are given below. Arrange them in the correct order of flow of the signal transduction pathway.

(i) Small or heterodimer, (ii) input, (iii) MAPK, (iv) MAPK2K, (v) MAPK3K, (vi) MAPK4K, (vii) major targets, (viii) protein kinase, (ix) transcription factor, (x) output. **3 Marks**

Q8. What are the target transcription factors of calcineurin in fungi and mammals? Show (using a labelled figure) how to block the calcineurin pathway using two distinct immunosuppressive drugs. **1 + 1 + 1 = 3 Marks**

Q9. How Ca^{2+} homeostasis is maintained in a cell (describe using a labelled figure)? Describe any one technique used to measure intracellular Ca^{2+}. What is RyR and how is it related to sudden cardiac death? **3 + 2 + 2 = 7 Marks**

Q10. Write the names of the PKC domains that bind to DAG and Ca^{2+}. Why PKC could be a therapeutic target for the treatment of addiction and neurodegenerative disorders? **2 + 3 = 5 Marks**

Q11. Describe BioID and activity-based protein profiling used for studying phosphatases. **2 + 2 = 4 Marks**

Q12. How does CK1 regulate Wnt signaling? **3 Marks**

Q13. Imatinib blocks the action of the .....in patients with .....(fill in the blanks). **2 Marks**

Q14. Write your understanding about the mechanism of the left-right asymmetry. **4 Marks**

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