M. Sc. Bio-Technology Part I Examination, 2019

Cell Biology

MSBT-1/2

Time : Four hours | Full Marks : 100

PART - I

Answer ***Question 1 and three*** from the rest

1. Answer ***any twelve*** from the following : 2×12

   i) In which phase of the cell cycle the activity of elF2 is likely to be highest ?

   ii) The checkpoint at the end of which phase is considered the most important aspect of cell cycle regulation, as any potential problem with it can lead to cancer ?

   iii) Name the regulatory subunit of maturation-promoting factor.

   iv) Caspases belong to which class of protease ?

   v) What molecule, when bound to-G-actin, promotes polymerization ?

   vi) What is the effect of adding Taxol to MT (microtubules) ?

   vii) Which molecule has an antagonistic action to adenylate cyclase ?

viii) Which G-protein takes part in the regulation of vision ?

ix) Why inhaling nitric oxide reduces blood pressure only in the lung tissue and not elsewhere in the body ?

x) Why there is no end replication problem for bactria ?

xi) Cytochalasin D inhibits the formation of microfilments. Which biological activites will be hindered ?

xii) The cholera toxin does not allow GTP to be hydrolyzed to GDP. What effects would you expect to see in the cell?

xiii) A cell that contains a mutation in Ras that decreases its abillity to hydrolyze GTP (without affecting its abillity to bind GTP), Which Kinase activity will increase ?

xiv) Which property of p53 enables it to prevent the development of cancer ?

xv) Name the protein which binds to E2F transcription factor and prevents cell from entering s phase untill a mitogenic signal is received.

xvi) Why the cells taken from a body and grown in a nutritional and protected culture will stop dividing after some generaton ?

PART - III

11. What is Kranz anatomy ? Discuss briefly the chlorplast dimorphism in C_4 plants. What is a proplastid ? Discuss briefly the red drop effect and Emerson effect. How chemiosmotic theory explains photophosphorylation ?

3+3+2+6+6

OR

12. Draw the Z scheme of electron transport in photosynthesis. How concentrations of orthophosphate and triose phosphate regulate starch systhesis in chloroplast ? Name three enzymes of Calvin cycle which are light-depedent. What is avtivator CO_2 molecule ? 6+(4+4)+3+3

6. a) Why RasD (mutant version of Ras) can transform 3T3 cell but not other cells ? Give some examples where Ras and myc cooperated in the transformation process of normal cell to cancer cells. 3+4

   b) How loss of TGF β signaling contributes to abnormal cell proliferation and malignancy ? 5

PART - II

Answer any ***Two*** Questions, each containing 10 marks, Total 20

7. i) Why an aquaporin does not allow ions (Like Na^+) to pass through ? (3)

   ii) "Alchohol inpairs aquaporin from being incorporated in the collecting duct membrane of nephron", What is the outcome and why ? (3)

   iii) What is a proton pump ? How does the use of proton pump can be beneficial for the treatment of heartburn ? 2+2=4

8. i) What makes simple diffusion different from facilitated diffusion? (2)

   ii) What do you measure by "Patch clamp" technique ? How will you measure the effects of extracellular substances on current flow through ion channels ? 2+3=5)

   iii) "Cystic Fibrosis (CF) is an autosomal recessive genetic disease mostly in Caucasinas." Which gene is mutated in CF ? Explain the mechanism of disease pathophysiology in CF patients. 1+2=3

9. i) What is endomembrane system ? Write any two signaling events that get activated upon induction of ER stress. (1+4)=5

ii) "Mitochondrial fission and fusion network is tightly regulated for cell viability"—Justify the statement. (2)

iii) PKKKRKV is a conserved nuclear localization signal. "How will you experimentally prove ? (3)

10. Write short notes ***(any four)*** 2.5×4

i) Neclear import of cargo molecules

ii) COP-II mediated vesicular trafficking

iii) Inport of proteins into mitochondrial matrix

iv) O-linked glycosylation

v) Ribosomal DNA (rDNA)

vi) I-cell diseases

xvii) Which structures are linked with the cytoskeleton of a cell that can generate movements such as in cytokinesis, or propulsive forces outside the cell like flagella.

2. a) What is cell cycle check point ? What does it ensure ? 3+3=6

b) Describe how cell cycle is regulated by cyclins and Cdks. 4

c) What are the importances of cell cycle regulation. 2

3. a) What are the different second messengers which are generated by the modification of common phospholipids ? Describe the pathway. 2+5

b) Insulin receptor is a tyrosine kinase receptor, describe how it can be activated by ras dependent and independent ways ? 5

4. a) Describe different ways by which executioner caspases are activated ? Why expression of c-FLIP prevent apoptpsis ? 3+3

b) Describe the role of MOMP in apoptosis. 6

5. a) Tubuline are basic unit of Microtubules, Descrive how microtubles are assembled from tubulin ? 5

b) Describe the mechanism of skeletal muscle movement. 7