

[6]

- b) What are the similarities and dissimilarities between O-linked and N-linked glycosylation ? 3
- c) What is endomembrane system ? Write any two signaling events that get activated upon induction of ER stress. 3

Part-II

11. a) What are the major functions of Ethylene hormone in plant growth and development ? 4
- b) Define Haploids and Doubled Haploids. Discuss the importance of Double Haploids and Somatic Hybrids in crop improvement. What is an Artificial seed ? 8+(2+4+2)

Or

- a) What is the significance of photorespiration ? Differentiate between dark respiration and photorespiration. Name the cell organelles of plants involved in photorespiration.
- b) What are the major effects of ABA hormone in plant growth and development ?
- c) What is Somatic Embryogenesis ? (2+5+2)+5+2

Ex/MSBT/1/2/53/2018

M. Sc. BIO-TECHNOLOGY PART I EXAMINATION, 2018

CELL BIOLOGY

MSBT-1/2

Time : Four hours

Full Marks : 100

GROUP - A

Answer **Question1 and three** from the rest

1. Answer any six questions : 6×1
- a) During which stage of mitosis do the centromeres split ?
- b) In what way does the ras oncogene contribute to cancers ?
- c) What happens when ATP binds to the head of myosin II.
- d) Which modification causes nuclear lamina to disassemble and nuclear envelope to rupture during mitotic entry.
- e) What happens when a mutation in the Gs α subunit that inhibits nucleotide exchange.
- f) How will cell cycle progression be affected when a cell is treated with a small molecule inhibitor that binds to kinetochores and specifically blocks their ability to interact with microtubules ?
- g) Name the special situation when Bax gene is activated by p53.

[Turn over

- h) “Telomeres become shorter as cells age” What will be consequence of the cells.
- i) What is the significance of appearance of phosphatidyl serine in apoptotic cells ?
- a) Mention the functions of MPF in metaphase. How Cdc 25 and Wee 1 regulate its activity ?

2. a) Compare the characteristic differences and similarities between GPCR and Ras.
- b) Describe the mechanism by which phosphatidylinositol generates several second messengers. Also mention the function of akt.
- c) How insulin and glucagon work together to maintain blood glucose level ?
 $3+5+3+3$

4. a) Discuss the mitochondria mediated apoptosis pathway mentioning the role of caspases. How receptor mediated pathway cross talk with this pathway ?
- b) How TNF receptor family induces apoptosis ?

- c) What are the different components involved in the formation of clathrin-coated vesicles ?
 3
- a) How will a type II single pass transmembrane protein be incorporated within the membrane bi-layer ?
 3

- b) Phospholipid bilayer in only slightly permeable to small polar molecules like water and yet placing an animal cell in hypotonic solution leads to swelling of it. But surprisingly, frog oocytes and eggs are protected from osmotic lysis if placed in hypotonic solution. Explain this phenomenon with proper justification.
 3

- c) “A nuclear localization sequence (NLS) is often a short stretch of basic amino acids”. What would be the consequences, if basic amino acids are replaced with hydroxyl ion-containing amino acids ? Experimentally demonstrate the fate of such incidence in an in vitro-culture system ?
 $2+2=4$

10. a) What are the factors that can alter lysosomal membrane permeabilization (LMP) in a cell ? You have identified a putative gene “LYSO” which might induce LMP. How will you experimentally prove that LYSO is necessary and sufficient to induce LMP ?
 $1+3=4$

[4]

driven by red light. Schematically compare the photosynthetic reaction centers of purple photosynthetic bacteria and chloroplasts of higher plants. Name one herbicide which blocks electron transfer of photosynthetic light reaction. How blue-light controls stomatal movement ? 2+2+5+1+6

or

Distinguish between C₄ and CAM pathways. Name different enzymes of the Calvin cycle which are light-dependent. How different enzymes of Calvin cycle are regulated by ferredoxin-thioredoxin system ? Briefly discuss different biotechnological methods by which photosynthetic yield can be increased. 3+4+5+4

GROUP - C

Answer **any two** questions (each carries 10 marks)
from **Part-I** and **one** from **Part -II**

Part-I

8. a) How would you experimentally prove that ATP hydrolysis is required to keep the protein in an unfolded state for the incorporation of the protein into mitochondria? 4
- b) How does glutathione molecule is able to predict the oxidative status of a cell ? 3

[3]

- c) How Telomerase maintain Telomere length ? 4+3+4+3
5. a) Describe the dynamic instability of microtubules inside the cells. What is mTOC ?
- b) Mention the factors which regulate the microfilament assembly ? Why new branches of microfilament always comes out from young filament.
- c) Cofilin preferentially binds to the older parts of actin filaments and promotes their disassembly. How does cofilin distinguish between old and new parts of actin filaments ? What is the function of profilin ?
(3+2)+(3+2)+(1+3)
6. a) Describe the role of myc oncogene in the development of several types of tumor.
- b) What is the significance of stem cells in the development of Cancer ?
- c) Why is a loss-of-function in PTEN cancer promoting ? Predict the effect of constitutively active PTEN on cell growth and survival. 5+4+(3+2)

GROUP - B

7. What is the quantum yield of photosynthesis ? Name one metabolic and one signaling process of plants which are
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