

DEPARTMENT OF BIOTECHNOLOGY
M.Sc. SEMESTER I ONLINE EXAMINATION, 2021
Paper Title : Cellular Biology and Biomolecules
Paper Code - MBT-OE101

Time : Three Hours

Maximum Marks : 75

Attempt all questions. All parts of a question must be attempted in continuation. Start answer of a fresh question on a new page. Cite examples and draw labeled diagrams.

Question No. 1:

[09 x 1 = 09]

A. Choose the correct option for the following questions:

1. The degradation of glycogen into glucose 6-phosphate is facilitated by glucagon and epinephrine:
 - a) Directly by binding to glycogen phosphorylase
 - b) Indirectly by activating adenyl cyclase to generate cAMP
 - c) In the liver only
 - d) In muscle cells
2. Which one of the following enzymes is involved in the positive regulation of glycolysis/gluconeogenesis?
 - a) Hexokinase II
 - b) PFK-2/FBPase
 - c) Hexokinase IV
 - d) Pyruvate kinase
3. The enzymes of urea cycle are located in:
 - a) Cytosol
 - b) Both a and b
 - c) Mitochondria
 - d) None of the above
4. Phi and psi angles or torsion angles helps in determining which of the following protein structure?
 - a) Secondary
 - b) Quaternary
 - c) Tertiary
 - d) Primary
5. 80S ribosomes occur in :
 - a) Eukaryotic cells of animals
 - b) Eukaryotic cells of animals and plants
 - c) Both Eukaryotic and Prokaryotic cells
 - d) None of these.
6. The enzymes of the urea cycle are located in:
 - a) Cytoplasm
 - b) Mitochondria
 - c) Both (a) & (b)
 - d) Lysosomes

7. Which one of the following genes is involved in the conversion of proto-oncogenes into oncogenes causing cancer:

- a) Metastasis genes
- b) Transposons
- c) Angiogenesis genes
- d) Tumour suppressor genes

8. Hydrolysis of an oil leads to production of three fatty acids and:

- a) A long-chain alcohol
- b) Phosphoric acid
- c) Glycerol
- d) An amino alcohol

9. Which enzyme classification group is an example of phosphoglucomutase?

- a) Ligase
- b) Lyase
- c) Isomerase
- d) Both a) and b)

[6 x 1 = 6]

B. Expand the following:

- i. CRE
- ii. CREB
- iii. PIP₂

- iv. PLC
- v. TNF
- vi. STAT

Question No. 2:

Attempt ANY THREE of the following:

[3 x 5 = 15]

- A. Differentiate between Chloroplast and Mitochondria.
- B. How maturation promoting factor regulates cell cycle?
- C. What do you mean by G protein-coupled receptors? How photoreception is linked with G protein receptors?
- D. How Quorum sensing control virulence factors in any gram-positive bacteria?
- E. Justify- Regulation of glycogen metabolism by Protein kinase A.

Question No. 3:

Attempt ANY THREE of the following:

[3 x 5 = 15]

- A. What are the important features of a biomolecule? Draw the structure of Sucrose. How does it differ from a reducing sugar?
- B. Explain the transfer of electrons from NADH to ubiquinone in complex I? Which prosthetic groups are attached with Complex II?
- C. What is oxidative phosphorylation? Briefly explain the binding change mechanism for ATP synthesis?
- D. What are the various steps of beta oxidation of fatty acids? How is it different from alpha oxidation?
- E. Briefly discuss the regulation of glycolysis by PFK. Write any one reaction of oxidative decarboxylation reactions of TCA cycle.

Question No. 4:

Attempt ANY THREE of the following:

[3 x 5=15]

- A. Differentiate between hydrophobic, non-polar amino acids and polar and charged amino acids. Give examples.
- B. What are the various types of interactions present in a protein structure? Explain the structure of an alpha helix and its bonding pattern.
- C. Briefly discuss the DnaJ and DnaK mechanism of chaperone assisted folding.
- D. Differentiate a hydropathy plot from Ramachandran Plot.
- E. What is the need of breaking the protein into fragments in protein sequencing? Where do the enzymes chymotrypsin, trypsin and carboxypeptidase act on a polypeptide chain? Differentiate between N- and C terminal analysis?

Question No. 5:

Attempt ANY THREE of the following:

[3 x 5=15]

- A. What are the important features of vitamins? Briefly discuss the role of coenzymes PLP and CoA as coenzymes.
- B. Differentiate between reversible and irreversible inhibitors. Explain the Lineweaver burk and Michaelis Menten plot for competitive and non competitive inhibition.
- C. Discuss the principle and application of the following:
 - (i) Salt fractionation
 - (ii) Affinity chromatography
- D. What is a Michaelis Menten Plot? Give the significance of K_m .
- E. Define activation energy? Explain how an enzyme helps in catalysis of a reaction?

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PLEASE NOTE

- You will be provided one hour additional time after exam for scanning and making PDF copy of the answer sheets.
- Email your PDF to biotechnologyexam2020@gmail.com
- Emails received after 2 PM will not be accepted for evaluation.