

**B.Sc.-M.Sc. INTEGRATED PROGRAMME (TOXICOLOGY)
SEMESTER III, ONLINE EXAMINATION 2020
PAPER CODE – BTX-CC08TH**

PAPER TITLE: MOLECULAR & BIOCHEMICAL BASIC OF TOXICOLOGY

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 wherever necessary

Question No. 1:

Choose the correct answer :

[15 x 1= 15]

- i. Which one of the following is devoid of nucleus
 - a. Egg
 - b. Amoeba
 - c. E. coli
 - d. Plasmodium
- ii. Which one of the following protein senses oxidative stress
 - a. KEAP1
 - b. NRF2
 - c. AHR
 - d. Prolyl hydroxylase
- iii. Which one of the following is not part of the endomembrane system
 - a. Nucleus
 - b. Endo plasmic reticulum
 - c. Lysosomes
 - d. Mitochondria
- iv. Following interactions are major driving force behind the formation of protein tertiary structures and membrane bilayer structure
 - a. Covalent interactions
 - b. Ionic interactions
 - c. Hydrophobic interactions
 - d. Hydrophilic interactions
- v. Which one of the following organelle has enzymes for steroid biosynthesis
 - a. Smooth ER
 - b. Rough ER
 - c. Golgi complex
 - d. Lysosomes
- vi. Which one of the following is true about genome size
 - a. Human > Fruit fly > Yeast > E. coli
 - b. Human > Fruit fly > Yeast < E. coli
 - c. Human < Fruit fly < Yeast < E. coli
 - d. Human > Fruit fly < Yeast < E. coli

Question No. 2:

Attempt any THREE of the following:

[03 x 5= 15]

- A. What is alpha helix ? which form of alpha helix is more stable. Describe the helical parameters.
- B. Classify the amino acids into different classes (at least 3) based on physicochemical properties. Provide an example for each classification. Briefly describe the side chain functional group with amino acid property (D't have to draw the structures).
- C. What is positive co-operativity and negative co-operativity. What is T state and R state of Hb. Explain the mechanism of CO toxicity.
- D. Draw the Ramachandran plot and Indicate allowed ϕ and ψ combinations for right handed alpha helix, left handed alpha helix and beta-sheet. The entire path of the peptide backbone is known if all ϕ and ψ angles are specified. Explain why only two dihedral angles (around C-alpha) are possible in proteins. Explain why some ϕ and ψ combinations are very unfavourable and others are favourable.

Question No. 3:

Attempt any THREE of the following:

[03 x 5= 15]

- A. What is membrane fluidity? explain the mechanism of how various membrane components affect the membrane fluidity.
- B. Name at least 4 different types of phospholipids. Write the structure of any phospholipid and indicate the hydrophilic and hydrophobic regions.
- C. Describe how primary active transporters and secondary active transporters are coupled to transport the glucose from intestinal lumen to the blood. What is driving and driven molecule in secondary active transport, provide an example for each.
- D. What is tautomerism? Draw the backbone of pyrimidine structure and number the atoms in ring. Draw the structure of Lactam and lactim form of 2,4 dioxo 5 methyl pyrimidine (T). Indicate the hydrogen bonding donors and acceptors in both forms. What is the individual number of hydrogen bonds for both the forms. Indicate the possible hydrogen bonding partners for both Lactam and lactim forms.

Question No. 4:

Attempt any THREE of the following:

[03 x 5= 15]

- A. What is gene and pseudogene? Describe mechanisms of generating unprocessed pseudogene
- B. What is an operon?. Draw the *LAC* operon structure with annotation of different functional elements in DNA and regulatory proteins that regulate transcription. In which condition the operon is highly transcribed and lowly transcribed?

- vii. Which one of the following is not true about gene
- Genes codes for a protein
 - Gene can be non-coding
 - Gene determines phenotype
 - Gene can be devoid of promoter
- viii. Identify the gene sequence in DNA strand (5'-AGTGTATGGTGATTTAATGT3). What is the length of protein sequence ?. (2 points)
- 3
 - 6
 - 5
 - 4
- ix. The bases in promoter sequences are numbered in relation to
- Transcription stop site
 - Transcription start site
 - Translation start site
 - Translation stop site
- x. What is the expected ratio of transitions to transversions
- 1:2
 - 1:1
 - 2:1
 - 1:3
- xi. Which one of the following conditions favour high transcription of LAC operon
- High cAMP and low Allolactose
 - Low cAMP and high Allolactose
 - High cAMP and high Allolactose
 - Low cAMP and low Allolactose
- xii. Which one of the following statement is not true about SNP
- SNP is found only in coding regions
 - SNP can be located in Intron
 - SNP can be located in non-coding regions
 - SNP can be located in any where in the genome
- xiii. Which one of the following is not true about transcription factor
- catalyses RNA synthesis
 - Regulates rate of transcription
 - Transports RNA polymerase
 - It is a protein
- xiv. Which one of the of the following is common for structural polysaccharides
- Inter chain covalent bonds
 - Inter chain Ionic bonds
 - Inter chain hydrogen bonds
 - Inter chain hydrophobic interactions
- xv. Which one of the following molecule is a morphogen
- Melanin
 - Retinoic acid
 - Vitamin E
 - Vitamin A

- C. Draw the general structure of eukaryote gene organisation and indicate the different regulatory elements.
- D. What is neofunctionalization? Which mutations favour neofunctionalization and why. Mention at least 2 different functions of Cyt-450 family of genes.

Question No. 5:

Attempt any THREE of the following:

[03 x 5= 15]

- A. What is an internal receptor? classify the internal receptors. Mention the various steps involved (from source of ligand to final target cell response) in testosterone signalling
- B. Cancer cells show chemoresistance due to the aryl hydrocarbon receptor mediated signalling. Briefly mention the steps involved in chemoresistance.
- C. Explain the steps involved in cell surface receptor signalling. Explain how the signal can be amplified at various stages of cell surface receptor signalling. You may take adrenaline / glucagon signalling as an example.
- D. What is Toxicogenetics? explain the precision medicine in toxicologists prospective. What is single nucleotide polymorphism? mention an application for SNP studies.

It should be noted that 40 minutes extra time will be provided to scan your answer sheets, build a PDF and uploaded it.

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