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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

**B.Tech**

SEM: III - THEORY EXAMINATION (2022 - 2023)

Subject: Biophysics

Time: 3 Hours

Max. Marks: 100

**General Instructions:**

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of three Sections -A, B, & C. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.
2. Maximum marks for each question are indicated on right -hand side of each question.
3. Illustrate your answers with neat sketches wherever necessary.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.
6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

**SECTION A**

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1. Attempt all parts:-

- |      |  |   |
|------|--|---|
| 1-a. | Free fatty acids enter cell by (CO1)   | 1 |
|      | (a) passive diffusion  |   |
|      | (b) primary active transport   |   |
|      | (c) cannot enter into the cell   |   |
|      | (d) secondary active transport   |   |
| 1-b. | When an ion or solute is moved against a concentration gradient using energy the process is called (CO1)                   | 1 |
|      | (a) diffusion  |   |
|      | (b) transport  |   |
|      | (c) active transport   |   |
|      | (d) regulated diffusion  |   |
| 1-c. | During depolarization the sodium channels move sodium ions _____ the cell and cause the membrane potential to _____. (CO2) | 1 |
|      | (a) into . . . increase  |   |

- (b) out of . . . decrease
- (c) into . . . decrease
- (d) out of . . . increase
- 1-d. Which of the following reasons best explains the "hyperpolarization" phenomenon during an action potential? (CO2) 1
- (a) Potassium channels close quickly, not allowing enough potassium out of the cell
- (b) Sodium channels close slowly, thus allowing too much sodium into the cell
- (c) Sodium channels close quickly, not allowing enough sodium into the cell
- (d) Potassium channels close slowly, thus allowing too much potassium out of the cell
- 1-e. Which of the following causes dissociation of the ligand from the G-protein coupled receptor? (CO3) 1
- (a) Release of cyclic AMP
- (b) Hydrolysis of GTP to GDP
- (c) Phosphorylation by tyrosine kinase
- (d) Docking of intracellular signaling proteins
- 1-f. Rhodopsin is a pigment found in: (CO3) 1
- (a) Retinal cells
- (b) Cornea
- (c) Sclerotic
- (d) Choroid
- 1-g. Which of the following elements is not found in any of the standard twenty amino acids? (CO4) 1
- (a) Phosphorous
- (b) Oxygen
- (c) Carbon
- (d) Nitrogen
- 1-h. Two amino acids of the standard 20 contain sulfur atoms. They are: (CO4) 1
- (a) . cysteine and serine
- (b) cysteine and threonine
- (c) methionine and cysteine
- (d) methionine and serine
- 1-i. Which two proteins are the major components of myofibrils, allowing for muscle fiber 1

contraction? (CO5)

- (a) Myosin and cartilage
- (b) Actin and myosin
- (c) Lamellae and actin
- (d) Myofibril and myosin

1-j. Which of the following is true about the organization of actin filaments and myosin in sarcomeres? (CO5) 1

- (a) Myosin filaments appear thinner than actin filaments
- (b) Prior to contraction, there is no overlap between actin and myosin
- (c) The degree of overlap of actin and myosin affects the overall contractile strength
- (d) All of the above

2. Attempt all parts:-

- 2.a. Why cell is called an osmotic system? (CO1) 2
- 2.b. What is the role of P wave and QRS complex in ECG? (CO2) 2
- 2.c. Write the name of any two disease that is caused due to mutations in rhodopsin? (CO3) 2
- 2.d. What do you understand by isoelectric pH of protein? (CO4) 2
- 2.e. What are the basic parts of flagella? (CO5) 2

## SECTION B

30

3. Answer any five of the following:-

- 3-a. Discuss the process of hydrogenation? Explain the differences between saturated and unsaturated fatty acids. Why are unsaturated fats considered healthier? (CO1) 6
- 3-b. Define nucleotides and draw the structure of a nucleotide along with numbering and components. Also explain the three types of RNAs and name nitrogen containing bases present in nucleic acids. (CO1) 6
- 3-c. Why neurons are called excitable cells? Differentiate between excitable and non excitable cells? (CO2) 6
- 3-d. What is membrane depolarization? Why do neurons use both chemical and electrical signals to communicate? (CO2) 6
- 3.e. What is an ATPase pump? Why it is important? (CO3) 6
- 3.f. With the help of suitable example, discuss about the tertiary and quaternary structure of protein (CO4) 6
- 3.g. Describe the concept of cell mechanobiology? (CO5) 6

4. Answer any one of the following:-

4-a. Explain, how the plasma membrane is selectively permeable, and tell how that is related to the movement of materials across the membrane? (CO1) 10

4-b. Discuss glycosidic linkage in detail? How maltose and sucrose be synthesized? (CO1) 10

5. Answer any one of the following:-

5-a. What is ionic hypothesis? How does the movement of ions create electrical charge? What does the Goldman equation calculate? (CO2) 10

5-b. What is conduction disorder? What causes electrical issues in the heart? What is an electrical problem in the heart? (CO2) 10

6. Answer any one of the following:-

6-a. Briefly explain the importance of cell signalling? What are the different types of cell signalling found in multicellular organisms? (CO3) 10

6-b. Discuss in detail about the glucose transporter? Explain its different types? (CO3) 10

7. Answer any one of the following:-

7-a. Explain in detail about Ramachandran plot? Why Glycine and proline has no preferred Ramachandran plot? (CO4) 10

7-b. Discuss in detail about protein folding. Also explain why it is important? (CO4) 10

8. Answer any one of the following:-

8-a. Discuss in detail about molecular motors? Give some examples? What are the importance of molecular motors? (CO5) 10

8-b. What are the different components of sarcomere? Write down all the steps involved in muscle contraction? (CO5) 10