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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

April 2024 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Mechanical Engineering **Duration: 1.5 hr.**
Course Code: 23ME3BSBFE **Max Marks: 50**
Course: Biology for Engineers

Instructions: 1. Answer all the questions in Part A. Answer any three questions from Part B.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

	PART A (Answer all Questions. Write the appropriate option and the complete answer)	*CO*	*PO*	Marks
1	In the hierarchical organization of the human body, which is the correct order: a) ATOMS--MOLECULES--ORGANELLES--CELLS--TISSUES--ORGANS--ORGAN SYSTEMS--A HUMAN b) ATOMS-MOLECULES-CELLS - ORGANELLES - TISSUES - ORGANS -ORGAN SYSTEMS --A HUMAN c) ATOMS -- MOLECULES -- ORGANELLES -- TISSUES -- ORGANS -- ORGAN SYSTEMS -- A HUMAN d) ATOMS -- MOLECULES -- ORGANELLES -- CELLS -- TISSUES -- ORGAN -- A HUMAN	*CO1*	*PO1*	**01**
2	The study of the structure of the body is: a) physiology. b) anatomy. c) pathophysiology. d) homeostasis.	*CO1*	*PO1*	**01**
3	Ionic bonds are formed when: a) one atom transfers an electron from its outer shell to another atom b) two atoms share one or more pairs of electrons. c) two anions meet. d) two elements are dissolved in water	*CO1*	*PO1*	**01**
4	The body stores glucose in the form of: a) starch. b) galactose. c) cellulose. d) glycogen.	*CO1*	*PO1*	**01**

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	5	Which statement correctly describes the sodium (Na)-potassium (K) pump? a) Energy is produced as the cell actively pumps Na out of the cell and K into the cell. b) The pump uses energy in the form of ATP to pump Na into the cell and K out of the cell so as to equalize the concentration of these two ions. c) The pump uses energy in the form of ATP to transfer Na from inside the cell (where concentrations of Na are low) to outside the cell (where concentration of Na are high) and to transfer K from outside the cell (where concentrations of K are low) to inside the cell (where concentrations of K are high). d) The pump uses energy in the form of ATP to transfer Na from inside the cell (where concentrations of Na are high) to outside the cell (where concentration of Na are low) and to transfer K from outside the cell (where concentrations of K are high) to inside the cell (where concentrations of K are low).	*CO1*	*PO1*	**01**
	6	Which of the following correctly describes diffusion? a) It is a form of passive transport in which water moves from an area of higher to lower concentration. b) It is a form of active transport in which particles move from an area of higher to lower concentration. c) It is a form of passive transport in which particles move from an area of higher to lower concentration. d) It is a form of passive transport in which particles pass through channels on the cell membrane to move from an area of higher to lower concentration.	*CO1*	*PO1*	**01**
	7	The following is not a part of Long Bone: a) Diaphysis b) Keratin, c) Epiphysis d) Medullary cavity	*CO1*	*PO1*	**01**
	8	The following are the Osseous tissue: a) Osteoblasts, Osteoclasts, Osteocytes b) muscle fiber, myofibril, myofilament. c) Thermoplastic, thermoset and resin d) None of the choices are correct	*CO1*	*PO1*	**01**
	9	What effect does physical stress have on bone? a) It stimulates osteoblasts to break down the bone b) It stimulates bone marrow to increase production of red blood cells c) It impairs longitudinal growth d) It stimulates osteocytes to create new bone	*CO1*	*PO1*	**01**

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	10	Identify where Biology could be relevant for Engineers. a) Musculoskeletal Mechanics b) Organ-on-a-chip c) Orthopedic Biomechanics d) All of the options	*CO1*	*PO1*	**01**
	11	Which statement correctly describes what occurs when a skeletal muscle contracts? a) Myosin and actin myofilaments form cross bridges, and the actin pulls the myosin myofilament toward the center of the sarcomere. b) The myosin and actin myofilaments shorten, pulling the Z-discs closer. c) After forming cross bridges with the actin myofilament, the myosin myofilament propels the actin myofilament toward the center of the sarcomere. d) The sarcomere shortens, pulling the actin and myosin myofilaments toward the center, which pulls the Z-discs closer together.	*CO1*	*PO1*	**01**
	12	Sliding filament model explains: a) Muscle contraction b) Muscle formation c) Muscle regeneration d) All the choices are correct	*CO1*	*PO1*	**01**
	13	The body contains three basic types of muscle. They are: a) Stretchable muscles, Non-stretchable muscles and Voluntary muscles b) Long muscles, short muscles and involuntary muscles c) cardiac muscle, smooth muscle, and skeletal muscle. d) None of the choices are correct	*CO1*	*PO1*	**01**
	14	Isotopes are a) atoms of the same element that have the same number of protons but a different number of neutrons, b) atoms of the same element that have the same number of neutrons but a different number of protons c) atoms having different number of protons and different number of neutrons d) atoms having same number of protons and same number of neutrons	*CO1*	*PO1*	**01**
	15	During the process of muscle contraction, the sarcoplasmic reticulum is stimulated to release which substance? a) Calcium b) Acetylcholine c) ATP d) Acetylcholinesterase	*CO1*	*PO1*	**01**
	16	The impulse-conducting cells of the nervous system are called: a) neuroglia. b) neurons. c) microglia. d) ependymal cells.	*CO1*	*PO1*	**01**

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	17	The axons of many neurons are encased in a _____ sheath: a) Ranvier b) Diaphysis c) Myelin d) periosteum.	*CO1*	*PO1*	**01**
	18	The outside of the cell is rich with ___while the inside contains an abundance of_____. a) potassium ions (K+) & sodium ions (Na+) b) sodium ions (Na+) & potassium ions (K+) c) Both (a) & (b) are correct d) None of the answers	*CO1*	*PO1*	**01**
	19	The following is NOT a common neurotransmitter: a) acetylcholine, b) epinephrine, c) dopamine, d) glucose.	*CO1*	*PO1*	**01**
	20	Electromyography measures muscle response or electrical activity in response to a nerve's stimulation of the muscle. True or False? a) False b) True	*CO1*	*PO1*	**01**
		PART B **(Answer any 3 Questions.)**			
	1	List and discuss any five applications showing how Biology is relevant to Mechanical Engineer.	*CO1*	*PO1*	**10**
	2	How is blood glucose level regulation carried in the human body? Discuss with the help of a control systems block diagram.	*CO1*	*PO1* *PO7*	**10**
	3	Illustrate the *sliding-filament model* of **muscle** contraction (with necessary sketch)	*CO1*	*PO1*	**10**
	4	Classify Bone cells highlighting their function. Draw a schematic of the long bone labelling the various parts.	*CO2* *CO3*	*PO1* *PO7*	**10**
	5	What are the applications of EMG in ergonomics? Discuss any one application.	*CO2*	*PO1* *PO7*	**10**

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