



**Ramakrishna Mission Vivekananda Educational and  
Research Institute**  
(Deemed-to-be University declared by Govt. of India under Section  
3 of UGC Act, 1956)

**School of Agriculture and Rural Development  
&  
School of Biological Sciences**

**Course: M. Sc. in Agricultural Biotechnology (AgBT) and M.  
Sc. in Medical Biotechnology (MdBt)**

**Model Questions for Entrance Examination**

**Time: 1-hour  
Full Marks: 60**

### **SECTION A**

#### **General Science**

1. Young's modulus is the property of
  - a) Liquids
  - b) Solids
  - c) Gasses
  - d) Both Solids and Liquids
2. What is the direction of electric and magnetic fields in an electromagnetic wave?
  - a) parallel to each other
  - b) perpendicular to each other
  - c) at  $45^\circ$  to each other
  - d) at  $120^\circ$  to each other
3. The rate constant of a reaction depends upon
  - a) temperature of the reaction
  - b) extent of the reaction
  - c) initial concentration of the reactants
  - d) the time of completion of reaction
4. How many microlitres of 20% SDS are required to bring 1.5ml of solution to 0.5%?
  - a)  $3.85\mu\text{L}$

- b) 38.5  $\mu$ l
- c) 1.9  $\mu$ l
- d) 19  $\mu$ l

5. How is 40mL of 50mM NaCl solution prepared from a 2M NaCl stock?

- a) To 38 ml of distilled water, add 2 ml of 2M NaCl stock solution to produce 40mL final volume of 50mM NaCl
- b) To 39 ml of distilled water, add 1 ml of 2M NaCl stock solution to produce 40mL final volume of 50mM NaCl
- c) To 37 ml of distilled water, add 3 ml of 2M NaCl stock solution to produce 40mL final volume of 50mM NaCl
- d) To 36 ml of distilled water, add 4 ml of 2M NaCl stock solution to produce 40mL final volume of 50mM NaCl

6. Enzyme acts by

- a) Increasing activation energy
- b) Lowering activation energy
- c) Interfering with  $\Delta G$
- d) none of the above

7. Which of the following diseases are caused by Coronavirus?

- a) SARS
- b) MERS
- c) Covid-19
- d) All of the above

8. Soap and detergents can clean dirt by forming

- a) lysosomes
- b) micelles
- c) phagosomes
- d) all of the options

9. Which of the following trigonometric formula is true?

- a)  $\sin(45^\circ + \alpha) = \sin \alpha$
- b)  $\sin(90^\circ - \alpha) = \sin \alpha$
- c)  $\sin(60^\circ - \alpha) = \sin \alpha$
- d)  $\sin(120^\circ + \alpha) = \sin \alpha$

10. What will be the values for x and y for the equation  $x-2y = 5$  is:

- a) (0,2)
- b) (2,0)
- c) (0,5)
- d) (5,0)

## **SECTION B**

### **Botany**

- 1.** Water Splitting to produce oxygen takes place in which step of photosynthesis
  - a) Light Reaction
  - b) Dark Reaction
  - c) Both Light and Dark Reaction
  - d) Neither Light nor Dark Reaction
  
- 2.** Mendel self-pollinated F1 progeny obtained from the cross of plants having Round-Yellow and Wrinkled-Green seeds. He obtained 4 different traits Round-Yellow, Wrinkled-yellow, Round-Green and Wrinkled-green in F2 generation in the ratio of
  - a) 3:3:1:9
  - b) 3:3:9:1
  - c) 9:3:1:3
  - d) 9: 3: 3:1
  
- 3.** The C4 plants grow very efficiently in warm climates because they
  - a) Consume fewer ATP molecules for glucose synthesis
  - b) Minimize photorespiratory losses
  - c) Have more efficient chloroplasts
  - d) Contain enzymes that are not activated at high temperatures
  
- 4.** Gibberellins can promote seed germination because of their influence on
  - a) Rate of cell division
  - b) Production of hydrolytic enzymes
  - c) Synthesis of abscisic acid
  - d) Absorption of water through hard seed coat

- 5.** Oxidative decarboxylation of pyruvate is one step of cellular respiration. Which of the following is correct about the process?
- a) It is the step that connect glycolysis and kreb cycle
  - b) Acetyl CoA is produced
  - c) NADH and CO<sub>2</sub> is produced
  - d) All of the above
- 6.** Plant Store energy is the form of?
- a) Starch
  - b) Glycogen
  - c) Raffinose
  - d) Cellulose
- 7.** Which of the following categories of organisms do not evolve oxygen during photosynthesis?
- a) Red algae
  - b) Photosynthetic bacteria
  - c) C<sub>4</sub> plants with Krantz anatomy
  - d) Blue green algae
- 8.** The phenotypic and genotypic ratio in F<sub>2</sub> generation will be same in case of
- a) incomplete dominance
  - b) codominance
  - c) multiple allele
  - d) both a & b
- 9.** Epiphytes on large trees is a classic example of what kind of relation?
- a) Commensalism
  - b) Mutualism
  - c) Protocoperation

d) None of the above

**10.** Phytoplanktons are

- a) Plants which live in water
- b) The microscopic plants which live in water
- c) Animals which live in water
- d) The microscopic animals which live in water

## **Zoology/Physiology**

- 1.** Cardiac impulse arrives bundle of His from-
  - a) SA node
  - b) AV node
  - c) Purkinje system
  - d) Ventricular muscle
  
- 2.** Podocytes are present in-
  - a) Heart
  - b) Skin epidermis
  - c) Inner ear
  - d) Glomerular capillaries
  
- 3.** When an infected individual has one mutant copy of the relevant gene and one healthy copy. This condition shows
  - a) Dominant diseases
  - b) Recessive diseases
  - c) X-linked diseases
  - d) All of the above
  
- 4.** Immunoglobulin (Ig) are Y-shaped protein used by the immune system to identify and neutralize pathogenic bacteria and viruses. Which of the following is incorrect about Ig?
  - a) The five primary classes of Igs are IgG, IgM, IgA, IgD and IgE
  - b) There are mainly two types of light chains Kappa (K) and lambda
  - c) Most abundant Ig is IgA
  - d) IgE is associated with allergies
  
- 5.** Based upon the type of nitrogenous waste excreted, the animals are classified into the following categories (i) Ammonotelic (ii) Ureotelic, and (iii) Uricotelic. Ureotelic

organisms are those which excrete nitrogenous waste in the form of

- a) Ammonia
- b) Urea
- c) Uric Acid
- d) Creatinine

- 6.** Which of the following is the correct order of Linnaeus classification of organism?
- a) Kingdom, Phylum, Domain, Class, Order, Family, Genus, Species
  - b) Domain, Phylum, Kingdom, Class, Order, Family, Genus, Species
  - c) Phylum, Domain, Kingdom, Class, Order, Family, Genus, Species
  - d) Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species
- 7.** Which of the following channel mainly contribute to the depolarization phase of the action potential of neuron?
- a)  $\text{Na}^+$  channels
  - b)  $\text{Cl}^-$  channels
  - c)  $\text{Ca}^{2+}$  channels
  - d)  $\text{K}^+$  channels
- 8.** The receptors responsible for increase in ventilation due to intravenous lactic acid accumulation are located in the-
- a) medulla oblongata
  - b) carotid bodies
  - c) aortic baroreceptors
  - d) trachea and large bronchi
- 9.** Populations that are morphologically similar but do not interbreed for physiological or behavioral reasons are grouped as
- a) Races
  - b) Varieties
  - c) Sub-species
  - d) Sibling species
- 10.** The backbone of hormone Testosterone and Estrogen is composed of
- a) Triglycerides
  - b) Phospholipid
  - c) Cholesterol

d) Waxes

## Microbiology

1. Viral genome that can become integrated into bacterial genome is called
  - a) Prophage
  - b) Temperate phage
  - c) Bacteriophage
  - d) Metaphage
  
2. Which of the following pairs is not matched correctly?
  - a) Glycocalyx-adherence
  - b) Fimbriae-motility
  - c) Pili-conjugation
  - d) Peptidoglycan-cell wall
  
3. Lipopolysaccharide in cell walls is characteristic of?
  - a) Algae
  - b) Fungi
  - c) Gram-negative bacteria
  - d) Gram-positive bacteria.
  
4. Which of the following are true for cytoplasmic membrane?
  - a) site of generation of proton motive force
  - b) hydrophilic barrier
  - c) hydrophobic barrier
  - d) hydrophobic barrier and site of generation of proton-motive force.
  
5. Which of the following is not true about plasmid
  - a) Extrachromosomal DNA
  - b) Provides unique genotypic characters to bacteria
  - c) Helps in antibiotic resistance
  - d) Helps in reproduction
  
6. Pasteurization is a process in which
  - a) All the microorganisms are removed
  - b) Only pathogenic forms are removed
  - c) Only non-pathogenic forms are removed
  - d) All of the above

7. Characteristics of Eukaryotic Cells are as follows: Pick the odd one out
- a) Eukaryotic cells have the nucleus enclosed within the nuclear membrane
  - b) The eukaryotic cells contain a cytoskeletal structure
  - c) The nucleus contains a single, linear DNA which carries all the genetic information
  - d) They divide asexually by binary fission. The sexual mode of reproduction involves conjugation.
8. There are many differences between prokaryotes and Eukaryotes. Pick which is incorrect.
- a) Prokaryotes are simple in structure and eukaryotes are complex in structure
  - b) Prokaryotes genome consists of single chromosome, Eukaryotes genome consists of numerous chromosomes
  - c) Prokaryotes reproduction is asexual while eukaryotes reproduction is sexual
  - d) Prokaryotic metabolic pathway is composed of Glycolysis while Eukaryotic metabolic pathway is composed of both glycolysis and TCA Cycle
9. Which phage is used for phage display technique?
- a) T7
  - b) M13
  - c)  $\lambda$ -phage
  - d)  $\phi$ 6
10. Prokaryotic cells are more resistant to osmotic shock than eukaryotic cells because
- a) Their cell wall is composed of peptidoglycan
  - b) They are selectively permeable
  - c) They contain osmoregulating porins
  - d) They block water molecules from entering the cell

## Biochemistry

1. Which of the following is a function of chaperone protein?
- a) It provides a template for how the proteins should fold
  - b) It degrades proteins that have folded properly
  - c) It degrades proteins that have folded improperly
  - d) It rescues proteins that have folded improperly and allowed them to refold properly
2. Which of the following is an example of epimers?



- a) Mannose & Glucose
- b) Glucose & Ribose
- c) Galactose & Mannose
- d) Glucose & Galactose

**3.** In ion-exchange chromatography

- a) Proteins are separated on the basis of their net charge
- b) Proteins are separated on the basis of their size
- c) Proteins are separated on the basis of their shape
- d) Either (b) or (c)

**4.** The degree of unsaturation of fat, wax, or oil is measured by

- a) Acid value
- b) Iodine value
- c) Saponification value
- d) Iodine number

**5.** Non Polar amino acids, Polar amino acids, Acidic amino acids and Basic amino acids are classified based on the

- a) Amino Group
- b) Carboxyl Group
- c) Side Chain (R group)
- d) Polarity of H-atom

**6.** Some proteins are made up of multiple polypeptide chains, also known as subunits. When these subunits come together, they give the protein its

- a) Primary Structure
- b) Secondary Structure
- c) Tertiary Structure
- d) Quaternary structure

**7.** The arrangement of nucleotides in DNA can be seen using one of the following instruments is

- a) Electron microscope
- b) Light microscope
- c) X-Ray crystallography
- d) Ultracentrifuge

**8.** Which of the following statement is true?

- a) fatty acids which have a very long carbon chain generally have a high saponification value
- b) fatty acids which have a very long carbon chain generally have a low saponification value
- c) fatty acids which have a very long carbon chain generally have moderate saponification value

d) None of the above

- 9.** A glucogenic amino acid is an amino acid that can be converted into glucose through the process called
- Gluconeogenesis
  - Glycolysis
  - TCA Cycle
  - Glycogenolysis
- 10.** Fermentation is a metabolic process that produces chemical changes in organic substrates through the action of enzymes. Which of the following is incorrect about fermentation?
- Fermentation is used for producing alcoholic beverages such as wine and beer
  - During alcoholic fermentation 2 molecules of ethanol is produced from one molecule of glucose
  - During lactic acid fermentation in muscle cells, 2 molecules of lactate are produced from one molecule of glucose
  - None of the above

## **Biotechnology/Genetics**

- 1.** Antibiotic Resistance gene in expression vector is used for
  - selection of host cells having the cloned gene
  - Killing of host cells
  - Putting recombinant DNA into the host cells
  - All of the above
- 2.** Hybridoma technology is utilized for
  - Synthesis of vaccines
  - Killing of cancerous cells
  - Production of monoclonal antibodies
  - All of these
- 3.** The first recombinant vaccine approved for human use was
  - BCG
  - Hepatitis B

- c) Influenza A
- d) Cholera

4. In eukaryotes, precursors of miRNAs and siRNAs are usually synthesized by-
- a) RNA pol I and III respectively
  - b) RNA pol III and I respectively
  - c) Only RNA pol I
  - d) Only RNA pol II

5. Which of the following condition is true for *in vivo* DNA replication?

- a) 3' -CATGCGATTGACGAGCTATTAGCTGATG-5'  
5' -GTACGCTAAC-OH
- b) 3' -CATGCGATTGACGAGCTATTAGCTGATG-5'  
3' -GTACGCTAAC-p
- c) 3' -CATGCGATTGACGAGCTATTAGCTGATG-5'  
3' -GUACGCUAAC-p
- d) 3' -CATGCGATTGACGAGCTATTAGCTGATG-5'  
5' -GUACGCUAAC-OH

6. Which of the following statement is NOT true about the blotting techniques?

- a) Southern hybridization is the blotting of DNA separated by gel electrophoresis on nylon membrane followed by hybridization with DNA probes
- b) Northern hybridization is the blotting of RNA separated by gel electrophoresis on nylon membrane followed by hybridization with DNA probes
- c) Southern hybridization is the blotting of RNA separated by gel electrophoresis on nylon membrane followed by hybridization with DNA probes
- d) Northern hybridization is the blotting of RNA separated by gel electrophoresis on nylon membrane followed by hybridization with RNA probes

7. The process of development of golden rice to increase the vitamin-A content in the staple rice grain is known as

- a) Biofortification
- b) Bioremediation
- c) Bioaccumulation
- d) Bioformulation

8. Arrange the steps involved in the production of Transgenic Microbes in Sequential order: (i) DNA is extracted from the organism and cut into fragments (ii) Bacteria replicate,

producing colonies of clones (iii) DNA Fragments are inserted into plasmids (iv) Bacteria are transformed with vectors

- a) (i), (iii), (iv) and (ii)
- b) (i), (iii), (ii), (iv)
- c) (i), (ii), (iii) and (iv)
- d) (iii), (i), (ii) and (iv)

**9.** Through the use of recombinant DNA technology, a piece of foreign DNA having antibiotic resistance gene is introduced into E. coli cells. Later these E. coli cells are plated on Antibiotic plates. What will be the outcome?

- a) All E. coli cells will survive
- b) Only E. coli cells having antibiotic resistance gene will survive
- c) All E. coli cells will die
- d) All of the above

**10.** Arrange the steps involved in the generation of Transgenic plant in the sequential order: (i) Incubate plant cells with transformed bacteria (ii) Transform bacteria (iii) Select transformed plant cells (iv) grow the plant

- a. (i), (iv), (iii), (ii)
- b. (ii), (i), (iii), (iv)
- c. (ii), (iii), (i), (iv)
- d. (i), (iii), (ii), (iv)