

28/11/2025

Printing Pages: 2

Paper Code: MSC-MB-104

C

(SVSU:2025-26/R)

Enrollment No.

Program Name-M.Sc Microbiology

Semester-I / I Year Examination

Subject Code-M.Sc MB 104

Subject Name-Biochemistry and Biophysics of Microbes

[Time : 03:00 Hours]

[Max. Marks : 70]

Note : 1. Attempt all the questions as per given instructions.

1. **Multiple Choice Questions (MCQs)** [01×15=15]

I Which carbon in glucose determines α and β anomeric forms?

- a) C-2 b) C-1 c) C-4 d) C-6

II Glucose and fructose are:

- a) Structural isomers b) Enantiomers
c) Epimers d) Diastereomers

III Starch and glycogen are both:

- a) Structural polysaccharides b) Glycolipids
c) Proteoglycans d) Storage polysaccharides

IV Proteoglycans are composed of:

- a) Carbohydrates and proteins b) Nucleotides and proteins
c) Sugars and fats d) Lipids and RNA

V Amino acids having hydrophobic side chains are:

- a) Polar b) Acidic c) Nonpolar d) Basic

VI Amphoteric nature of amino acids is due to:

- a) Presence of both acidic and basic groups b) Resonance
c) Ring structure d) Polarity

VII The peptide bond is formed by removal of:

- a) CO_2 b) H_2O c) NH_3 d) H_2

VIII The three-dimensional folding of a protein is determined by:

- a) Environmental pH only b) Enzyme presence
c) Random processes d) Its primary sequence

IX The disulfide bond is formed between:

- a) Cysteine residues b) Lysine residues
c) Histidine residues d) Serine residues

X The second law of thermodynamics is related to:

- a) Entropy b) Free energy
c) Enthalpy d) Energy conservation

XI Gibbs free energy (ΔG) becomes zero when:

- a) Reaction is spontaneous b) Reaction is at equilibrium
c) Reaction absorbs energy d) Temperature increases

- XII** The main energy currency molecule in microbes is:
a) NADH b) ADP c) ATP d) AMP
- XIII** Osmosis refers to movement of:
a) Solvent through a semipermeable membrane b) Solute
c) Both solute and solvent d) Ions only
- XIV** Active transport uses energy obtained from:
a) ATP hydrolysis b) Diffusion
c) Osmotic flow d) Chemical gradient
- XV** In microbial systems, ion gradients are important for:
a) ATP synthesis and nutrient uptake b) DNA replication only
c) Cell wall biosynthesis d) Fatty acid degradation

2. Answer in long (any three) [10×3=30]

- I** Elaborate on the classification, structure, and physicochemical properties of amino acids. Describe the titration curve of glycine and determine its pKa and isoelectric point
- II** Discuss the first and second laws of thermodynamics. Explain how these laws apply to microbial energy metabolism, emphasizing ATP synthesis, free energy, and membrane transport models.
- III** Explain the methods used for separation and analysis of amino acids, highlighting paper chromatography, TLC, and HPLC.
- IV** Discuss the importance of free energy changes in microbial metabolism and its relation to ATP synthesis.

3. Answer in short (any five) [5×5=25]

- I** Write short notes on facilitated diffusion and active transport in microbial systems
- II** What is the Lambert–Beer's Law? Explain its application in studying amino acids and proteins.
- III** Define and differentiate between anomers, epimers, and enantiomers with suitable examples
- IV** Describe the oxidation reactions of sugars and their biological importance.
- V** Write short notes on glycolipids (gangliosides and lipopolysaccharides) and their structural roles.
- VI** Discuss the importance of the peptide bond, including its configuration and bond length characteristics.
- VII** Define carbohydrates as informational molecules and mention their key applications in microbiology.

Program Name - MSc Microbiology

I Semester /I Year Examination

Subject Code- MS-MB-101

Subject Name- MICROBIAL DIVERSITY AND MICROBIAL CELL BIOLOGY

[Time : 03:00 Hours]

[Max. Marks : 70]

Note : 1. Attempt all the questions as per given instructions.

1. Multiple Choice Questions (MCQs) [01×15=15]

- I The scientist who developed the germ theory of disease—
(a) Koch (b) Pasteur (c) Jenner (d) Leeuwenhoek
- II The first vaccine developed was against—
(a) Smallpox (b) Cholera (c) Anthrax (d) Rabies
- III The Five Kingdom system includes—
(a) Protista (b) Monera (c) Plantae (d) All of these
- IV Bergey's Manual is a standard reference for—
(a) Classification of bacteria (b) Classification of viruses
(c) Study of fungi (d) Study of algae
- V Radiation sterilization uses—
(a) UV rays (b) Infrared
(c) Microwave (d) All of these
- VI The isolation of a single bacterial colony is achieved through—
(a) Pour plate (b) Spread plate (c) Streak plate (d) All
- VII Simple staining involves—
(a) One dye (b) Two dyes (c) Three dyes (d) None
- VIII TEM is used to study—
(a) Internal structure (b) Surface structure
(c) Shape (d) Size
- IX A complex medium contains—
(a) Exact composition known (b) Unknown composition
(c) Single nutrient (d) Inorganic salts
- X Bacteria reproduces by—
(a) Binary fission (b) Mitosis (c) Meiosis (d) Budding

- XI** Measurement of growth by viable count method detects—
(a) Dead cells (b) Living cells (c) Both (d) None
- XII** Gram-negative bacteria have—
(a) Thick peptidoglycan layer (b) Thin peptidoglycan layer
(c) No cell wall (d) Cellulose
- XIII** Chlamydiae are—
(a) Intracellular parasites (b) Extracellular
(c) Saprophytic (d) Photosynthetic
- XIV** SCP is useful as—
(a) Animal feed (b) Biofertilizer
(c) Antibiotic (d) Enzyme
- XV** Fungi are classified under kingdom—
(a) Monera (b) Protista (c) Fungi (d) Plantae
- 2. Answer in long (any three) [10×3=30]**
- I** Explain the principles of bright field and electron microscopy.
- II** Describe in detail the nutritional based classification of bacteria.
- III** Write an account of bacterial growth phases and methods of measuring growth.
- IV** Discuss the structure, chemical composition and importance of bacterial cell wall.
- 3. Answer in short (any five) [5x5=25]**
- I** Write the significance of microbiology in daily life.
- II** Differentiate between autoclaving and hot air oven.
- III** Define pure culture and enrichment culture.
- IV** What are the components of Gram-positive and Gram-negative cell walls?
- V** Define actinomycetes and state their importance.
- VI** Mention two applications of single cell protein.
- VII** Give two examples of differential media.

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Paper Code: MSMB-103

A

(SVSU:2025-26/R)

Enrollment No.

Program Name M.Sc. Microbiology

I Semester / Ist Year Examination

Subject Code: MSMB 103

Subject Name: Microbial Genetics and Molecular Biology

[Time: 03:00 Hours]

[Max. Marks: 70]

Note: 1. Attempt all the questions as per given instructions.

1. Multiple Choice Questions (MCQs) [01×15=15]

- I** Which structure carries genetic information in bacteria?
(a) Nucleus (b) Plasmid (c) Ribosome (d) Lysosome
- II** Who proposed the Central Dogma of Molecular Biology?
(a) Watson (b) Crick (c) Mendel (d) Avery
- III** Which enzyme unzips the DNA helix during replication?
(a) DNA polymerase (b) DNA helicase (c) Ligase (d) Primase
- IV** Okazaki fragments are found in:
(a) Leading strand (b) Lagging strand (c) Both strands (d) RNA
- V** Which base pair is held by three hydrogen bonds?
(a) A-T (b) G-C (c) A-U (d) G-U
- VI** Bacterial conjugation involves:
(a) DNA uptake (b) DNA transfer by phage
(c) Direct cell contact (d) Transformation
- VII** Which RNA carries amino acids to the ribosome?
(a) mRNA (b) rRNA (c) tRNA (d) snRNA
- VIII** Which enzyme synthesizes RNA from DNA?
(a) RNA polymerase (b) DNA polymerase
(c) Ligase (d) Helicase
- IX** In Griffith's experiment, transformation was shown in:
(a) Mice (b) Plants (c) Viruses (d) Fungi
- X** The anticodon is found on:
(a) mRNA (b) rRNA (c) tRNA (d) DNA
- XI** Which process involves mRNA, tRNA, and ribosomes?
(a) Transcription (b) Translation (c) Replication (d) Splicing
- XII** Which enzyme joins Okazaki fragments?
(a) Ligase (b) Polymerase (c) Helicase (d) Topoisomerase

XIII Plasmids are:

- (a) Chromosomal DNA (b) Extrachromosomal DNA
(c) Protein complexes (d) Ribosomal particles

XIV Which of the following is a stop codon?

- (a) AUG (b) UAA (c) GGA (d) UGC

XV Reverse transcriptase synthesizes:

- (a) RNA from DNA (b) DNA from RNA
(c) Protein from RNA (d) RNA from Protein

2. Answer in long (any three) [10×3=30]

I Explain the structure and function of DNA and RNA with suitable diagrams.

II Describe the process of DNA replication in prokaryotes.

III Explain the mechanisms of gene transfer in bacteria (transformation, transduction, conjugation).

IV Discuss the molecular basis of the Central Dogma in microorganisms.

3. Answer in short (any five) [5×5=25]

I Define plasmid and its role in genetic engineering.

II What is the difference between DNA and RNA?

III Write a note on Okazaki fragments.

IV Define transcription and translation.

V Write two functions of tRNA.

VI What is the importance of genetic recombination?

VII Give the role of ligase in DNA replication.

Printing Pages: 2

Paper Code: MSMB-102

B

(SVSU:2025-26/R)

Enrollment No.

Program Name : MSc Microbiology

I Semester / I Year Examination

Subject Code : MSMB-102

Subject Name: Microbial Growth, Physiology and Metabolism

[Time : 03:00 Hours]

[Max. Marks : 70]

Note : Attempt all the questions as per given instructions.

1. Multiple Choice Questions (MCQs) [01×15=15]

- I** The ED pathway is found mainly in:
(a) E. coli (b) Pseudomonas (c) Bacillus (d) Mycobacterium
- II** The specific growth rate (μ) is expressed as:
(a) 1/time (b) cells/time (c) time/cell (d) none
- III** A chemostat maintains:
(a) constant cell density (b) fluctuating pH
(c) death phase (d) nutrient depletion
- IV** Direct cell count is performed by:
(a) spectrophotometer (b) haemocytometer
(c) centrifuge (d) autoclave
- V** Phototrophs obtain energy from:
(a) organic compounds (b) light
(c) inorganic oxidation (d) fermentation
- VI** Mixed acid fermentation yields:
(a) ethanol only (b) butanol only
(c) lactate, acetate, succinate, formate (d) propionate only
- VII** Heat shock proteins are primarily involved in:
(a) energy generation (b) DNA replication
(c) protein refolding under stress (d) photosynthesis
- VIII** Quorum sensing involves:
(a) genetic mutations
(b) cell communication by signaling molecules
(c) phagocytosis (d) nutrient uptake
- IX** The EMP pathway refers to:
(a) Entner-Doudoroff pathway (b) Glycolysis
(c) PPP (d) Calvin cycle
- X** End product of alcoholic fermentation is:
(a) lactic acid (b) ethanol (c) butyric acid (d) acetone

- XI** The TCA cycle occurs in:
(a) cytoplasm (b) mitochondria or cytosol
(c) nucleus (d) plasma membrane
- XII** Nitrogen fixation converts:
(a) $\text{NH}_3 \rightarrow \text{NO}_3^-$ (b) $\text{N}_2 \rightarrow \text{NH}_3$
(c) $\text{NO}_2^- \rightarrow \text{NO}_3^-$ (d) $\text{SO}_4^{2-} \rightarrow \text{H}_2\text{S}$
- XIII** Peptidoglycan biosynthesis occurs in:
(a) cytoplasm (b) cell wall (c) nucleus (d) ribosome
- XIV** Lipid biosynthesis occurs in:
(a) ribosomes (b) cytoplasm
(c) nucleoid (d) periplasmic space
- XV** Stringent response is triggered by:
(a) amino acid starvation (b) excess nutrients
(c) high temperature (d) DNA synthesis
- 2. Answer in long (any three) [10×3=30]**
- I** Explain the chemostat and turbidostat systems with their applications in microbial research.
- II** Describe synchronous and batch culture techniques with examples.
- III** Discuss the major metabolic pathways of carbohydrate breakdown in microbe respiration.
- IV** Explain the different nutritional types of microorganisms with suitable examples.
- 3. Answer in short (any five) [5×5=25]**
- I** Explain the role of heat shock proteins.
- II** Differentiate between autotrophs and chemotrophs.
- III** Write a short note on alkali tolerance mechanisms in microbes.
- IV** Explain the role of enzymes in microbial metabolism.
- V** Outline the major steps in peptidoglycan biosynthesis.
- VI** Write short note on quorum.
- VII** Explain the difference between aerobic and anaerobic respiration.