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Paper Code: B100301T

A (SVSU:2025-26/R)

Enrollment No.

Program Name : B.Sc. Biotechnology/Biochemistry/Microbiology

IIIrd Semester / IInd Year Examination

Subject Code: B100301T

Subject Name: Biochemistry and Biochemical Tools

[Time : 03:00 Hours]

[Max. Marks : 75]

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

2. Fill the correct answer of MCQs

1. Multiple Choice Questions (MCQs)

[01×15=15]

I Dark-field microscopy is used to observe:

- a) Stained specimens only
- b) Living, unstained specimens
- c) Only bacteria that are Gram-positive
- d) Only viruses

II The full form of SEM is:

- a) Scanning Electron Microscope
- b) Secondary Electron Microscope
- c) Simple Electron Microscope
- d) Surface Emission Microscope

III What is used to coat samples in SEM to make them conductive?

- a) Gold or platinum
- b) Copper
- c) Zinc
- d) Iron

IV The α -helix and β -pleated sheet structures are stabilized by:

- a) Hydrogen bonds
- b) Ionic bonds
- c) Peptide bonds
- d) Hydrophobic interactions

V Which of the following is a storage lipid?

- a) Phospholipid
- b) Triglyceride
- c) Cholesterol
- d) Glycolipid

VI Which of the following is TRUE about bright-field microscopy?

- a) Can view living unstained cells clearly
- b) Uses oblique light only
- c) Background is dark
- d) Requires staining for better contrast

VII Beer-Lambert law relates:

- a) Absorbance and wavelength
- b) Absorbance and concentration
- c) Wavelength and transmittance
- d) Molar mass and absorbance

VIII Mass spectrometry is used to determine:

- a) Molecular weight of compounds
- b) Boiling point
- c) Solubility
- d) Refractive index

IX Phase contrast microscopy is mainly used to observe:

- a) Dead, stained cells
- b) Living, transparent cells
- c) Metal surfaces
- d) Fluorescent proteins

- X** Which of the following is a limitation of fluorescence microscopy?
 a) Low contrast b) Photobleaching of fluorophores
 c) Cannot observe live cells d) Cannot magnify above 1.0×
- XI** GFP (Green Fluorescent Protein) is commonly used to:
 a) Stain cell membranes b) Tag proteins in living cells
 c) Measure pH d) Stain lipids
- XII** Acrylamide is used in:
 a) Agarose gel b) SDS-PAGE c) Both d) Neither
- XIII** Which lipid forms the myelin sheath around nerve fibers?
 a) Phospholipids b) Cholesterol
 c) Glycolipids d) Sphingolipids
- XIV** Which of the following is a conjugated protein?
 a) Keratin b) Collagen c) Hemoglobin d) Albumin
- XV** Which component focuses the electron beam in an electron microscope?
 a) Glass lenses b) Magnetic/electromagnetic lenses
 c) Quartz lenses d) Objective mirrors

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

- I** Describe the different levels of protein structure (primary, secondary, tertiary, and quaternary) with suitable examples and diagrams.
- II** Explain the construction, principle, and working of a phase contrast microscope.
- III** Describe the process of β -oxidation of fatty acids.
- IV** Explain the principle, instrumentation, and working of a mass spectrometer. Illustrate with a neat labeled diagram.

3. Answer in short (any six) [5×6=30]

- I** Why is phase contrast microscopy useful for observing live, unstained cells?
- II** What is the quaternary structure of proteins?
- III** What is the significance of lipids in energy storage?
- IV** What is the basic principle of UV-Visible spectroscopy?
- V** Name the main components of a mass spectrometer
- VI** Differentiate between bright field and dark field microscopy in terms of image formation.
- VII** What is the basic principle of mass spectrometry?
- VIII** Explain Beer's Lambert Law.

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Paper Code B110301T

C

(SVSU:2025-26/R)

Enrollment No.

Program Name: B.Sc. (Biotech/Micro/Biochem/EVS)

III Semester / 2nd Year Examination

Subject Code: B110301T

Subject Name: Tools and Technique in Biochemistry

[Time : 03:00 Hours]

[Max. Marks : 75]

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

1. Multiple Choice Questions (MCQs) [01×15=15]**I** Ionic bonds are generally formed between:

- (a) Metals and nonmetals (b) Two metals
(c) Two nonmetals (d) None

II Van der Waals forces arise due to:

- (a) Permanent dipoles (b) Temporary dipoles
(c) Electron transfer (d) Covalent linkage

III Ion-exchange chromatography separates molecules based on:

- (a) Size (b) Charge (c) Solubility (d) Color

IV Molecular sieving chromatography separates molecules based on:

- (a) Charge (b) Size or molecular weight
(c) Density (d) Absorbance

V The centrifugal force depends directly on:

- (a) Radius and speed of rotation (b) Temperature
(c) Pressure (d) Solubility

VI High-speed centrifuge is used for:

- (a) Small biomolecules (b) Large organelles
(c) DNA and proteins (d) Cell debris

VII Isopycnic centrifugation separates particles:

- (a) At their buoyant density (b) By shape
(c) By charge (d) By color

VIII PAGE stands for:

- (a) Polyacrylamide Gel Electrophoresis
(b) Polysaccharide Agar Gel Electrophoresis
(c) Polymer Gel Extraction
(d) Protein Agar Electrophoresis

IX SDS in SDS-PAGE acts as:

- (a) Reducing agent (b) Denaturing detergent
(c) Buffer (d) Dye

- X** The main advantage of phase-contrast microscopy is:
 (a) Viewing stained cells (b) Viewing live, unstained cells
 (c) Producing fluorescence (d) High magnification only
- XI** Histological staining helps in:
 (a) Observing chemical reactions
 (b) Enhancing contrast of tissues
 (c) Counting bacteria
 (d) Measuring absorbance
- XII** The radioactive isotope commonly used in biological studies is:
 (a) C-14 (b) Na-22 (c) H-3 (d) All of these
- XIII** Atomic absorption spectroscopy is mainly used for:
 (a) Protein estimation (b) Metal ion quantification
 (c) DNA analysis (d) Fluorescence
- XIV** Raman spectroscopy measures:
 (a) Light absorption (b) Inelastic scattering of light
 (c) Heat emission (d) Magnetic resonance
- XV** Mass spectrometry gives information about:
 (a) Molecular mass and structure (b) Absorption
 (c) Wavelength (d) Crystalline form
- 2. Answer in long (any three) [10×3=30]**
- I** Clarify the Beer–Lambert Law and applications of UV–Visible Spectrophotometry.
- II** Describe the basic principle and applications of Infrared (IR) and Raman Spectroscopy.
- III** Explain the principle and applications of NMR and Mass Spectrometry.
- IV** Describe the principle, types and applications of Chromatography.
- 3. Answer in short (any six) [6×5=30]**
- I** Define Van der Waals forces and mention their biological importance.
- II** Describe the working principle of ion exchange chromatography.
- III** Outline the concept of density gradient centrifugation.
- IV** Mention the principle and application of agarose gel electrophoresis.
- V** Differentiate electron microscopy from light microscopy in terms of resolution.
- VI** State the principle of scintillation counting in radioactivity measurement.
- VII** How does mass spectrometry help in molecular identification?

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