

2021

**MICROBIOLOGY — HONOURS**

**Paper : DSE-B-3**

**(Instrumentation and Biotechniques)**

**Full Marks : 50**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**Question No. 1** is compulsory and answer **any three** from the rest (2 - 6).

1. Answer **any ten** questions: 2×10
- (a) What is optical density?
  - (b) What is analytical centrifugation?
  - (c) What are the common monochromators used in spectrophotometer?
  - (d) What is competitive illusion?
  - (e) What type of detectors are used in HPLC?
  - (f) What is moving boundary electrophoresis?
  - (g) What is isoelectric focussing?
  - (h) Why are protein gels run vertically?
  - (i) Draw the UV absorption spectra of a protein molecule in the range between 200 nm and 350 nm.
  - (j) Why is the running buffer used in electrophoresis alkaline in nature?
  - (k) Why is TLC named so?
  - (l) What is subcellular fractionation? On what principle is it based?
  - (m) State the units of (i) Molar extinction coefficient (ii) Sedimentation coefficient.
  - (n) What is partition coefficient? Give its mathematical expression.
  - (o) What is Agarose? Why is it a preferred medium for electrophoresis?
2. (a) How can you isolate glutathione and glycosylated proteins from mixtures by using affinity chromatography?
- (b) What will be the main criterion to be the carrier gas in gas chromatography?
- (c) How is immobilization of ligand performed in affinity chromatography?
- (d) How is the specificity of affinity chromatography determined? 2+3+2+3

**Please Turn Over**

3. (a) Differentiate between fixed angle rotors and swinging bucket rotors.  
(b) What are the factors that influence the rate of sedimentation?  
(c) Define the following terms:  
(i) Rate zonal centrifugation  
(ii) Isopycnic centrifugation  
(iii) Sedimentation velocity  
(iv) Ultracentrifugation 3+3+(1×4)
4. (a) What are the two dimensions of separation in a protein 2D electrophoresis? Can the order of the two dimensions be reversed? Explain.  
(b) What is PAGE? State one application of this method.  
(c) You have purified a protein which has a known molecular weight of 60 kD. In order to check its purity, you perform a SDS-PAGE. Although you get a single band, the protein co-migrates with the 30 kD MW marker. Did you purify a wrong protein? Explain.  
(d) What is a zymogram? (2+2)+(2+1)+2+1
5. (a) What are chromophores? State the significance of conjugation in chromophores.  
(b) How can we get useful information about a protein's structure from its UV absorption spectroscopy by changing the polarity of the solvent?  
(c) State under which circumstance/s negative deviation occur from Lambert-Beer's law.  
(d) A suspension of bacteria containing 400 mg dry weight/litre shows an absorbance of 1 in a 1 cm cuvette at 600 nm. What is the cell density that has a transmission of 30% in a 3 cm cuvette at the same wavelength?  
(e) Why can't glass cuvettes be used for recording absorbance in the UV region?  
(1+1)+2+2+3+1
6. (a) What is the numerical aperture of a lens in a microscope? State its importance.  
(b) Define total magnification of a compound microscope. What are the major factors that play an important role in magnification?  
(c) State the principle of operation of a phase contrast microscope.  
(d) You want to find out the subcellular localization of a novel yeast protein. Can you take help of microscopy? Explain. 2+3+2+3
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