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

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) Isopyenic 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
