WEST BENGAL STATE UNIVERSITY

B.Sc. Programme 5th Semester Examination, 2021-22

MCBGDSE01T-MICROBIOLOGY (DSE1)

INSTRUMENTATION AND BIOTECHNIQUES

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

Question No. 1 is compulsory and answer any *four* from the rest

1. Answer any ***four*** questions from the following: 2×4 = 8
   (a) How does magnification of a microscope relate to the focal length?
   (b) Define Sedimentation Coefficient. What is its unit?
   (c) What is Bathochromic Shift?
   (d) Define "Red Shift" and "Blue Shift".
   (e) What is Relative Centrifugal Force?
   (f) Which components are used as mobile phase in TLC process?
   (g) Mention two solvents used in thin layer chromatography.

2. (a) Explain the difference between absorbance and transmittance with respect to spectrophotometry. How absorbance is related to optical density? 2+1
   (b) How does the absorbance of chromophore vary with pH and polarity of a solution? $1\frac{1}{2}+1\frac{1}{2}$
   (c) The concentration of a substance in a solution is (4 g/lt). The length of the cuvette is 2 cm and only 50% of the light beam is being transmitted. What is the absorption coefficient? 2

3. (a) Compare between electron microscope and light microscope. 3
   (b) Write down the relation between resolution and numerical aperture of a microscope. 2
   (c) How is phase contrast microscope advantageous over bright field microscope? Mention one use of the former in observation of biological sample. 2+1

4. (a) What are the different means to overcome chromatic aberration in microscopy? 2
   (b) Why oil is used for 100X lens in microscopy? What type of oil is used? 2

(c) Mention the difference between SEM and TEM. 2

(d) What are the applications of annular diaphragm and phase plate in phase contrast microscopy? 2

5. (a) Describe the basic structure and use of an ultracentrifuge with suitable diagram. 2+2

(b) Discuss the effective sedimentation force, sedimentation velocity and sedimentation coefficient mentioning their mathematical equation. 3

(c) Mention one application of density gradient centrifugation. 1

6. (a) How does absorption spectra differ from emission spectra? 2

(b) How does dark field microscopy differ from bright field microscopy? 2

(c) Briefly describe the Lambert-Beer's law. 4

7. (a) What is specific gravity? 2

(b) Write the difference between differential centrifugation and density gradient centrifugation. 3

(c) Differentiate between Rate-Zonal separation and Isopycnic separation. 3

8. (a) What is the full form of TEM? 1

(b) What is the principle behind separation of DNA during gel-electrophoresis? 2

(c) How does adsorption chromatography differ from ion-exchange chromatography? 2

(d) Explain concept of mobile phase in column chromatography. 2

(e) What does R_f value of 1 mean? 1

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

——×——