



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/l). 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.*

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