



**WEST BENGAL STATE UNIVERSITY**  
B.Sc. Honours 6th Semester Examination, 2021

**MCBADSE06T-MICROBIOLOGY (DSE3/4)**

**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.*

**Answer Question No. 1 and any *four* questions from the rest**

1. Answer any *four* questions from the following: 2×4 =8
- (a) Differentiate between bright field and dark field microscopy.
  - (b) Mention two solvents used in thin layer chromatography. Which one is more hydrophobic in your opinion?
  - (c) What would you mean by a 'fraction' in column chromatography?
  - (d) How is ultracentrifugation different from normal centrifugation?
  - (e) A researcher is working with a protein that contains four subunits of differing molecular weights. If the researcher performs SDS-PAGE, how many distinct bands should he see on the gel?
  - (f) Who invented Confocal Microscope? What is the resolution of the Confocal Microscope?
  - (g) What is the difference between positive and negative phase contrast?
  - (h) Why is there vacuum in electron microscope?
2. (a) What is the notation for RCF and what is its significance? 1+1
- (b) Differentiate between a swing out rotor and a fixed angle rotor with diagrams. 3
- (c) What is a density gradient? How is it useful in centrifugation? 1+2
3. (a) Why is it necessary to cover the developing chamber during the paper development? 2
- (b) What are the common techniques used for detecting colourless spots? 4
- (c) What information you get from the retardation factor value? 2
4. (a) Mention the difference between a simple microscope and a compound microscope. 2
- (b) "A phase contrast microscope can be used to visualise live cells." Mention true or false and justify your answer.  $\frac{1}{2} + 1 \frac{1}{2}$
- (c) Illustrate the light path in a fluorescence microscope with a diagram. 4

5. (a) Two common designs for a spectrometer's optics are single-beam and double-beam. Explain the difference between the two designs. What advantages are there in choosing a double-beam design over a single-beam design? What are the disadvantages, if any, of the double-beam design? 4
- (b) Guanosine has a maximum absorbance of 275 nm.  $\epsilon_{275} = 8400 \text{ M}^{-1} \text{ cm}^{-1}$  and the path length is 1 cm. Using a spectrophotometer, you have found that  $A_{275} = 0.70$ . What is the concentration of guanosine? 2
- (c) There is a substance in a solution (4 g/liter). The length of cuvette is 2 cm and only 50% of the certain light beam is transmitted. What is the absorption coefficient? 2
6. (a) Explain the difference between absorbance and transmittance with respect to spectrophotometry. How is absorbance related to optical density?  $1 \frac{1}{2} + \frac{1}{2}$
- (b) "Colourless biomolecules can be analysed using UV spectroscopy." Mention true or false and justify your answer.  $\frac{1}{2} + 2 \frac{1}{2}$
- (c) How can the technique of turbidometry be used to assay the number of bacterial cells in a culture? 3
7. (a) Describe the factors that one must consider when running an agarose gel for analysis vs isolating DNA from an enzyme digest. 4
- (b) Briefly explain the use of SDS and  $\beta$ -mercaptoethanol in protein denaturation during SDS-PAGE. 4
8. (a) Why is thin layer chromatography called so? How does the technique relate to the capillary flow of liquids? 1+1
- (b) Why is the length of the column important in column chromatography? 2
- (c) Explain the concept of mobile phase in column chromatography. 2
- (d) Give an example of affinity chromatography. 2
9. (a) Mention two characteristics of an immersion oil used with a 100 $\times$  objective of a microscope. 2
- (b) Discuss the essential differences between a scanning electron microscope and a transmission electron microscope using a diagram. 4
- (c) What is the advantage of a confocal microscope over a fluorescence microscope? 2

**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.*

—x—