

**U.G. 6th Semester Examination - 2021**

**Molecular Biology and Biotechnology**  
**[HONOURS]**

**Course Code : MBBT-H-601-T-CCR-13**

**(Bio-Analytical Tools)**

Full Marks : 40 Time :  $2\frac{1}{2}$  Hours

*The figures in the right-hand margin indicate marks.*

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

1. Answer any **five** of the following:  $2 \times 5 = 10$

- i) a) The amount of incident light absorbed by a material is proportional to the concentration of the absorbing solution is referred to as \_\_\_\_\_ law.
- b) A microscope that exposes a specimen to ultraviolet light and forms an image with the resulting emitted light at a higher wavelength is called \_\_\_\_\_ microscope.

- ii) a) In a DNA gel electrophoresis, DNA molecule moves towards anode.

**(True or False)**

- b) Atoms do not participate in IR spectroscopy. **(True or False)**
- iii) What is homogenization? How do you prevent swelling of mitochondria during cell fractionation? 1+1
- iv) Calculate the actual magnification of the specimen when it is observed under a 40X objective lens with a microscope having a standard eyepiece.
- v) Why is glycerol used in DNA gel loading buffer? How do you control the porosity of an agarose gel? 1+1
- vi) What is the relation between buoyancy, friction and centrifugal forces acting on a particle during centrifugation? Define the term RCF. 1+1
- vii) Mention applications of nanoparticles in biological field. Write down the name of the instruments required to measure the size of nanoparticles. 1+1

- viii) What is the principle of isoelectric focusing?
2. Answer any **two** from the following:  $5 \times 2 = 10$
- i) What is pH? Describe the principle of a pH meter. How is it standardized? What is buffer solution?  $1+2+1+1$
- ii) Compare between AAS and AES. Write down the applications of AAS. What is ppm?  $3+1+1$
- iii) The refractive index of air is 1.0. The sine of the angular aperture  $\alpha$ ,  $\sin(\alpha) = 0.94$ . Calculate the numerical aperture. If you want to observe a live bacterial culture under a microscope, what would be your choice of microscope? Justify.  $2\frac{1}{2}+2\frac{1}{2}$
- iv) Differentiate fluorescence from phosphorescence. State the working principle of a simple spectrofluorometer.  $2\frac{1}{2}+2\frac{1}{2}$
3. Answer any **two** of the following:  $10 \times 2 = 20$
- i) If a researcher wants to study the internal organization of SARS COVID-19 virus, which microscopy technique should he use and why? Why are phase plate and annular diaphragm used in phase contrast microscope?  $6+(2+2)$

- ii) Discuss the principle and the rationale behind the choice of exchanger in an Ion Exchange Chromatography. How is void volume calculated? Why is HPLC superior to other chromatographic techniques? Discuss.  $6+2+2$
- iii) Discuss the chemistry behind the formation of sharp band of proteins before entering the resolving gel in SDS-PAGE. What act as catalysts in polyacrylamide gel formation? Explain. A researcher is working with a tetrameric protein having subunits of different molecular weights. If the researcher performs an SDS-PAGE, how many distinct bands are expected to be seen on the gel? Justify.  $6+2+2$
- iv) What is Column Chromatography? What is the main advantage of Column Chromatography? Write down Column Chromatography Principle. Describe the Column Chromatography Procedure with suitable diagram. Describe the different types of Column Chromatography.  $1+1+3+3+2$