Ref. No. Ex/MSBT 236/2022

M. Sc. (Biotechnology) Examination, 2022

(1st Year, 2nd Smester)

Subject : Bio-Analytical Techniques

Paper : MSBT 236

Time : Two hours | Full Marks : 40

Group A

Answer any one questions

1. (a) What do you mean by 'Half-life' of a radionuclide. Explain, which one among the following radioisotopes is easiest and safest to dispose following the guidelines of radiation safety. (i) ^{32}P ($t_{1/2}$=14.3 days), (ii) ^{14}C ($t_{1/2}$=5730 years), and (iii) ^{3}H ($t_{1/2}$= 12.3 years) 2

(b) Explain the features of ion pairs formed at the Geiger-Muller region. 1

(c) Mention the working principles involved in the liquid scintillation counting. 2

2. (a) Are the energies of the β ray emitted by all the radionuclides are same? How that influence in the subsequent detection of various radioisotopes? 1

(b) How a piece of liner DNA should be labeled which will be subsequently used in in vitro DNase I foot printing assay? 2

(c) You are conducting an experiment that involves the use of a ^{60}Co source (emits γ ray). Mention what kind of protection you should exercise to ensure the safety of yours and your fellow co-workers. 2

Group B: Answer any one question

3. How does Confocal microscope improve images? What are major disadvantage of such microscope? How these can be improved? (2+2+1)
4. What is the difference between SEM and TEM techniques? How does EDX work in SEM? How dynamic light scattering is helpful in biophysical chemistry? (2+2+1)
5. Mention the process to analyze cell cycle using flow cytometry. How you can detect early apoptotic, late apoptotic cells by flow cytometry? (3+2)

[Turn over

6. How with pull down assay you determine interaction between two protein ? Why it is necessary to use antibody control for immunoprecipitation experiment? (4+1)

Group C : Answer any two questions

7. (a) In SDS-PAGE, the test sample is heated in a boiling water bath in presence of SDS and 2-mercaptoethanol. What are the functions of all these three components?
(b) Why the dye bromophenol blue is added in the sample before electrophoresis? 3+2=5

8. (a) In immune-affinity chromatography, which properties of antigen-antibody interactions are used?
(b) What is meant by overloading of samples in ion-exchange chromatography?
3+2=5

9. (a) What is meant by the statement – 'The fractionation range of the gel filtration matrix Sephadex G-50 is 5 – 50 kDa?
(b) Why buffers of low ionic strength are compulsory used for equilibration of any ion exchange chromatography matrix before application of samples?
3+2=5

10. (a) Why SDS-PAGE is not suitable for the separation of small – very small peptides?
(b) Is it possible to use a gel filtration column for re-equilibration with a fresh buffer in addition to separation of macro-molecules?
3+2=5

11. (a) What is the difference between PAGE and SDS-PAGE?
(b) In any electrophoresis, the voltage may be raised to shorten the duration of electrophoresis run. But it cannot be done. Why?
3+2=5

12. . (a) In an horizontal iso-electric focusing gel electrophoresis system between pH 3.0 – 10.0, why it is recommended that the test sample be loaded near the middle of the gel body?
(b) What is meant by C_{18} – Reverse Phase HPLC? Why they are called reverse phase?
2+2+1=5

Group D

Answer any two Questions

13. Explain the phenomena of fluorescence, delayed fluorescence and Phosphorescence with the help of Jablonski Diagram. Explain static and dynamic quenching by appropriate equations. 6+4

14. Define circular Dichroism. Discuss the principle of generation of circularly polarized light. How do you convert the ellipticity to ΔA? What is the difference between ellipticity and molar ellipticity? What is mean residue concentration? 2+2+2+2+2

15. What is the essential requirement/criterion for a substance to be Raman active? State with an equation the Rayleigh and Raman lines. How do IR and Raman spectroscopy complement each other? 2+6+2

16. What gives rise to the phenomenon of Nuclear Magnetic Resonance (NMR) in an atom? What is Larmor precision? Define Chemical Shift in mathematical terms. How the shieldind effect alter the resonance frequency? 2+2+2+4