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M.Sc. Examination 2022
Semester I
Biotechnology
Core Course - IV
(Biotechniques)

Time: 3 hours

Full Marks: 40

Questions are of values as indicated in the margin.
Answer any *four* questions

1. Characterize different types of ionizing radiations. Define radioactive half life? What are the different units of radioactivity? What are appropriate lab attires one should follow while working with radioactive materials?

4+2+2+2=10

2. What is a Dichroic mirror? Explain its role in microscopy. Write the working principle of phase contrast microscopy.

2+3+5=10

3a. Define the molar extinction coefficient. What information can be obtained from it?

3b. Biological Oxidation reduction involves the coenzyme NAD and its reduction product NADH. NADH produces two strong UV bands at λ_{max} 260 nm ($\epsilon = 15000$) and λ_{max} 240 nm ($\epsilon = 6220$), while NAD gives only one band at λ_{max} 220 nm ($\epsilon = 18000$). A reaction mixture taken in a cell of 1 cm path length showed the following data

λ_{max} 260 nm absorbance 1.2

λ_{max} 340 nm absorbance 0.311

Estimate the relative amounts of NAD and NADH in the reaction mixture

1+4+5=10

4. (a) Mention the principle of density gradient centrifugation. What is the utility of nomograph.

(b) Discuss about radioactive waste disposal.

(3+3)+4=10

5. Briefly state the principle of gel filtration chromatography. A protein has an isoelectric point of 7.2, what will be the net charge of this protein molecule when the pH of the solution is raised by 1.5 units above its isoelectric point? What kind of ion exchange resin will you choose so that the said protein can bind to that resin effectively in this solution at the elevated pH? For purification purposes how can you elute proteins bound to anion or cation exchangers? State the principles of a chromatographic method using which you can purify a protein sample many folds in a single step.

3+1+1+2+3=10

6. Two proteins are suspected to interact *in vivo*. Using two techniques, describe how would you prove the same experimentally