BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI (RAJ.)
II Semester 2017-18

BIO F244 Instrumental Methods of Analysis
COMPREHENSIVE EXAMINATION

Max Marks: 40 **Date: 01-May-2018**
Time: 90 min.

PART-B

1. *Answer the following questions in detail:* **[4 x 4 = 16]**

(i) You are given a protein A. Suggest 4 instrument which you use to determine its purity. Draw a flow chart to explain your methodology for any one of them.

(ii) Suppose you are given a sample of polluted water containing an organic industrial affluent. Which 4 instruments (from IMA lab) will you preferably use for analyzing any 4 properties of the sample? What information can you acquire about the contaminated water sample in each case?

(iii) Suppose you have to isolate, identify and identify an aberrant protein B from the serum sample of a patient. How can you use the instruments learnt by you in IMA for this purpose? Also draw a flow chart depicting your work plan (you include some instrument/information learnt outside this course for the flow chart).

(iv) How can UV-Vis spectrometry be used for disease diagnosis. Give 2 examples.

2. Name the eight components of a flame photometer and briefly state the function of each of them. **[4]**

3. *Give brief answers:* **[4 x 2 = 8]**

(i) You are given two samples: (a) 1- bromo butane, and (b) 2- bromo butane. Which of them will be optically active? Why?

(ii) You are given single cell samples of Bacteria, RBCs, lymphocytes and Neuronal cells. Arrange them in decreasing order of forward scatter as expected by FACS analysis. Justify.

(iii) You are given single cell samples of polyploid cells, diploid cells and haploid lymphocyte cells. Arrange them in decreasing order of side scatter as expected by FACS analysis, offering a brief justification.

(iv) Mention four advantages of using concave grating monochromators over rectangular grating monochromators.

4. Suppose you have to set up a laboratory to do forensic testing. What 3 important instruments must you have and why? Briefly justify the use of each one. **[3]**

5. *State whether each of the following statements is true or false. If true, justify why. If false, state why it is false and correct the statement.* **[3]**

(i) Primers should be added in excess in the reaction in order for PCR to work.

(ii) The concentration of agarose used to make a gel is a matter of personal choice to facilitate handling of the gel, rather than to do with the size range of DNA fragments to be resolved.

(iii) Polyacrylamide and agarose gels can both be used to separate nucleic acids or proteins.

6. *Answer the following in not more than 2 lines:* **[6]**

(i) How is the polymerase used in PCR different from that found in humans? How would the procedure have to be modified if a human enzyme were used in a PCR instead?

(ii) Of the three temperatures used in a typical PCR cycle, the temperature of which step is most variable across PCR reactions? And why?

(iii) What is the cross linking agent in an acrylamide gel? Which is the other molecule that links with acrylamide?

(iv) Which kind of chromatography will give you the purest sample of interest?

(v) In which kind of chromatography there is the chemical interaction between the solvent and solute is not the basis of separation?

(vi) Arrange the following in increasing order of wavelength:

UV, IR, microwaves, sound waves, X-rays, gamma rays