Course No.: BIO C391   23.12.09   **Maximum Marks: 40**
Course Title: Instrumental Methods of Analysis   Maximum Time: 2 hours

1. a) Which three principal areas do the major analytical techniques fit into?
(2M)

   b) Which part of the EM radiation is responsible for the electronic spectroscopy?
(1M)

   c) Which is the chromophore in nitromethane?   (1M)

   d) What are the transitions possible in aniline, $C_6H_5NH_2$.
   What is an auxochrome; identify it in aniline.   (2+2M)

   e) How does one obtain plane polarized light?   (2M)

2. a) Briefly discuss with the help of a diagram, how the plasma is generated in an ICP unit?   (3M)

   b) Name two areas where ICP-AES is extensively used and for what specific purpose.   (2M)

   c) List the three main parts of FTIR instrument giving an example wherever possible.
(2M)

   d) 'The best feature of the infrared spectrum is that the absorption at specific frequency regions can be co-related to the molecular structure.' List the various molecular motions (*at least six*) that are captured by the spectra.   (3M)

3. a) If you have a mixture of two proteins A and B, name the column you would choose to separate them through HPLC, if they differed by: (4M)
   i) number of charges; ii) M. Wt.; iii) functional antigens and iv) unknown factors.

   b) Which components of the GC are heated (temperature set) during a run?   (3M)

   c) Generally, TLC separations are studied before a compound mixture is subjected to a HPLC separation for the first time, using a normal, adsorption column. Explain.   (3M)

4. a) The PCR cycle usually has three steps, with a particular temperature being set for each step. How do we determine the temperature to be set for each of these steps?(3M)

   b) How do the following factors affect migration of molecules in agarose gel electrophoresis?   (2M)
         i) Agarose concentration ii) Voltage applied

   c) Suppose we have two DNA mixtures: one has very small DNA molecules and the other has large DNA molecules. Can we run both sample mixtures on the same gel? Explain.   (2M)

   d) List two applications for each of the three detection modes of an autoanalyser.(3M)

Course No.: BIO C391   04.10.09   **Maximum Marks: 20**
Course Title: Instrumental Methods of Analysis   **Maximum Time: 50 minutes**

Instructions:
TB or bound Xerox copies of chapters 1, 5, 6 and 9. Manual and handwritten class notes are allowed. Answer all questions in the proper sequence.

1.a) What do you understand by the term hyphenated technique? Give an example.   (1M)

b) Differentiate an analytical procedure from an analytical protocol.   (2M)

c) What is the role of a diffraction grating in a spectrophotometer?   (2M)

2. The absorbance A or 'optical density' [in UV radiation] of a compound of 5.3 molar concentration taken in 1 cm cuvette is 2.1×10^3. What will be its ε or molar extinction co-efficient?   (2M)

3. List three paths by which an excited molecule comes back to the ground state. Give a schematic energy-level diagram.   (3M)

4. An unsaturated ketone dissolved in hexane has a λmax of 278 nm. What shift would you observe (λmax) when it is analyzed in ethanol? Explain.   (2M)

5. (a) In elemental analysis by using flame, graphite or inductively coupled plasma, the sample preparation plays a major role to obtain reproducible results as the molecules are atomized at high temperatures. In addition to maintaining the temperature, list at least four other procedures you may follow to maximize the atomization and minimize interferences?   (4M)

(b) Explain why the path length of light in AAS or Graphite furnace is higher when compared to other spectroscopy methods for quantitative measurements?   (2M)

(c) Why the cathode of HCL is made of the metal to be analyzed   (2M)

16.11.09
COURSE NO: BIO C391   **MAXIMUM MARKS: 10**
TITLE   : IMA   **DURATION: 20 min.**

Name: _____   **Section:** ____   **ID No.:**_____

1. a) List two factors which influence the separation and rate of elution in a TLC. I have a mixture, A & B which did not move from the spotting point when eluted with a solvent mixture of toluene and chloroform. What change do you suggest in the mobile phase?   (2M)

b) Briefly discuss two advantages of TLC over other forms of chromatography.
. **(2M)**

2 a) Taking one example of the stationary phase liquid used in GC, list the properties it should possess to be compatible for GC.   **(2M)**

PTO

b) What is the difference between packed and capillary column? Which will give better resolution; give any one reason for it. **(2M)**

3) Assume 2 fluorescent samples A and B. For Sample A – Concentration = 0.02 units; Absorbance = 0.04; Fluorescence intensity= 0.8. For Sample B – Concentration = 0.01 units; Absorbance = 0.02. Calculate the fluorescent intensity for sample B. **[2M]**

BITS, PILANI –DUBAI
DUBAI INTERNATIONAL ACADEMIC CITY
SECOND SEMESTER 2008-2009
QUIZ – 1   28.10.09

COURSE NO: BIO C391   **MAXIMUM MARKS: 10**
TITLE   : IMA   **DURATION: 20 min.**

Name: _____   **Section:** _____   **ID No.:**_____

1. a) A solution of BSA shows absorption in the UV region and follows Beer-Lambert's law. Give any one molecular group responsible for this absorption.
(1M)

b) What is an *auxochrome*? Explain briefly taking aniline ($C_6H_5NH_2$) as an example.   . **(2M)**

c) Cuvette used in visible region is made of ------------------ and that used in the UV region is made of ----------------------------.   **(1M)**

2 a) Give any four molecular vibrations which absorb in the IR region   **(1M)**

b) Give the main optical component of a FT-IR which differentiates it from the older, dispersion models.   **(1M)**

PTO

c) An alkyl ketone shows carbonyl stretching at 1715 cm^{-1}. Where would you expect a similar alkyl ketone conjugated to an unsaturated system, for ex. acetophenone, to appear in the IR? Why? **(2M)**

3) a) When a mixture of equal amounts of two enantiomers are placed in the sample cell of a polarimeter, what would be the expected reading? **[0.5M]**

b) Calculate the specific rotation of a compound, if a solution containing 0.75 g / 10 ml is placed in a 10 cm sample cell and the observed rotation at D line is 1.2 degrees. **(1.5M)**