Reg.No.									

INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(Manipal University)

III SEMESTER B.S. DEGREE EXAMINATIONS-NOV. / DEC. 2016

SUBJECT: ANALYTICAL METHODS & INSTRUMENTATION (CHM 234)

(BRANCH: INDUSTRIAL BIOTECHNOLOGY)

Monday, 28 Nov. 2016

Time: 3 hrs. **Max. Marks: 100**

- ✓ **Answer ANY FIVE full Questions.**
- ✓ **Missing data, if any, may be suitably assumed**

1 A.What is electromagnetic radiation? Explain the effect of interaction of EMR with matter in the different regions of electromagnetic spectrum.

B. With a neat diagram explain the working of a Raman spectrometer. What are the advantages of Raman spectroscopy over IR spectroscopy?

C. Give reasons:

i) HBr molecule is microwave active but H_2 and Br_2 molecules are not.

ii) All modes of vibrations of water molecule are Raman active.

8+8+4

2 A. Derive a mathematical expressions for the frequency of transition for a rotating non-rigid diatomic molecule.

B. With a neat diagram explain the working of double beam UV-Visible spectrophotometer. Discuss any two applications of UV-Visible spectroscopy

C.The fundamental vibrational frequency of HCl is 2890 cm^{-1}.Calculate the force constant of this molecule. The molar masses are ^{1}H = 1.008 g/mole and ^{35}Cl = 35.5 g/mole,N=$6.023\times10^{23}mol^{-1}$, c = $3\times 10^{8}ms^{-1}$,h = 6.626×10^{-34} J s

8+8+4

3 A. What is Raman shift? Explain the classical theory of Raman Effect.

B. Give an account of the following:

i) Photomultiplier tube ii) Real deviation from Beer's law

C. Give reasons:

i)Benzene is colourless but nitrobenzene is pale yellow in colour

ii)Stokes lines are more intense than anti Stokes lines.

8+8+4

4 A. State and derive the mathematical expressions for the laws of spectrophotometry. Show that A=2-log%T

B. Discuss the various kinds of electronic transitions observed in the UV region for organic molecules. What are red and blue shifts?

C. Give reasons:

i) Microwave spectroscopic studies are suitable only for gaseous substances

ii) ^{12}C is NMR inactive whereas ^{13}C is NMR active

8+8+4

5 A.Give the various modes of vibrations for $>CH_2$. Explain the working of any two detectors of IR radiation

B. Give an account of i) sampling of solids for IR studies. ii) NMR spectrometer

C. Write a note on evaluation of chromatogram in TLC.

8+8+4

6 A. Give the classification of chromatographic methods. Explain the terms distribution constant, retention time and capacity factor.

B. With a neat diagram describe the working of three different kinds of detectors used in GLC.

C. Write a note on combustion analysis

8+8+4

7 A. Explain the principles of X-ray absorption and working of x-ray Absorptiometer.

B. What is potentiometric titration? Explain with a suitable example three different types of potentiometric titrations

C. Predict the following.

i) No of Proton NMR signals in $CH_3CH_2CH_2Cl$ and $C_6H_5NO_2$

ii) Position and splitting of Proton NMR signals of pure CH_3CH_2OH

8+8+4

8 A. Describe the technique of HPLC. What are the advantages of this technique?

B. Give an account of i) Origin of X-ray line spectra

ii) Mass spectrometer.

C. Give reasons:

i) In the conductometric titration of HCl with NaOH, conductivity decreases till the equivalence point and then increases

ii) In the conductometric titration of HCl with NH_4OH, conductivity decreases till the equivalence point and then remains constant.

8+8+4