Reg. No.										

INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(Manipal University)

IV SEMESTER B.S. DEGREE EXAMINATION –MAY 2016

SUBJECT: TECHNICAL CHEMISTRY-III (CH 242)

(BRANCH: CHEMICAL)

25TH MAY, 2016

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

- ✓ **Answer ANY FIVE full Questions.**

1. A) What are potentiometric titrations? Describe with a suitable example the potentiometric method of redox and complexometric titrations.

B) What are reference and indicator electrodes? Explain the construction and working of a reference electrode.

C) The resistance of a 0.1 N solution of an electrolyte was found to be 210 ohms at 25°C. Calculate the equivalent conductance of the solution at 25°C if the electrodes in the cell are 0.8 cm apart and have an area of 0.7628 sq.cm.

(8+8+4)

2. A) Briefly explain the effect of interaction of electromagnetic radiation with molecules in the different regions of the spectrum. Give the differences between line spectrum & band spectrum

B) With a Schematic diagram explain the working of double beam IR spectrophotometer. What are its advantages over single beam IR spectrophotometer?

C) Obtain the expression for potential of a glass electrode.

(8+8+4)

3. A) State Lamberts & Beers law. Obtain the Mathematical expression for Beer –Lamberts law.

B) Explain with suitable examples the various kinds of electronic transitions observed for molecules in the ultraviolet region. What are hypsochromic & hypochromic shifts of absorption lines?

C) The pure rotational spectrum of gaseous HCl consists of a series of equally spaced lines separated by 20.80 cm^{-1}. Calculate the internuclear distance of the molecule.

The atomic masses are: $^{1}H = 1.673\times10^{-27}$kg and $^{35}Cl = 58.06\times10^{-27}$kg.

$h = 6.626 \times 10^{-34}$ J s , $c = 3\times 10^{8} ms^{-1}$

(8+8+4)

4. A) What are the conditions required for the molecule to absorb radiation in the middle IR region? Discuss any two sources and detectors used in IR spectrophotometer.

B) Give an account of sampling of solids and liquids for IR studies.

C) Discuss the methods of detection of end point in potentiometric titrations.

(8+8+4)

5. A) What is thermogravimetric analysis? Briefly explain how the sample characteristics affect the nature of TGA curve.

B) What are the characteristics of an ideal detector for gas chromatography? With a schematic diagram explain any two kinds of detectors used in GLC.

C) TGA studies reveal that MgC_2O_4 exists as MgO above 480^0C, Ca C_2O_4 changes to $CaCO_3$ between 398^0 and 420^0 C and CaCO3 changes to CaO between 660^0 and 840^0 C. A mixture of CaC_2O_4 and MgC_2O_4 obtained from 0.35 g dolomite ($CaCO_3$ + $MgCO_3$) weighed 0.24 g at 500^0C and 0.1696 g at 900^0C respectively. Calculate the % $CaCO_3$ and % $MgCO_3$ in the original sample of dolomite. (At.wts of Ca and Mg are 40 and 24 respectively).

(8+8+4)

6. A) Explain the term distribution constant and retention time used in chromatography. Obtain the expression for the relationship between retention time and distribution constant.

B) Discuss the following components of a gas chromatograph:

i) Carrier gas ii) Sample introduction system and iii) Column

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

(8+8+4)

7. A) Explain the TGA curves for $CuSO_4.5H_2O$ and Hg_2CrO_4.

B) Give an account of various modes of vibrations of polyatomic molecule. What are the differences between IR and Raman spectra?

C) Show that for a rotating rigid diatomic molecule $I = \mu r^2$.

(8+8+4)

8. A) Explain the Quantum theory of Raman effect. With a schematic diagram explain the working of Raman spectrometer.

B) Obtain the mathematical expressions for fundamental band, overtones and hot bands of an anharmonically vibrating diatomic molecule.

C) Give reasons for the following:

i) Stokes lines are more intense than antistokes lines in the Raman spectrum

ii) Deviations from Beer's law are observed at higher concentrations of the solution of a substance.

(8+8+4)