M. Sc. (Semester-II) Examination
April-2015
P-V Analytical Chemistry (Spectroscopy)
Code: 2950

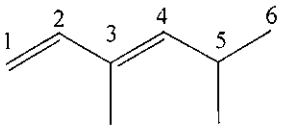
Time: 2.5 hours **Marks: 70**

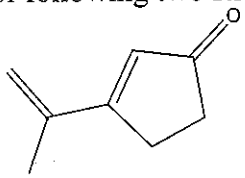
Q-1 Attempt following questions **14**

(i) Draw the schematic diagram of grating monochromator and explain the working of each component.

(ii) Draw the schematic diagram of photo multiplier tube and explain the working of each component.

(iii) Base values: 253 nm; 214 nm; 202 nm; 215 nm
Calculate Wavelength maximum for following two structures





OR

(i) Give comparison of alkane, alkene and alkyne using prominent IR frequencies.

(ii) Define Microwave spectroscopy. Give classification of molecule and explain symmetric top molecule with suitable example.

(iii) What are Rayleigh scattering and Raman scattering? Explain principle of stokes and anti-stokes lines with suitable example.

Q-2 Attempt following questions **14**

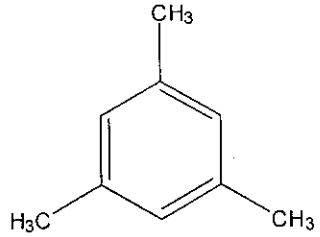
(i) What are the criteria for a nucleus to be NMR active? Explain factors affecting the chemical shift with suitable examples.

(ii) Define equivalent and non-equivalent protons in NMR with suitable examples

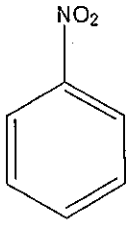
OR

(i) Find out D B E values for compounds: (a) C_6H_6 (b) $CH_3–C\cong C–CH_3$

(c)



(d)



(ii) Draw the schematic diagram of continuous wave method with proper labeling and describe its working.

Q-3 Attempt following questions 14

(i) How will you calibrate ESR spectrum using standard species. Calculate the ESR spectrum lines for AlH_3^-, $CH_3^\bullet$, and $H^\bullet$ species.

(ii) Explain the hyperfine coupling in ESR spectrum with suitable example.

OR

(i) The species, AlH_3^-, gives rise to a complex spectrum centered at 329.48 mT with microwave radiation of frequency 9.235 GHz. Compute the g-value for AlH_3^-. Given: $g = h\nu / \mu_B B$ where $h = 6.626\times10^{-34}$Js ν= 9.235 GHz, $\mu_B = 9.274'10^{-24}$ J $T^{-1}$and B = 329.48 mT

(ii) Draw cross section of klystron and show its importance in generating high frequency radio wave or microwave radiation.

Q-4 Attempt <u>any two</u> of following questions 14

(i) Give difference between flame photometry and Atomic absorption techniques.

(ii) Write a shot note on various sequences of flame atomizer.

(iii) Draw schematic diagram of single beam AAS with proper labeling.

(iv) Draw schematic diagram of composite burner and explain its working indetail

Q-5 Attempt following questions 14

(i) Explain following terms with respect to mass spectrum: (i) homolytic cleavage (ii) heterolytic cleavage (iii) retro-Diels-Alder reaction (iv) α-cleavage of σ-bond rapture

(ii) What is Molecular ion peak in Mass spectrum? Give few suitable examples of Molecular ion. Give possible mechanism for Molecule when exposed upon 70 ev ionization source.

(iii) Draw schematic diagram of Electrospray ionization (ESI) and explain its working.

OR

(i) Draw schematic diagram of Electro Impact Ionization and explain its working.

(ii) Why is it necessary to have data of HRMS? Explain with suitable examples.

(iii) How will you determine isotopes of Pb using mass spectrometry?