No. of Printed Pages : 4

MCH-003

P.G. DIPLOMA IN ANALYTICAL CHEMISTRY (PGDAC)

00186

Term-End Examination

June, 2014

MCH-003 : SPECTROSCOPIC METHODS

Time : 3 hours *Maximum Marks : 75*

Note : *Answer any **five** questions in all. Question no. **1** is compulsory.*

1. Answer any ***five*** of the following : *5×3=15*

(a) What do you understand by refraction of light ? State Snell's law.

(b) Explain why it is necessary to use quartz cuvettes while recording UV spectra.

(c) Explain spin-lattice and spin-spin relaxation processes.

(d) What are isotopic peaks ? Explain their utility.

(e) State the reasons for using argon gas as the plasma gas.

(f) Write briefly about sample handling devices in Raman Spectroscopy.

2. (a) What do you understand by the fingerprint region of an IR spectra ? Explain its significance. 5

(b) In what way is a diode array detector better than a photomultiplier tube ? 5

(c) Discuss clinical/biological applications of IR spectroscopy. 5

3. (a) List different factors that may affect the fluorescence characteristics of a molecule. 5

(b) The molar absorptivity of a substance is $1{\cdot}5 \times 10^4$ cm^{-1} mol^{-1} dm^3. Calculate the transmittance through a cuvette of path length 50 mm containing 2×10^{-6} mol dm^{-3} solution of the substance. 5

(c) State Franck – Condon principle and write its significance. 5

4. (a) Explain concentric type pneumatic nebuliser with the help of a neat diagram. 5

(b) Explain the principle of atomic fluorescence spectroscopy with the help of a schematic energy level diagram. 5

(c) What are the merits and limitations of flame photometry ? 5

5. (a) Explain how fluorimetric method is useful in the monitoring of SO_2 in the atmosphere. 5

(b) Why is flame photometry also called atomic flame emission spectrometry ? 5

(c) What kind of chemical interferences are found in flame photometry ? 5

6. (a) State any three fuel-oxidant mixtures used in AAS. Also write the reactions involved. 6

(b) Write a short note on Microwave Induced Plasma. 4

(c) What is meant by matrix modifier ? State its importance. 5

7. (a) Explain why tetramethylsilane (TMS) is used as reference material in NMR spectroscopy. 5

(b) Write briefly about inlet devices in mass spectrometry. 5

(c) Define Chemical shift. State its unit. Explain how lines due to chemical shift may be differentiated from those due to spin-spin splitting. 5

8. (a) Double focussing mass spectrometers yield better results – Justify. 5

(b) What are the conditions for McLafferty rearrangement ? Explain with suitable example. 5

(c) Arrange the following fragment ions in the order of their detection in the mass spectrometer, giving reasons :

$^{+}OCH_3$, $^{+}OCCH_3$, $^{+}CH_2CH_3$ 5