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MCH-003

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P.G. DIPLOMA IN ANALYTICAL CHEMISTRY (PGDAC)

Term-End Examination

June, 2012

MCH-003 : SPECTROSCOPIC METHODS

Time : 3 hours *Maximum Marks : 75*

Note : *Answer **five** questions in all. Question number **1** is **compulsory**.*

1. Answer ***any five*** of the following : **5x3=15**

(a) Explain the term-quantum yield.

(b) Describe the characteristics of electromagnetic radiations.

(c) State the advantages of FTIR instruments as compared to dispersive instruments.

(d) Explain spin-lattice and spin-spin relaxation processes with reference to NMR.

(e) Describe Fast Atom Bombardment method of ionization in mass spectrometry.

(f) Justify the blood red colour of thiocyanatoiron ion (III)

2. (a) Describe the quantitative applications of IR spectrometry. 5

(b) Atomic spectrum consists of sharp lines whereas molecular spectrum contains broad bands. Explain. 5

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

3. (a) Explain the factors on which fluorescence and phosphorescence depend. 5

(b) State Frank-Condon principle and write its significance. 5

(c) A compound of formula weight 280 absorbed 65% of the radiation at a certain wavelength in a 2 cm cell at a concentration of 15 mg/cm^3. Calculate molar absorptivity of the compound at this wavelength. 5

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

(b) Explain the processes which occur in flamephotometric analysis. 5

(c) Describe the construction of a premise burner with the help of a neat diagram. 5

5. (a) Write the quantitative applications of flamephotometry. 5

(b) What are the essential components of a fluorescence spectrometer ? Draw a schematic diagram and explain it. 6

(c) Explain how fluorimetric method is useful in the monitoring of SO_2 in the atmosphere. 4

6. (a) What are the advantages of using wet decomposition method in AAS measurements ? 5

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

(c) Plasma sources are most suitable for the purpose of atomization -excitation. Justify giving reasons. 5

7. (a) State the characteristics of tetramethylsilane (TMS) that make it a suitable choice to act as reference in NMR. 5

(b) Write short notes on the following : 6

(i) Inlet devices in mass spectrometry

(ii) Chemical ionization

(c) Define chemical shift. What are the factors which affect chemical shift ? 4

8. (a) Explain the importance of M+1 and M+2 peaks in the mass spectrometry. 5

(b) Although ionization is caused at low energies by electrons, a beam of energy of about 70 eV is used to record mass spectrum. 5

(c) What are the conditions for Mc Lafferty rearrangement ? Explain with a suitable example. 5