

**P.G. DIPLOMA IN ANALYTICAL CHEMISTRY
(PGDAC)**

Term-End Examination

December, 2014

00892

MCH-003 : SPECTROSCOPIC METHODS

Time : 3 hours

Maximum Marks : 75

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

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

- (a) Explain the working of a bolometer.
- (b) Why is it necessary to use linear region of the calibration plot for quantitative analysis ?
- (c) Explain chemical ionization with reference to mass spectrometry, with the help of reactions.
- (d) Explain shielding and deshielding mechanisms with reference to NMR spectroscopy.
- (e) Discuss the merits and limitations of flame photometry.
- (f) Explain the term – quantum yield.

2. (a) IR spectra of polyatomic molecules are of complex nature. Justify. 5
- (b) List essential components of FTIR spectrometer and explain the role of interferometer. 5
- (c) Briefly discuss applications of Raman spectroscopy. 5
3. (a) Differentiate between chemiluminescence and photoluminescence. 5
- (b) Explain the factors on which fluorescence and phosphorescence depend. 5
- (c) Describe the analysis of Al in water by fluorescence method. 5
4. (a) Draw a schematic diagram of Hollow Cathode Lamp. What is EDL ? 5
- (b) Describe the standard addition method in flame photometry analysis. 5
- (c) Why has AFS not found widespread acceptance as an analytical technique ? 5
5. (a) Write briefly about stepwise line fluorescence spectroscopy and thermally assisted fluorescence. 5
- (b) What are the essential components of a fluorescence spectrometer ? Explain with the help of a schematic diagram. 5
- (c) Describe any two types of spectral interferences in flame photometry. 5

6. (a) The ICP-AES is a better technique than AAS for quantitative analysis. Justify. 4
- (b) Briefly describe the working of a polychromator. 5
- (c) Draw a schematic diagram of a double beam AAS. State any two special features of AAS. 6
7. (a) Explain why it is advantageous to use a magnet with higher field strength in NMR spectroscopy. 5
- (b) Give the characteristics of TMS that make it a suitable choice as a reference in NMR. 5
- (c) State any two quantitative applications of mass spectrometry. 5
8. (a) Explain the following terms : 6
- (i) Nitrogen rule
- (ii) Metastable ions
- (iii) Index of Hydrogen Deficiency
- (b) Write briefly about Magnetic sector analyser in mass spectrometry. 5
- (c) The mass spectrum of butanoic acid gives a characteristic peak at $m/z = 60$. Explain the observation. 4
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