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Jan 2022

M.Sc. (Chem.) IIIrd SEMESTER

Analytical Techniques (CH-303A)

Time : 90 Minutes] [Max. Marks : 25

Instructions :

1. *It is compulsory to answer all the questions (1 mark each) of Part-A in short.*
2. *Answer any three questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART - A

1. (a) Arrange the following compounds $SnMe_3$, $SnCl_4$, $SnBr_4$, and SnI_4 in increasing order of their chemical shift values for Sn-119 NMR. (1)

(b) Give the significance of shimming in NMR before starting the collection of data from an NMR instrument. (1)

(c) Draw a graphical sketch of PES spectrum of Na atom and mention the number of peaks observed for the same. (1)

(d) Explain the reason why Hyperfine Interactions arise in EPR spectra? (1)

(e) The photoelectron spectrum of Xe atom obtained by ejection of electron from _____ orbital and giving rise to _____ states. (1)

(f) Which of the following species is ESR-active $VOSO_4$, $K_2Cr_2O_7$, $KMnO_4$, $[Co(NH_3)_6]Cl_3$ and why? (1)

(g) How many Kramers doublets are observed for tetragonally distorted Cr(III) complex in zero field splitting. (1)

(h) Define quadrupolar interaction in Mossbauer spectroscopy. (1)

(i) What do you understand by term T_2 relaxation in NMR spectroscopy? (1)

(j) Draw normal modes of vibrations for a bent AB_2 molecule. (1)

PART - B

2. (a) Sketch and explain Mossbauer spectra for $[Fe(CO)_5]$. (3)

(b) Explain with a flow chart the atomization process of $MgCl_2$ using AAS. (2)

3 (a) Write a note on significance of Resonance Raman spectroscopy in metalloprotiens. (2)

(b) Discuss the hyperfine splitting pattern for $.NH_2$ and methoxy methyl radical ($.CH_2OCH_3$) and DPPH. (3)

4. Explain the observation that the ^{19}F, ^{31}P, ^{1}H-NMR spectrum of HPF_2. (5)

5. (a) Explain shifting of g-value of transition elements. Also explain the effect of covalency factor on g-value. (3)

(b) Describe Koopman's Theorem. (2)

6. (a) Describe in detail methods to remove any *one* interference in FES. (3)

(b) Explain how addition of lanthanide shift reagents to the sample affects the NMR spectra. (2)