Roll No. ....

Total No. of Questions : 11] [Total No. of Printed Pages : 7

RJ-383

M.Sc. 3rd Semester (NEW / ATKT)
Examination - 2018
CHEMISTRY
Paper--I
Application of Spectroscopy-I

Time : 3 Hours] [Maximum Marks : 85

Note : *Attempt all questions.*

Section–A
(Objective Type Questions)

Note : *Objective type 10 Questions of 1½ mark each.*
$10 \times 1½ = 15$

1. Choose the correct option answer:

   (i) Which statement is *incorrect*

      (a) Square-planar Ni

      (b) Octahedral Cu(II) complexes are expected to suffer a Jahn- Teller distortion

      (c) Low-spin, octahedral Fe(II) complexes are diamagnetic

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      (d) High-spin, octahedral Cr(II) complexes are expected to suffer a Jahn- Teller distortion

   (ii) Which statement is incorrect?

      (a) Vanadium metal reacts with aqueous HNO_3

      (b) Manganese metal dissolves in dilute aqueous mineral acids

      (c) Cobalt metal does not liberate H_2 from aqueous mineral acids.

      (d) Zinc metal dissolves readily in dilute aqueous HCl and H_2SO_4.

   (iii) Assuming that on a 500 MHz NMR spectrometer the 15N 90⁰ pulse length is 35 μs at 60 dB and a higher decibel value means more power for a pulse, what is most likely the power setting for 15N WALTZ-16 decoupling over a 30 ppm bandwidth? http://www.onlinebu.com

      (a) 40 dB (b) 42 dB

      (c) 45 dB (d) 49 dB

   (iv) ¹³C chemical shift has a much wider range (~300 ppm) than¹ H (~10 ppm) because

      (a) the contribution of the diamagnetic shielding of ¹³C is much larger than ¹H due to the small ¹³C energy gap.

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(b) the contribution of the paramagnetic shielding of ^{13}C is much larger than ^1H due to the small ^{13}C energy gap.

(c) the electron density of ^1H is almost always spherically symmetrical.

(d) The reason is unknown.

(v) Certain NMR parameters are measured for the study of protein dynamics. Which of the following parameters is not measured for the protein dynamics? http://www.onlinebu.com

(a) $^{15}NT_1$ relaxation rate

(b) ^1H–^1H NOE

(c) ^1H–^{15}N NOE

(d) $^{15}NT_2$ relaxation rate

(vi) The nuclear relaxation characterized by T_1 relaxation is not

(a) spin-lattice relaxation

(b) longitudinal relaxation

(c) spin-spin relaxation

(d) relaxation along the z axis

(vii) Deuterated solvent in an NMR sample is used to

(a) stabilize the magnetic field

(b) set the chemical shift reference

(c) obtain good field homogeneity across the sample

(d) both (a) and (c)

(viii) The correct value of isomer shift (in Mossbauer spectra) and its explanation for Fe(II)-TPP and Fe(III) - TPP respectively from the following are: (TPP = Tetraphenylporphyrinate)

(a) $0.52 \, mms^{-1}$

(b) $0.45 \, mms^{-1}$

(c) Increase in s electron density

(d) Decrease in s electron density

(ix) In The 1H NMR Spectrum of $CH_3CH_2C\ell$, the Quartet for The CH_2 Group has A Coupling constant of 7 Hz. What is the coupling constant for the CH_3 Triplet?

(a) 0 (b) 3.5 (c) 7 (d) 10.5

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RJ-383 (4)

(x)   Electron in atom are held in atom due to

    (a)   coulombs force

    (b)   nuclear force

    (c)   atomic force

    (d)   both (a) and (b) ✓

Section–B

(Short Answer Type Questions)

Note :   *Short Answer Type 5 Questions of 5 marks each*
       with Internal choice.   5×5=25

2.   How to distinguish between 'allowed' and 'forbidden' transitions?

Or

Write about Laporte Selection Rule.

3.   How might you use vibrational spectroscopy to determine with an oxalate complex $M(C_2O_4)_2$ was square planar or tetrahedral?

Or

Determine all the IR active vibrations and sketch them for the CFC, CF_2Cl_2, another greendhouse gas.

4.   What is net magnetization and how does it apply to NMR.

Or

What is shielding and de shielding in NMR? Can you give me an example?

5.   Explain mechanism of measurement of shielding.

Or

Explain spin spin interaction of NMR.

6.   What is recoil? When ever a high energy particle/ projectile is released from a body at rest, the releasing body explain.

Or

What is mossbauer spectroscopy explain.

Section–C

(Long Answer Type Questions)   5×9=45

Note :   *Long Answer Type 5 Questions of 9 marks each*
       with Internal Choice.   5×9=45

7.   Describe the electronic structures of square-planar complexes

Or

Describe d-d Transitions in O_h and T_d Fields.

8.   Describe vibrational normal modes in polyatomic molecules.

Or

Discuss Raman depolarization ratio, force models & the isotope effect of vibrations using Raman spectroscopy.

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RJ-383   (6)

9. What properties should an "ideal" NMR probe have? How does probe tuning affect the quality of the NMR spectrum?

Or

Describe correlation for protons bonded to carbon aldehydic compound.

10. Following parameter required for NMR

Or

Discuss the spin spin coupling in NMR spectroscopy

11. Describe the mossbauer effect recoilless nuclear resonance absorption of gamma-radiation.

Or

Why it is difficult? The only suitable source of γ radiation is the excited nuclei of the same isotope in the course of radioactive decay.

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