**SRM IST RAMAPURAM -DEPARTMENT OF CHEMISTRY CHEMISTRY (18CYB101J) -QUESTION BANK**

**SEMESTER I (2020-2021)**

# PART- A MCQ WITH ANSWER

# MODULE -2

1. The different types of energies associated with a molecule are

# Electronic, Vibrational and Rotational energies

1. Dissociation energy
2. Potential energy
3. Kinetic energy
4. The nuclei with spin quantum number greater than can exhibit the NMR phenomenon.

# 0

1. 5
2. 10
3. -5
4. The number of different orientations which a magnetic nucleus can take is --.
5. 2I
6. 2I-1

# 2I+1

1. 4I
2. The selection rule for vibrational transition in simple harmonic oscillation is ----.
3. ΔJ = ±1

# ΔV = ±1

1. ΔJ = +1
2. ΔV = +1
3. Which of the following electronic transitions is forbidden in the H atom spectrum?
4. 1S →nP

# 1S →nS

1. 2P →nS
2. 2P →nD
3. Which of the following transitions between rotational energy levels is not allowed?

a) J=1 →J=0

b) J=1←J=2

c) J=0←J=1

# d) J=1←J=3

1. The wavenumbers are expressed in-----.
2. sec-1

# cm-1

1. cm.sec-1
2. cm2.sec-1
3. The electronic spectra are caused by -----.
4. Microwave
5. Radio waves

# UV-Visible rays

1. Infra-red rays
2. In K4[Fe(CN)6] the number of unpaired electrons in iron are?

# 0

1. 2
2. 3
3. 5
4. The tetrahedral complexes have coordination number
5. 3
6. 6

# 4

1. 8
2. The spin only magnetic moment value (in Bohr magneton units) of Cr(CO)6 is

**(a) 0** (b) 2.84 (c) 4.90 (d) 5.92

1. Potassium ferrocyanide is an example of
2. Tetrahedral

# Octahedral

1. Square Planar
2. Linear
3. In the complex compound K4[Ni(CN)4] oxidation state of nickel is?
4. -1

# 0

(c) +1

(d) +2

1. The spin only formula (µs) for octahedral complexes is

# a) (4S(S+1))1/2

b) (4S(S+1))1/2 + (L (L+1))1/2

c) (L (L+1))1/2

d) L(L+1)

1. The selection rule for microwave spectroscopy is

# ΔJ = ±1

1. ΔV = ±1
2. ΔJ = +1
3. ΔV = **±2**.
4. The spin only magnetic moment value (in Bohr magneton units) of Cr(CO)6 is

# a) 0

b) 2.84

c) 4.90

d) 5.92

1. The number of unpaired electrons in d6 low spin octahedral complex is

# 0

1. 1
2. 2
3. 3
4. The vibrational rotational spectrum is observedregion.

# near IR

1. microwave region
2. visible region
3. radiofrequency region
4. The crystal field splitting energy for octahedral and tetrahedral complexes is related as

# a) ∆t ≈ 4/9 ∆o

b) ∆t ≈ 1/2 ∆o

c) ∆o≈ 2 ∆t

d) ∆o ≈ 4/9 ∆t

1. Among the ligands NH3, en, CN-and CO the correct order of their increasing field strength, is
2. CO< NH3 <en< CN–

# NH3<en< CN–< CO

1. CN–< NH3< CO<en
2. en< CN–<NH3< CO
3. Which of the following octahedral complexes of Co (at. no.27) will be magnitude of Δoct be the highest?

**(a) [Co(CN)6] 3-** (b) [Co(C2O4)3] 3- (c) [Co(H2O)6] 3+ (d) [Co(NH3)6] 3+

1. The magnetic moment of [Co(NH3)6]CI3 is (a) 1.73

(b) 2.83

(c) 6.6

# (d) Zero

1. The magnetic moment (spin only) of [NiCI4]2-is

# 1.82 BM

1. 5.46 BM
2. 2.82 BM
3. 1.41 BM
4. The region of electromagnetic spectrum for nuclear magnetic resonance is
5. Microwave

# Radio frequency

1. Infrared
2. UV-rays
3. Which of the following cannot show a vibrational absorption spectrum?
4. OCS
5. H2O
6. CO2
7. **CH2 = C H2**
8. Presence of functional group in a compound can be established by using
9. Chromatography

# IR spectroscopy

1. Mass spectroscopy
2. X-ray diffraction
3. Which of the following molecules will not display an infrared spectrum?
4. CO2

# N2

1. H2O
2. SO2
3. Which of the following compounds is frequently used as an internal reference in proton NMR spectroscopy?

# TMS

1. TNS
2. DMF
3. DMSO
4. The electronic spectra lies within the region of
5. Infrared
6. Radio wave
7. Microwave

# Ultraviolet or Visible

1. Which of the following molecule is not homonuclear?
2. H2
3. N2 **c)NO** d)O2
4. The CFSE for a high spin d4 octahedral complex is

**a)-0.6∆oct**

1. **-1.8∆oct**
2. -1.6 ∆oct+P
3. -1.2∆oct
4. Which of the following molecules is IR active?
5. H2
6. N2
7. O2

# CO2

1. The allowed electronic transition of hydrogen atom
2. 3d-→1s

# 2p -→1s

1. 2pz-→2py
2. 2py-→2px
3. What is the coordination number and oxidation state for the cobalt atom in the compound [Co(NH3)5Cl]Cl2?

a) 4; +2

b) 5 ; +2

c) 6 ; +2

# d) 6 ;+3

1. Which of the following species will be diamagnetic?

# a) [Fe(CN)6] 4-

b) [FeF6] 3+

c) [Co(C2O4)3] 3-

1. [CoF6] 3-
2. How many unpaired electrons are there in a strong field complex [Co(NH3)Cl2]?

# Zero

* 1. One
  2. Two
  3. three

1. Which one of the following nuclei has a magnetic moment? a)12C

# 14N

* 1. 16O
  2. 32S

1. Co[(NH3)6] 3+ ion is:
2. Paramagnetic

# Diamagnetic

1. Ferromagnetic
2. Ferri magnetic
3. Which of the following molecules have infrared active vibrations?

# NO

* 1. CH4
  2. H2
  3. N2

1. The correct order of different types of energies is

# Eel>>Evib>>Erot>> E tr

* 1. Eel>>Erot>>Evib>> E tr
  2. Eel>>Evib>>Etr>> E rot
  3. Etr>>Evib>>Erot>> E el

1. Which statement is incorrect about H2O?

# It has four degrees of vibrational freedom.

* 1. It is non-linear.
  2. It undergoes symmetric and asymmetric stretching modes of vibration.
  3. It has three IR active modes of vibration.

1. For which of the following molecules could a pure rotational spectrum not be observed in the gas phase?
   1. HCl
   2. NO

# N2

* 1. CO

1. https://lh3.googleusercontent.com/8xwC75UlHeSLitsVdo5l0IjKnpMjKVSmeid581jVKXnZtRdO2npnK2LbDDck9fq1cZDYqGUZ5eEwz9Ly5aTXZ2SaoAVZhNPNA2-NfABhJPH3TrH-F97pzwZXI_Qjo--qGCfzta710bXHXLYWhich of hydrogens a-d in the following molecule gives a triplet signal in a normal 1H NMR spectrum?
   1. Hydrogen a
   2. Hydrogen b

# Hydrogen c

* 1. Hydrogen d

1. **Out of the given vibrational modes which one does not belong to IR spectroscopy?**
2. Stretching
3. Scissoring
4. Rocking

# Rolling

1. Select the device used to separate the radiation of specific wavelength from wavelength of a continuous spectra?

# Monochromator

1. Radiation source
2. Recorder
3. Processor
4. According to Beer's Law

# absorbance is proportional to both the path length and concentration of the absorbing species

1. absorbance is proportional to the log of the concentration of the absorbing species
2. absorbance is equal to P0 / P
3. absorbance is equal to transmittance
4. Fine lines observed in atomic absorption spectra along with narrow brand with peaks are produced by

# Electronic transition only

1. Vibrational transitions only
2. Rotational transitions only
3. Ro-vibrational transitions only
4. Which formula is correct for nuclear spins?
5. 2I
6. 2I-1

# 2I+1

1. 4I
2. What is the wavelength of ultra-violet region? A. 400 nm – 700 nm
3. 700 nm to 1000 nm
4. 400 nm to 1000 nm

# 10 nm to 400 nm

1. Which one is correct?

# Eel >Evib >Erot > E tr

1. E tr >Erot >Evib > Eel
2. Etr >Evib > Eel > E rot
3. Erot >Evib >Etr > E el
4. The nuclear magnetic resonance occurs in region of electromagnetic spectrum
5. Visible region

# Radiowave region

1. Infrared region
2. UV region
3. Which of the region of IR spectra cannot be same for two compounds?
4. Functional group region

# Fingerprint region

1. Low-frequency region
2. No specific region
3. Which of the following is not a type of bending molecular vibration?
4. Scissoring

# Symmetric Stretching

1. Wagging
2. Rocking
3. Presence of a functional group in a compound is investigated by
4. Chromatography

# IR spectroscopy

1. X-ray photoelectron spectroscopy
2. X-ray diffraction
3. Hydrogen bonding can be detected by

# IR

1. UV
2. XPS
3. XRD
4. The absorption or emission of light can be analysed using
5. Potentiometry
6. Conductometry

# Spectroscopy

1. Viscosity
2. The CFSE for a high spin d4 octahedral complex is:

# –0.6 Δoct

1. –0.8 Δoct
2. –0.4 Δoct
3. –0.2 Δoct
4. [Cr (CN)6]3– will be in nature:

# paramagnetic

1. diamagnetic
2. nonmagnetic
3. uniform
4. The magnetic moment for [Cr (CN)6]3– is approximately:

# 3.87 μB

1. 4.87 μB
2. 2.87 μB
3. 1.87 μB
4. Which is correct according to ligands in spectrochemical series:

# I– < Cl– < H2O <en

1. I– < Cl– < H2O = en
2. I– = Cl– < H2O <en
3. I– < Cl– = H2O <en
4. The electron acceptor in coordination complex is

# Metal ion

1. ligand
2. p-orbital
3. s-orbital
4. Which metal ion have d3 electronic configuration in the following complexes?

# A. [Cr(NH3)6]3+

B. [Co(OH2)6]2+

C. [Fe(CN)6]3-

D. [Ni(OH2)6]2+

1. From the following options, choose the heteronuclear diatomic molecules which are paramagnetic in nature?
2. HF and NO
3. HF and O2
4. NO and O2

# Only NO

1. Which complex ion will be having tetrahedral geometry?
2. [PdCl4]2–
3. [PtCl4]2–

# [NiCl4]2–

1. [AuCl4]2–

65. [Co(NH3)6]3+is

# Diamagnetic

1. paramagnetic
2. nonmagnetic
3. comagnetic
4. What is the coordination number of the metal in [Co (en) 2 Cl2] +
   1. 4
   2. 5

# 6

* 1. 3

1. Which of the following has square planar structure
   1. [NiCl4]2-
   2. [Ni(CO)4]

# C. [Ni(CN)4]2-

D. MnCl2

1. Which of the following molecule have infrared active vibrations?
   1. HCl
   2. CH4
   3. H2
   4. N2
2. Which rays have larger wavelengths?

# Gamma rays

* 1. Beta rays
  2. Microwave
  3. Visible light

1. Which one of the following transitions of an electron in hydrogen atom emits radiation of the lowest wavelength?
   1. n2=∞ to n1=2
   2. n2=4 to n1=3

# n2=2 to n1=1

* 1. n2=5 to n1=3

1. Which of the following is not an ambidentate ligand?
   1. CN-
   2. SCN-
   3. **NH3**
   4. NO2