DEPARTMENT OF CHEMISTRY

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

B.TECH (2018-2019)

Subject/Code: Chemistry/ 18CYB101J **Semester-I**

Module II

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

   a) Electronic, Vibrational and Rotational energies

   b) Dissociation energy

   c) Potential energy

   d) Kinetic energy

2. The correct order of different types of energies is

   a) **E_{el}>>E_{vib}>>E_{rot}>> E $_{tr}$**

   b) E_{el}>>E_{rot}>>E_{vib}>> E $_{tr}$

   c) E_{el}>>E_{vib}>>E_{tr}>> E $_{rot}$

   d) E_{tr}>>E_{vib}>>E_{rot}>> E $_{el}$

3. The region of electromagnetic spectrum for nuclear magnetic resonance is

   a) Microwave

   b) **Radio frequency**

   c) Infrared

   d) UV-rays

4. The electronic spectra in the visible range span

   a) 25000-72000 cm^{-1}

   b) 25000-50000 cm^{-1}

   c) 12500-25000 cm^{-1}

d) 15000-30000 cm^{-1}

5. Which of the following transitions are of weak intensities and lie in the visible region?

a) $n \rightarrow n^*$

b) $\sigma \rightarrow \sigma^*$

c) $\pi \rightarrow \pi^*$

d) $n \rightarrow \sigma^*$

6. Which of the following organic compound shows transition due to conjugation?

a) Alkenes

b) Saturated aliphatic ketones

c) Conjugated dienes

d) Alkanes

7. Vibrational spectroscopy involves the transitions falling in the spectral range of

a) 100-1000 cm^{-1}

b) 300-3000 cm^{-1}

c) 400-4000 cm^{-1}

d) 500-5000 cm^{-1}

8. Which of the following molecule have infrared active vibrations?

a) NO

b) CH_4

c) H_2

d) N_2

9. Which of the following **cannot** show a vibrational absorption spectrum?

a) OCS

b) H_2O

c) CO_2

d) C H_2 = C H_2

10. Presence of functional group in a compound can be established by using

    a) Chromatography

    b) **IR spectroscopy**

    c) Mass spectroscopy

    d) X-ray diffraction

11. The nuclei with spin quantum number greater than _____ can exhibit the NMR phenomenon.

    a) **0**

    b) 5

    c) 10

    d) -5

12. The number of different orientations which a magnetic nucleus can take is

    a) 2I

    b) 2I-1

    c) 2I+1

    d) 4I

13. The number of signals in 1-propanol are _____ while those in 2-propanol are _____

    a) **4, 3**

    b) 4, 2

    c) 2, 4

    d) 3, 4

14. In how many ways –CH_3 protons can couple with the protons on adjacent carbon atom relative to the external field.

a) 1

b) 2

c) 3

d) 4

[Explanation: In four ways $-CH_3$ protons can couple with the protons on adjacent carbon atom relative to the external field.]

15. Which of the following is inversely proportional to the chemical shifts positions (δ)?

a) Frequency of unknown group of protons

b) Frequency of TMS

c) Operating frequency of the instrument

d) Frequency of $CDCl_3$

16. Which of the following molecules will not display an infrared spectrum?

a) CO_2 **b) N_2** c) H_2O d) SO_2

17. Which one of the following nuclei has a magnetic moment?

a) ^{12}C **b) ^{14}N** c) ^{16}O d) ^{32}S

18. The selection rule for vibrational transition in simple harmonic oscillation is

a) $\Delta J = \pm 1$ **b) $\Delta V = \pm 1$** c) $\Delta J = +1$ d) $\Delta V = +1$

19. Which of the following electronic transition is forbidden in H atom spectrum?

a) 1S →nP **b) 1S →nS** c) 2P →nS d) 2P →nD

20. 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**

21. According to the Beer-Lambert Law, on which of the following does absorbance not depend?

a) **Colour of the solution** b) Concentration c) Extinction coefficient d) Path length

22. The electronic spectra lies within the region of _____

a) Infrared b) Radiowave c) Microwave **d) Ultraviolet or Visible**

23. The wavenumbers are expressed in

a) sec^{-1} **b) cm^{-1}** c) $cm.sec^{-1}$ d) $cm^2.Sec^{-1}$

24. Which of the following compounds is frequently used as an internal reference in proton NMR spectroscopy?

a) TMS b) TNS c) DMF d) DMSO

25. The electronic spectra are caused by

a) Microwave b) Radio waves **c) UV-Visible rays** d) Infra-red rays

27. $Co[(NH_3)_6]^{3+}$ ion is:

(a) Paramagentic

(b) Diamagnetic

(c) Ferromagnetic

(d) Ferri magnetic.

28. In K4[Fe(CN)6] the number of unpaired electrons in iron are :

(a) 0

(b) 2

(c) 3

(d) 5.

29. A complex compound in which the oxidation number of a metal is zero, is

(a) K4[Fe(CN)6]

(b) K3[Fe(CN)6]

(c) [Ni(CO)4]

(d) $[Pt(NH3)4]Cl_2$

30. The tetrahedral complexes have coordination number

(a) 3

(b) 6

(c) 4

(d) 8

31. Ethylene diamine is an example of

(a) Monodentate ligand

(b) Bidentate ligand

(c) Tridentate ligand

(d) Hexadentateligand.dinitrate

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

(a) 1.82 BM

(b) 5.46 BM

(c) 2.82 BM

(d) 1.41 BM

33. Among the ligands NH_3, en, CN-and CO the correct order of their increasing field strength, is

(a) CO< NH3 <en < CN–

(b) NH3< en< CN–< CO

(c) CN–< NH3< CO<en

(d) en< CN–<NH3< CO

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

(a) 0

(b) 2.84

(c) 4.90

(d) 5.92

35. Potassium ferrocyanide is an example of

(a) Tetrahedral

(b) Octahedral

(c) Square Planar

(d) Linear

36. Which of the following species will be diamagnetic?

(a) $[Fe(CN)_6]^{4-}$

(b) $[FeF_6]^{3+}$

(c) $[Co(C_2O_4)_3]^{3-}$

(d) $[CoF_6]^{3-}$

37. Which of the following octahedral complexes of Co (at. no.27) will be magnitude of Δ_{oct} be the highest?

(a) $[Co(CN)_6]^{3-}$

(b) $[Co(C_2O_4)_3]^{3-}$

(c) $[Co(H_2O)_6]^{3+}$

(d) $[Co(NH_3)_6]^{3+}$

38. The magnetic moment of $[Co(NH_3)_6]CI_3$ is

(a) 1.73

(b) 2.83

(c) 6.6

(d) Zero

39. In the complex compound $K_4[Ni(CN)_4]$ oxidation state of nickel is ?

(a) -1

(b) 0

(c) +1

(d) +2

40. The spin only formula (μ_s) 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)

41. The selection rule for microwave spectroscopy is

a) **$\Delta J = \pm 1$** b) $\Delta V = \pm 1$ c) $\Delta J = +1$ d) $\Delta V = +1$

42. Which of the following molecule is IR active?

a) H_2

b) N_2

c) O_2

d) **CO_2**

43. The reference used in NMR is

a) **TMS**

b) Water

c) KBr

d) Hexane

44. The allowed electronic transistion of hydrogen atom

a) **3d-→1s**

b) 2p -→1s

c) $2p_z$-→$2p_y$

d) $2p_y$-→$2p_x$

45. The correct order of different types of energies is

a) $E_{el} >> E_{vib} >> E_{rot} >> E_{tr}$

b) $E_{el} >> E_{rot} >> E_{vib} >> E_{tr}$

c) $E_{el} >> E_{vib} >> E_{tr} >> E_{rot}$

d) $E_{tr} >> E_{vib} >> E_{rot} >> E_{el}$

46. During the motion, if the centre of gravity of molecule changes, the molecule possess

a) Electronic energy

b) Rotational energy

c) **Translational energy**

d) Vibrational energy

47. 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
48. How many impaired electrons are there in a strong field complex $[Co(NH_3)Cl_2]$?
    a) **Zero**
    b) One
    c) Two
    d) three
49. The number of unpaired electrons in d6 low spin octahedral complex is

    a) 0 b) 1 c) 2 d) 3

50. The vibrational rotational spectrum is observed in ……region.

    a) near IR b) microwave region c) visible region d) radiofrequency region

51. In a rotational spectrum transitions are only observed between rotational levels of ΔJ = ?

    a) ± 1 b) ±2 c) ± ½ d) ± 3

52. In XPS the primary and secondary beams consist of

    a) X-ray photon, electron

b) electrons, X-ray photon

c) electrons, electrons

d) UV-photons, electrons