

SRM Institute of Science and Technology, Delhi-NCR campus, Modinagar  
B. Tech. First Year, MCQ Question Bank  
Chemistry, 18CYB101J

1. Molecular orbitals are filled not according to

- A. Aufbau Principle
- B. Pauli Exclusion Principle
- C. Hund's rule
- D. Huckel's rule

ANSWER: D

2. The donor atom of a ligand in coordination chemistry is

- A. Lewis acid
- B. a counter ion
- C. central metal ion
- D. ligand atom that shares e- pair with metal

ANSWER: D

3. Does a linear molecule show aromaticity?

- A. may show
- B. may not show
- C. both a and b
- D. can not show

ANSWER: D

4. The wave function is a linear combination of

- A. Vectors
- B. Eigen values
- C. Eigen Functions
- D. Operators

ANSWER: C

5. Antibonding molecular orbitals are formed by ..... of atomic orbitals.

- A. constructive interference
- B. destructive interference
- C. overlapping of atomic orbitals with two negative signs
- D. hybridization

ANSWER: B

6. For a particle in one dimensional box, potential energy  $V = \underline{\hspace{2cm}}$  inside the box.

- A. -1
- B.  $\infty$
- C. 0
- D. 1

ANSWER: C

7. The normalization constant for a particle in one-dimensional box is

- A. A
- B.  $2/a$
- C.  $a/2$
- D.  $\sqrt{2/a}$

ANSWER: D

8. The points inside the box where  $\psi=0$  are called

- A. Antinodes
- B. nodes
- C. radial points
- D. angular points

ANSWER: B

9. Energy of electron in the  $n$  th orbit of H- atom is proportional to

- A. square root of  $n$
- B. inverse square root of  $n$
- C. cube root of  $n$
- D.  $n$

ANSWER: B

10. The probability of finding a particle per unit volume is known as

- A. particle density
- B. probability density
- C. normalization
- D. orthogonalization

ANSWER: B

11. The wave function  $\Psi$  describes

- A. Intensity
- B. energy density
- C. state of the system
- D. probability

ANSWER: C

12. For a particle in one-dimensional box, the number of nodes ( $N$ ) and quantum number are related as

- A.  $N = n$
- B.  $N = n-1$
- C.  $N = 2n$
- D.  $N = n+1$

ANSWER: B

13. The maximum probability of finding the electron for the ground state hydrogen atom is found to be at

- A. 0.0529 nm
- B. 0.00529 nm
- C. 0.529 nm
- D. 0.158 nm

ANSWER: A

14. The carbon of aromatic benzene molecule is

- A. sp<sup>3</sup>d<sup>2</sup> hybridized
- B. sp hybridized
- C. sp<sup>2</sup> hybridized
- D. sp<sup>3</sup> hybridized

ANSWER: C

15. Aromatic compounds do not have

- A. planar structure
- B. 4n π-electrons in structure
- C. cyclic structure
- D. 4n+2 π-electrons in structure

ANSWER: B

16. Benzene is a ..... structure of two Kekule's structure

- A. hybrid
- B. meso
- C. monoclinic
- D. isomeric

ANSWER: A

17. X-ray photoelectron spectroscopy is also known as

- A. EPS
- B. ECS
- C. ESCA
- D. EAS

ANSWER: C

18. Which energy is responsible to release the electron in XPS?

- A. rotational energy
- B. gibbs energy
- C. binding energy
- D. free energy

ANSWER: C

19. In XPS, the photon ejects electrons from which orbital?

- A. 1s electron
- B. 3s electron
- C. 2s electron
- D. 2p electron

ANSWER: A

20. In Bragg's equation [ $n\lambda = 2d \sin\theta$ ], d is the:

- A. interplanar spacing
- B. inter spacing
- C. planar spacing
- D. extraplanar spacing

ANSWER: A

21. Which bond is weaker?

- A. van der Waals bond
- B. sigma bond
- C. coordination bond
- D. Ionic bond

ANSWER: A

22. Particles those are responsible for most of the properties

- A. Nucleons
- B. Protons
- C. Shell electrons
- D. Valence shell electrons

ANSWER: D

23. Which is correct?

- A.  $d \sin\theta = n\lambda$
- B.  $d = n\lambda \sin\theta$
- C.  $d = n\lambda \sin\theta$
- D.  $2d \sin\theta = n\lambda$

ANSWER: D

24. Which of the following elements has completely filled two shells?

- A. Ni
- B. Ne
- C. Na
- D. No

ANSWER: B

25. Electronic configuration 2,8 is related to

- A. Al+
- B. Al+2

C. Al+3

D. Al+4

ANSWER: C

26. Periodic table gives a platform for studying

- A. physical properties only
- B. chemical properties only
- C. not any property
- D. physical and chemical properties both

ANSWER: D

29. The nature of bond between two dissimilar atoms having different charges

- A. polar only
- B. non-polar only
- C. polar and non-polar both
- D. neutral

ANSWER: A

30. The geometry of  $[\text{PtCl}_4]^{2-}$  is

- A. tetrahedral
- B. octahedral
- C. square planar
- D. pyramidal

ANSWER: C

31. Miller indices is indicated by

- A. (hkl)
- B. (h,k,l)
- C. [h,k,l]
- D. {h,k,l}

ANSWER: A

32. Stereoisomerism is the study of ..... of the molecules

- A. 3D orientation
- B. 2D orientation
- C. 1D orientation
- D. No orientation

ANSWER: A

33. The isomers which are having same molecular formula but different configurations are called as

- A. Structural isomers
- B. Stereoisomers
- C. positional isomers

D. tautomers

ANSWER: B

34. Geometric isomers are different from

- A. Enantiomer
- B. diastereomer
- C. Both
- D. non-mirror images

ANSWER: A

35. Enantiomer are not

- A. Mirror image only
- B. achiral
- C. superimposable mirror images
- D. non-specific images

ANSWER: C

36. Joule/Kelvin is unit of

- A. energy
- B. entropy
- C. emf
- D. power

ANSWER: B

37. .... is a measure of randomness of a system.

- A. entropy
- B. internal energy
- C. heat flow
- D. enthalpy

ANSWER: A

38. Which one of the following thermodynamic quantities is a state function?

- A. Gibbs free energy
- B. temperature
- C. power
- D. work

ANSWER: A

39. The correct equation is-

- A.  $\Delta G = nF/E$
- B.  $\Delta G = n/FE$
- C.  $\Delta G = -nFE$
- D.  $\Delta G = F/nE$

ANSWER: C

40. Which of the following statement is correct about galvanic cell?

- A. oxidation takes place at the cathode
- B. reduction takes place at the cathode
- C. reduction takes place at the anode
- D. anode is negatively charged

ANSWER: B

41. Wet corrosion takes place on

- A. anode
- B. cathode
- C. near cathode
- D. near anode

ANSWER: A

42. Wet corrosion products are formed on

- A. anode
- B. cathode
- C. conducting medium
- D. near anode

ANSWER: B

43. Dry corrosion products are formed on

- A. anode
- B. cathode
- C. conducting medium
- D. near cathode

ANSWER: A

44. The rate of dry corrosion is ..... than wet corrosion

- A. lower
- B. faster
- C. average
- D. moderate

ANSWER: A

45. Passivation is due to formation of

- A. higher EMF
- B. lower EMF
- C. metal oxide layer on metal
- D. electrode potential

ANSWER: C

46. Total energy of a system remains constant according to

- A. first law of thermodynamics
- B. second law of thermodynamics
- C. third law of thermodynamics
- D. newton's law

ANSWER: A

47.  $E = E^\circ - [(2.303RT)/nF] \log_{10} [H^+]$  is the formula of .....

- A. Nernst equation
- B. Newton equation
- C. Gibbs equation
- D. Free energy equation

ANSWER: A

48. Which is used to differentiate d- and l-isomers?

- A. heat
- B. temperature
- C. polarized light
- D. pressure

ANSWER: C

49. An equal proportion of two enantiomers is called as a \_\_\_\_\_

- A. cis/trans mixture
- B. mirror image
- C. constitutional mixture
- D. racemic mixture

ANSWER: D

50. Which cyclic compound feels highest ring strain

- A. Cyclomethane
- B. Cyclopropane
- C. Cyclohexane
- D. Cyclopentane

ANSWER: B

51. Which of the following is used in the sulphonation of benzene?

- A. sulphuric acid
- B. nitric acid
- C. phosphoric acid
- D. acetic acid

ANSWER: A

52. Antipyretics are used to

- A. reduce body temperature
- B. reduce vomiting

- C. reduce nausea
- D. increase body temperature

ANSWER: A

53. Analgesics are used to

- A. reduce pain
- B. reduce nausea
- C. increase ache
- D. increase pain

ANSWER: A

54. Which statement about aspirin is false.

- A. Aspirin belongs to narcotic analgesics.
- B. It is effective in relieving pain.
- C. It has anticoagulant action.
- D. It is a neurologically active drug.

ANSWER: A

55. Which is most reactive species?

- A. free radical
- B. nucleophile
- C. electrophile
- D. cation

ANSWER:

56. Which is electron deficient species?

- A. free radical
- B. nucleophile
- C. electrophile
- D. anion

ANSWER: A

57. The name of OH<sup>-</sup> ligand is

- A. Hydroxy
- B. hydroxide
- C. hydroxo
- D. hydroxyl

ANSWER: C

58. Iso cyano is the name of ..... Ligand

- A. CN<sup>-</sup>
- B. NC<sup>-</sup>
- C. NCS<sup>-</sup>
- D. SCN<sup>-</sup>

ANSWER: B

59. If the sign of wave function remains unaffected upon reflecting an orbital about its centre, the orbital is known as \_\_\_\_\_

- A. Gerade
- B. Ungerade
- C. Gerade as well as Ungerade
- D. Centralized

ANSWER: A

60. Molecular orbitals are being filled as per the \_\_\_\_\_

- A. The Aufbau Principle
- B. Pauli Exclusion Principle
- C. Hund's rule of maximum multiplicity
- D. All of the mentioned

ANSWER: D

61. The correct option as per the MOT

- A. The bond order of O<sub>2</sub> is 2.5 and it is paramagnetic
- B. The bond order of O<sub>2</sub> is 1.5 and it is paramagnetic
- C. The bond order of O<sub>2</sub> is 2 and it is diamagnetic
- D. The bond order of O<sub>2</sub> is 2 and it is paramagnetic

ANSWER: D

62. Which one is incorrect from the following options.

- A. Electron density is low in the region between the nuclei of bonded atoms in case of bonding MO.
- B. Antibonding MO is higher in energy than atomic orbitals from which it is formed
- C. Every electron in bonding MO contributes toward stability of the molecule
- D. Antibonding takes place when lobes of atomic orbitals have different signs

ANSWER: A

63. Which of the following properties is most likely to be retained during the process of corrosion?

- A. Malleability
- B. Ductility
- C. Conductivity
- D. Colour

ANSWER: D

64. The reason for conductivity of electrolytic conductors is \_\_\_\_\_

- A. Flow of free mobile electrons
- B. Movement of ions
- C. Either movement of electrons or ions

D. Cannot be said

ANSWER: B

65. Which corrosion product is volatile in nature \_\_\_\_\_.

A. Fe<sub>2</sub>O<sub>3</sub>

B. MoO<sub>3</sub>

C. Fe<sub>3</sub>O<sub>4</sub>

D. FeO

ANSWER : B

66. The area in which electrochemical corrosion takes place is

A. Anodic area

B. Cathodic area

C. Near cathode

D. Near anode

ANSWER: A

67. In anodic reaction of corrosion metal is dissolved by releasing \_\_\_\_\_.

A. Pair of electron

B. Free electron

C. Ions

D. Current in electrolytic solution.

ANSWER: B

68. The green film of formed on the surface during corrosion of Cu contains CuCO<sub>3</sub> and

\_\_\_\_\_.

A. BaCO<sub>3</sub>

B. Ba(OH)<sub>2</sub>

C. Cu(OH)<sub>2</sub>

D. CuO

ANSWER: C

69. What is the value of average kinetic energy per molecule \_\_\_\_\_.

A.  $(\frac{3}{2})kT$

B.  $(\frac{3}{2}) RT$

C.  $(\frac{1}{2})kT$

D.  $(\frac{1}{2}) RT$

ANSWER: A

70. Which one has the highest value of first ionisation energy \_\_\_\_\_.

A. Hydrogen

B. Helium

C. Lithium

D. Sodium

ANSWER: B

71. The low solubility of beryllium sulphate in water is due to \_\_\_\_\_.

- A. High inflammable energy
- B. Low Energy of dissociation
- C. Low inflammable energy
- D. Ionic bond

ANSWER: B

72. Choose the correct option regarding the formation of a chemical bond \_\_\_\_\_.

- A. Energy is always absorbed
- B. Energy is always released
- C. More energy is released than is absorbed
- D. Energy is neither released nor absorbed

ANSWER: B

73. Electrons residing in the same orbital will have \_\_\_\_\_.

- A. Same spin
- B. Opposite spin
- C. Same or opposite spin
- D. No spin

ANSWER: B

74. The reason for greater strength of diamond as compared to graphite is \_\_\_\_\_.

- A. Difference in layers of atoms
- B. Tetrahedral structure of diamond
- C. Difference of crystalline structures
- D. Lusture of diamond

ANSWER: B

75. Polythene is industrially manufactured from \_\_\_\_\_.

- A. Methane
- B. Styrene
- C. Acetylene
- D. Ethylene

ANSWER: D

76. The chemical formula of aspirin is

- A. Methoxy benzoic acid
- B. Methyl Salicilate
- C. Acetyl Salicilic acid
- D. Phenyl Salicilate

ANSWER: C

77. The correct statement about the atomic of the alkaline earth metals is \_\_\_\_\_.

- A. it is smaller than corresponding alkali metals in the same periods
- B. it is larger than corresponding alkali metals in the same periods
- C. It is same as the corresponding alkali metals in the same periods
- D. None of the above

ANSWER: A

78. The general electronic configuration of outermost orbital in the elements of Group 13 is \_\_\_\_\_.

- A. ns<sub>2</sub> np<sub>2</sub>
- B. ns<sub>2</sub>
- C. ns<sub>2</sub> np<sub>1</sub>
- D. ns<sub>2</sub> np<sub>3</sub>

ANSWER: C

79. The correct statement about the variation of electronegativity in a group of the periodic table

- A. It increases
- B. It decreases
- C. It remains constant
- D. All of the above

ANSWER: B

80. The correct reason for the increase in the electronegativity across a period in periodic table

- A. attraction between the valence electrons and the nucleus increases
- B. attraction between the valence electrons and the nucleus decreases
- C. increase in the atomic weight
- D. decrease in the atomic weight

ANSWER: A

81. The correct statement about cell potential is \_\_\_\_\_.

- A. sum of the electrode potentials of the cathode and anode
- B. difference between the electrode potentials of the cathode and anode
- C. half of the sum of the electrode potentials of the cathode and anode
- D. twice the difference between the electrode potentials of the cathode and anode

ANSWER: B

82. The correct statement about methane is \_\_\_\_\_.

- 1. The largest reservoir of methane on earth is under the permafrost at arctic and Antarctic
- 2. Methane has a tetrahedral structure and also known as Hydrogen Carbide
- 3. Methane can be produced by Serpentinite method

Select the correct option from codes given below:

- A. Only 1 & 2

- B. Only 1 & 3
- C. Only 2 & 3
- D. 1, 2 & 3

ANSWER: C

83. What is the reason for variable valency of transition metals

- A. Release of electrons from ns orbitals
- B. Release of electrons from np orbitals
- C. Release of electrons from (n-1)d orbitals
- D. Release of electrons from (n-1)d & ns orbitals

ANSWER: C

84. The enthalpy change in an exothermic reaction is shown with

- A. negative values
- B. positive values
- C. neutral
- D. constant

ANSWER: A

85. The incorrect statement about entropy is

- A. S(monoclinic) > S(rhombic)
- B. C(diamond) > C(graphite)
- C. H<sub>2</sub>O(g) > H<sub>2</sub>O(l)
- D. O<sub>3</sub>(g) > O<sub>2</sub>(g)

ANSWER: B

86. The Gibbs free energy change in a spontaneous process is equal to the

- A. heat content of the system
- B. entropy change of the system
- C. work of expansion
- D. useful work

ANSWER: D

87. Which of the following is a state function?

- A. q
- B. w
- C.  $q_{rev}/T$
- D. qw

ANSWER: C

88. The concept of matter wave was suggested by

- A. Heisenberg
- B. Schrodinger
- C. De Broglie

D. Niels Bhor

ANSWER: C

89. The operator  $\nabla^2$  is called operator

- A. Hamiltonian
- B. Poisson
- C. Laplacian
- D. Vector

ANSWER: A

90. The shape of s-orbital?

- A. Sphere
- B. Dumbbell
- C. Pear-shaped lobe
- D. Conical

ANSWER: A

91. Developing year of Valence Bond Theory was?

- A. 1925
- B. 1927
- C. 1929
- D. 1932

ANSWER: B

92. The Valence Bond Theory was developed by?

- A. Heitler and London.
- B. Bhor
- C. Linus Pauling
- D. Pauli

ANSWER: C

93. The s-orbital does not show preference to any direction because \_\_\_\_\_

- A. It is the smallest orbital
- B. It is present in every atom
- C. It is spherically symmetric
- D. It is the first orbital

ANSWER: C

94. Schrodinger equation in shorter form is given by  $\hat{H} \Psi =$

- A. EH
- B. E
- C.  $E\Psi$
- D. G

ANSWER: C

95. Which of the following molecule is not homonuclear?

- A. H<sub>2</sub>
- B. N<sub>2</sub>
- C. CO
- D. O<sub>2</sub>

ANSWER: C

96. Which of the following molecule is homonuclear?

- A. HF
- B. NO<sub>2</sub>
- C. NO
- D. O<sub>2</sub>

ANSWER: D

97. The shape of a p orbital is?

- A. Sphere
- B. Dumbbell
- C. Pear-shaped lobe
- D. Cuboid

ANSWER: B

98. The interaction between a pair of orbitals of the same type is \_\_\_\_\_

- A. Attractive
- B. Repulsive
- C. There is no interaction
- D. None of the mentioned

ANSWER: B

99. Potential energy of a particle outside the box is

- A. 1
- B. Infinity
- C. Zero
- D. Finite

ANSWER: A

100. The most stable free radical among the following is

- A. C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>CH<sub>2</sub>
- B. C<sub>6</sub>H<sub>5</sub>CHCH<sub>3</sub>
- C. CH<sub>3</sub>CH<sub>2</sub>
- D. CH<sub>3</sub>CHCH<sub>3</sub>

ANSWER: B

101. Geometrical Isomerism is shown by

- A. CH<sub>2</sub>=C(Br)I

- B.  $\text{CH}_3\text{CH}=\text{C}(\text{Br})\text{I}$
- C.  $(\text{CH}_3)_2\text{C}=\text{C}(\text{Cl})\text{Br}$
- D.  $\text{CH}_3\text{CH}=\text{CCl}_2$

ANSWER: B

102. Which of the following outer electronic configurations is characteristic of alkali metals

- A.  $\text{ns}^1$
- B.  $\text{ns}^2$
- C.  $\text{ns}^2\text{np}^6$
- D.  $\text{ns}^2\text{np}^2$

ANSWER: A

103. Group 2 elements are

- A. oxidizing agents
- B. reducing agents
- C. oxidizing as well reducing agents
- D. microbial agents

ANSWER: A

105. Paramagnetism is common in

- A. p- block elements
- B. d- block elements
- C. s- block elements
- D. f- block elements

ANSWER: B

106. d- block elements form coloured ions because

- A. They absorb some energy for d – s transition
- B. They absorb some energy for p – d transition
- C. They absorb some energy for d – d transition
- D. They do not absorb any energy

ANSWER: C

107. Which of the following elements involves gradual filling of 5f level

- A. Lanthanides
- B. Actinides
- C. Transition metals
- D. Coinage metals

ANSWER: B

108.  $\text{KMnO}_4$  acts as an oxidizing agent in

- A. Acidic medium only
- B. Neutral and acidic medium
- C. Neutral and alkaline medium
- D. Neutral, acidic and alkaline medium

ANSWER: D

109. The hardness of water is measure by

- A. EDTA method

- B. Distillation method
- C. Conductivity method
- D. Viscosity method

ANSWER: A

110. What is the coordination number of the metal in  $[\text{Co}(\text{en})_2\text{Cl}_2]^+$

- A. 4
- B. 5
- C. 6
- D. 3

ANSWER: C

111. Which of the following has square planar structure

- A.  $[\text{NiCl}_4]^{2-}$
- B.  $[\text{Ni}(\text{CO})_4]$
- C.  $[\text{Ni}(\text{CN})_4]^{2-}$
- D.  $\text{MnCl}_2$

ANSWER: C

112. The drugs used to get relief from pain are called

- A. Antipyretics
- B. Analgesics
- C. Antibiotics
- D. Antiseptics

ANSWER: B

113. The chemical extracted from the plant Rauwolfia serpentine is

- A. Aspirin
- B. Quinine
- C. Bithional
- D. Reserpine

ANSWER: D

114. The de Broglie equation applies to

- A. Electrons only
- B. Protons only
- C. Neutrons only
- D. All the material objects in motion

ANSWER: C

115. The number of nodal planes in a  $p_x$  orbital is

- A. One
- B. Two
- C. Three
- D. Zero

ANSWER: A

116. As compared to bonding MO, the antibonding MO has

- A. Higher energy
- B. Lower energy
- C. Equal energy
- D. Unpredictable value of energy

ANSWER: A

117. Out of the given vibrational modes which one does not belong to IR spectroscopy?

- A. Stretching
- B. Scissoring
- C. Rocking
- D. Rolling

ANSWER: D

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

- A. Monochromator
- B. Radiation source
- C. Recorder
- D. Processor

ANSWER: A

119. According to Beer's Law

- A. absorbance is proportional to both the path length and concentration of the absorbing species
- B. absorbance is proportional to the log of the concentration of the absorbing species
- C. absorbance is equal to  $P_0 / P$
- D. absorbance is equal to transmittance

ANSWER: A

120. Fine lines observed in atomic absorption spectra along with narrow band with peaks are produced by

- A. Electronic transition only
- B. Vibrational transitions only
- C. Rotational transitions only
- D. Ro-vibrational transitions only

ANSWER: A

121. Which is incorrect about aromaticity?

- A. It must be planar
- B. It must be conjugated
- C. Cyclic delocalization takes place
- D. It must not obey Huckel's rule

ANSWER: D

122. Carbon monoxide has a ..... bond order

- A. 3
- B. 5
- C. 1
- D. 1/2

ANSWER: A

123. What is the bond order in H<sub>2</sub>?

- A. 3.0
- B. 2.0
- C. 1.5
- D. 1.0

ANSWER: D

124. Which formula is correct for nuclear spins?

- A. 2I
- B. 2I-1
- C. 2I+1
- D. 4I

ANSWER: C

125. What is the wavelength of ultra-violet region?

- A. 400 nm – 700 nm
- B. 700 nm to 1000 nm
- C. 400 nm to 1000 nm
- D. 10 nm to 400 nm

ANSWER: D

126. Which one is correct?

- A. Eel > Evib > Erot > E tr
- B. E tr > Erot > Evib > Eel
- C. Etr > Evib > Eel > E rot
- D. Erot > Evib > Etr > E el

ANSWER: A

127. The nuclear magnetic resonance occurs in region of electromagnetic spectrum

- A. Visible region
- B. Radiowave region
- C. Infrared region
- D. UV region

ANSWER: B

128. Which of the region of IR spectra cannot be same for two compounds?

- A. Functional group region
- B. Fingerprint region
- C. Low-frequency region
- D. No specific region

ANSWER: B

129. Which of the following is not a type of bending molecular vibration?

- A. Scissoring
- B. Symmetric Stretching
- C. Wagging
- D. Rocking

ANSWER: B

130. Presence of a functional group in a compound is investigated by

- A. Chromatography
- B. IR spectroscopy
- C. X-ray photoelectron spectroscopy
- D. X-ray diffraction

ANSWER: B

131. Hydrogen bonding can be detected by

- A. IR
- B. UV
- C. XPS
- D. XRD

ANSWER: A

132. The absorption or emission of light can be analysed using \_\_\_\_\_

- A. Potentiometry
- B. Conductometry
- C. Spectroscopy
- D. Viscosity

ANSWER: C

133. The CFSE for a high-spin d<sub>4</sub> octahedral complex is:

- A. -0.6 Δ<sub>oct</sub>
- B. -0.8 Δ<sub>oct</sub>
- C. -0.4 Δ<sub>oct</sub>
- D. -0.2 Δ<sub>oct</sub>

ANSWER: A

134. [Cr(CN)<sub>6</sub>]<sup>3-</sup> will be ..... in nature:

- A. paramagnetic
- B. diamagnetic

C. nonmagnetic

D. uniform

ANSWER: A

135. The magnetic moment for  $[\text{Cr}(\text{CN})_6]^{3-}$  is approximately:

A. 3.87  $\mu\text{B}$

B. 4.87  $\mu\text{B}$

C. 2.87  $\mu\text{B}$

D. 1.87  $\mu\text{B}$

ANSWER: A

136. Which is correct according to ligands in spectrochemical series:

A.  $\text{I}^- < \text{Cl}^- < \text{H}_2\text{O} < \text{en}$

B.  $\text{I}^- < \text{Cl}^- < \text{H}_2\text{O} = \text{en}$

C.  $\text{I}^- = \text{Cl}^- < \text{H}_2\text{O} < \text{en}$

D.  $\text{I}^- < \text{Cl}^- = \text{H}_2\text{O} < \text{en}$

ANSWER: A

137. The electron acceptor in coordination complex is

A. Metal ion

B. ligand

C. p-orbital

D. s-orbital

ANSWER: A

138. Which metal ion have d<sub>3</sub> electronic configuration in the following complexes?

A.  $[\text{Cr}(\text{NH}_3)_6]^{3+}$

B.  $[\text{Co}(\text{OH}_2)_6]^{2+}$

C.  $[\text{Fe}(\text{CN})_6]^{3-}$

D.  $[\text{Ni}(\text{OH}_2)_6]^{2+}$

ANSWER: A

139. Which method is used in XRD?

A. Lawe method

B. Leue method

C. Liue method

D. Laue method

ANSWER: D

140. Which one is having largest atomic radii?

A. Oxygen

B. Nitrogen

C. Fluorine

D. Lithium

ANSWER: B

141. Which statement is incorrect?

- A. At constant pressure,  $\Delta H = \Delta E + P \Delta V$
- B. The thermodynamic symbol for enthalpy is H.
- C. Gibbs free energy is a state function.
- D. For an endothermic process,  $\Delta H$  is not positive.

ANSWER: D

142. The purpose of the salt bridge in an electrochemical cell is to \_\_\_\_\_.

- A. increase electrons
- B. maintain electrical neutrality
- C. decrease electrons
- D. decrease electrical neutrality

ANSWER: B

143. As per the HSAB principle ionic bond is formed when

- A. soft acid combines with hard bases
- B. hard acid combines with soft bases
- C. hard acid combines with hard bases
- D. hydrogen combination with acid

ANSWER: C

144. The potential energy of n-butane is not maximum for \_\_\_\_\_.

- A. Skew conformations
- B. Staggered conformations
- C. Eclipsed conformations
- D. Gauche

ANSWER: B

145. Which of the following acts as catalyst in the nitration of benzene?

- A. Conc. HCl
- B. Conc. H<sub>2</sub>SO<sub>4</sub>
- C. both A and B
- D. H<sub>3</sub>PO<sub>4</sub>

ANSWER: B

146. The aldehydes give ..... on treated with Lithium aluminium hydride.

- A. Alcohols
- B. benzene
- C. toluene
- D. furan

ANSWER: A

147. The Dieckmann condensation reaction gives

- A. Alkane
- B. cyclic  $\beta$ -ketoesters
- C. alocohol
- D. acyclic  $\beta$ -ketoesters

ANSWER: B

148. Paracetamol is synthesized from

- A. o-aminophenol and acetic anhydride
- B. p-aminophenol and acetic anhydride
- C. methyl amine and phenol
- D. phenol and amine

ANSWER: B

149. Aspirin is chemically known as.....

- A. methyl salicylic acid
- B. phenyl salicylic acid
- C. acetylsalicylic acid
- D. methanol

ANSWER: C

150. Bond angle in  $\text{PCl}_5$  molecule are \_\_\_\_\_

- A.  $120^\circ$  and  $60^\circ$
- B.  $120^\circ$  and  $90^\circ$
- C.  $120^\circ$  and  $180^\circ$
- D. None of these

ANSWER: B

151. Shape of  $\text{H}_2\text{O}$  molecule is \_\_\_\_\_

- A. Tigonal Planar
- B. Linear
- C. Angular or bent structure
- D. Tetrahedral

ANSWER: C

152. The total probability of finding the electron in a orbital must be

- A. Zero
- B. One
- C. Infinity
- D. Double

ANSWER: B

153. Which one is the correct expression for uncertainty principle

- A.  $\Delta X \cdot \Delta p \geq h/4\pi$
- B.  $\Delta X \cdot \Delta p \geq h/2\pi$
- C.  $\Delta E \cdot \Delta t \leq h/4\pi$
- D. None of these

ANSWER: A

154. An atom has two unpaired electrons. The total spin of this atom will be

- A. 0
- B. 1
- C. 1.5
- D. 2

ANSWER: B

155. Energy expression of a particle in one dimensional box is

- A.  $n^2 h^2 / 4mL^2$
- B.  $n^2 h^2 / 6mL^2$
- C.  $n^2 h^2 / 8mL^2$
- D.  $n^2 h^2 / mL^2$

ANSWER: C

156. From the following options, choose the heteronuclear diatomic molecules which are paramagnetic in nature?

- A. HF and NO
- B. HF and O<sub>2</sub>
- C. NO and O<sub>2</sub>
- D. Only NO

ANSWER: D

157. The bond order of O<sub>2</sub> molecule on the basis of molecular orbital theory .....

- A. is 2 and it is paramagnetic
- B. is 2.5 and it is paramagnetic
- C. is 1.5 and it is paramagnetic
- D. is 2 and it is diamagnetic

ANSWER: A

158. When  $\psi(x) = \psi(-x)$  the function is

- A. Symmetric
- B. antisymmetric
- C. sine
- D. finite

ANSWER: A

159. Which complex ion will be having tetrahedral geometry?

- A. [PdCl<sub>4</sub>]<sup>2-</sup>

- B.  $[\text{PtCl}_4]^{2-}$
- C.  $[\text{NiCl}_4]^{2-}$
- D.  $[\text{AuCl}_4]^{2-}$

ANSWER: C

160.  $[\text{Co}(\text{NH}_3)_6]^{3+}$  is

- A. Diamagnetic
- B. paramagnetic
- C. non magnetic
- D. comagnetic

ANSWER: A

161. Which dissolves in water according to Fajans rule?

- A. silver fluoride
- B. silver fluoride
- C. silver bromide
- D. silver iodide

ANSWER: A

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

- A. HCl
- B. CH<sub>4</sub>
- C. H<sub>2</sub>
- D. N<sub>2</sub>

ANSWER: A

163. Ketones gives ..... upon reduction.

- A. 1° alcohols
- B. 2° alcohols
- C. 3° alcohols
- D. Alkenes

ANSWER: B

164. Primary amines are formed upon ..... of Primary amides.

- A. reduction
- B. oxidation
- C. acylation
- D. alkylation

ANSWER: B

165. Which ..... nomenclature not used to differentiate enantiomers?

- A. R/S
- B. E/Z
- C. +/−

D. D/L

ANSWER: B

166. Ion etching technique provides the ..... from the surface.

- A. depth profiling
- B. round profiling
- C. vertical profiling
- D. horizontal profiling

ANSWER: A

167. X-ray diffractometers can not analyze .....

- A. Metals
- B. Liquids
- C. Polymers
- D. Solids

ANSWER: B

168. XRD can be used to analyze the samples .....

- A. quantitatively
- B. qualitatively
- C. quantitatively and qualitatively both
- D. Either quantitatively or qualitatively

ANSWER: C

169. Which rays have larger wavelengths?

- A. Gamma rays
- B. Beta rays
- C. Microwave
- D. Visible light

ANSWER: A

170. The best class of drugs is based upon\_\_\_\_\_.

- A. chemical structure.
- B. drug action.
- C. molecular targets.
- D. pharmacological effect

ANSWER: C

171. Which is the example of elimination reaction?

- A. Hydration
- B. Dehydration
- C. Halogenation
- D. alkylation

ANSWER: B

172.  $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$  is chemical formula for

- A. iron catalyst
- B. iron metal
- C. hydroxyapatite
- D. rust

ANSWER: D

173. Correct set of four quantum numbers for the valence (outermost) electron of Rubidium ( $Z=37$ ) is:

- A. 5, 0, 0,  $+\frac{1}{2}$
- B. 5, 1, 0,  $+\frac{1}{2}$
- C. 5, 1, 1,  $+\frac{1}{2}$
- D. 6, 0, 0,  $+\frac{1}{2}$

ANSWER: A

174. Which hydrogen like species will have same radius as that of Bohr's first orbit of hydrogen atom?

- A.  $n=2$ ,  $\text{Li}^{2+}$
- B.  $n=2$ ,  $\text{Be}^{3+}$
- C.  $n=2$ ,  $\text{He}^+$
- D.  $n=3$ ,  $\text{Li}^{2+}$

ANSWER: B

175. The number of radial nodes of 3s and 2p orbitals are respectively :

- A. 2, 0
- B. 0, 2
- C. 1, 2
- D. 2, 11

ANSWER: B

176. Uncertainty in position of a particle of 25 g in space is 10<sup>-5</sup> m. Hence, uncertainty in velocity ( $\text{m s}^{-1}$ ) is: (Planck's constant,  $h = 6.6 \times 10^{-34} \text{ J s}$ )

- A.  $2.1 \times 10^{-28}$
- B.  $2.1 \times 10^{-34}$
- C.  $0.5 \times 10^{-34}$
- D.  $5.0 \times 10^{-24}$

ANSWER: A

177. Which one of the following transitions of an electron in hydrogen atom emits radiation of the lowest wavelength?

- A.  $n_2=\infty$  to  $n_1=2$
- B.  $n_2=4$  to  $n_1=3$
- C.  $n_2=2$  to  $n_1=1$

D.  $n_2=5$  to  $n_1=3$

ANSWER: C

178. Which of the following is not an ambidentate ligand ?

- A.  $\text{CN}^-$
- B.  $\text{SCN}^-$
- C.  $\text{NH}_3$
- D.  $\text{NO}_2$

ANSWER: C

179. The compound of the formula  $\text{CH}_3\text{CO}(\text{CH}_2)_5\text{CH}=\text{CH}-\text{COOH}$  would be expected to

- I: rotate the plane polarised light
- II: contain chiral centre
- III: Contain three stereocentres
- IV: show geometrical isomerism

- A. only I, II, III correct
- B. only II, IV correct
- C. I, II, III, IV correct
- D. only IV correct

ANSWER: D

180. Which isomers are not separable from their mixture by any physical method of separation?

- 1. Enantiomers
- 2. Conformational isomers
- 3. Geometrical isomers
- 4. Functional isomers

- A. only 1 and 2 correct
- B. only 4
- C. 1, 2, 3, 4
- D. only 2,3

ANSWER: D

181. The relative energies order of molecular orbitals in increasing order to be as follows.

$$(\sigma_{1s}) < (\sigma^*_{1s}) < (\sigma_{2s}) < (\sigma^*_{2s}) < [(\pi_{2py})(\pi_{2pz})] < (\sigma_{2px}) < [(\pi^*_{2py})(\pi^*_{2pz})] < (\sigma^*_{2px})$$

- A. For  $\text{O}_2$  to  $\text{Ne}_2$
- B. For  $\text{H}_2$  to  $\text{N}_2$
- C. For  $\text{H}_2$  to  $\text{Ne}_2$
- D. For  $\text{N}_2$  to  $\text{Ne}_{2+}$

ANSWER: B

182. Order of the following molecules in increasing stability is?

- A.  $\text{N}_2 < \text{N}_2^- < \text{N}_2^{2-}$
- B.  $\text{N}_2^{2-} < \text{N}_2^- < \text{N}_2^+$
- C.  $\text{N}_2^{2-} < \text{N}_2^- < \text{N}_2$
- D.  $\text{N}_2 < \text{N}_2^+ < \text{N}_2^{2-}$

ANSWER: C

183. Bond Order of  $\text{O}_2$ ,  $\text{N}_2$  are ..... respectively?

- A. +1, +2
- B. +2, +3
- C. +2, +1
- D. +3, +2

ANSWER: B

184. The combination of H ( $1s^1$ ) and F ( $2px^1$ ) gives \_\_\_\_\_

- A. Bonding orbital
- B. Antibonding orbital
- C. Both bonding and antibonding orbital
- D. P-orbital

ANSWER: C

185. Ground state energy of an electron in an infinite 1dimensional box of width of  $1\text{\AA}$ ?

- A. 38 eV
- B. 342 eV
- C. 152 eV
- D. 28eV

ANSWER: A

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**Easy Questions**

1. Select the incorrect statement from the following option?
  - a) Racemic modification is an equimolar mixture of dextrorotatory and levorotatory isomers
  - b) Meso compounds contains more than one chiral carbon centre
  - c) **Meso compounds are externally compensated**
  - d) Racemic mixture is designated as dl-pair
2. How many optical isomers are possible in a compound with one chiral carbon?
  - a) 5
  - b) 4
  - c) 2
  - d) 3**
3. Which of the following compounds would show optical isomerism?
  - a)  $\text{CH}_3 - \text{CH}(\text{OH}) \text{ COOH}$
  - b)  $\text{H}_2\text{N CH(CH}_3)_2$
  - c)  $(\text{CH}_3)_2 \text{ CHCHO}$
  - d)  $\text{H}_2\text{N CH}_2 \text{ COOH}$
4. The number of configurational isomers of molecules having (n) different chiral carbons is?
  - a)  $2n$
  - b)  $2n$
  - c)  $2n-1$
  - d)  $2n+1$
5. The number of racemic forms of molecules having (n) different chiral carbons is?
  - a)  $2n$
  - b)  $2^n$
  - c)  $2^{n-1}$**
  - d)  $2^{n+1}$
6. For a molecule with two like chiral carbon atoms, the number of optically inactive form is?

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- a) 1**
- b) 2  
c) 3  
d) 4
7. For a molecule with two like chiral carbon atoms, the number of optically active form is?
- a) 4  
b) 3  
c) 1  
**d) 2**
8. Find the number of stereoisomers for  $\text{CH}_3 - \text{CHOH} - \text{CH} = \text{CH} - \text{CH}_3$ ? [ E ]
- a) 1  
b) 2  
c) 3  
**d) 4**
9. The infinity of intermediate conformations are called?
- a) Skew conformations**  
b) Staggered conformations  
c) Eclipsed conformations  
d) Gauche
10. The potential energy of n-butane is minimum for?
- a) Skew conformations  
**b) Staggered conformations**  
c) Eclipsed conformations  
d) Gauche
11. The potential energy of n-butane is maximum for?
- a) Skew conformations  
b) Staggered conformations  
**c) Eclipsed conformations**  
d) Gauche

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12. The relative instability of any of the intermediate skew conformations is due to?
- a) Lateral strain
  - b) Shear strain
  - c) Longitudinal strain
  - d) Torsional strain**
13. In gauche conformations, the methyl groups are?
- a)  $60^0$  apart**
  - b)  $90^0$  apart
  - c)  $180^0$  apart
  - d)  $360^0$  apart
14. Which of the following is least stable?
- a) Anti conformation
  - b) Gauche conformation
  - c) Staggered conformation
  - d) Eclipsed conformation**
15. When the nucleophile :OR attacks the RX, the resultant product will be ?
- a) R – OH
  - b) ROR**
  - c) R:CN
  - d) RNHR
16. Which step in S<sub>N</sub>1 reaction is a slow rate determining step?
- a) Attack of nucleophile
  - b) Formation of racemic mixture
  - c) Formation of transition state**
  - d) Both a and b
17. Which of the following act as electrophile in halogenation?
- a) Nitronium ion
  - b) Sulphonium ion
  - c) Halonium ion**
  - d) Acylium ion

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18. Which of the following is an initiator molecule in the free radical polymerisation?

- a) **Benzoyl peroxide**
- b) Sulphuric acid
- c) Potassium permanganate
- d) Chromium oxide

19. Aldehydes and ketones are formed from

- a) the dehydration of alcholos
- b) **the oxidation of alcohols.**
- c) the addition of nucleophiles to alkenes
- d) the elimination of alcohols

20. Losing of small molecule from original organic molecule is-----

- a) **Elimination reaction**
- b) Substitution reaction
- c) Addition reaction
- d) Both A and D

21. In a free radical reaction, free radicals are formed at----.

- a) Initiation step
- b) propagation step
- c) termination step
- d) **both a and b**

22. An acceptor of pair of electron is termed as?

- a) Nucleophile
- b) **electrophile**
- c) carbocation
- d) Anion

23. Drugs that are used to diagnose, cure and prevent disease are called?

- a) **pharmaceutical drugs**
- b) addictive drugs
- c) industrial drugs
- d) single cell drugs

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24. Which of the following would exhibit co-ordination isomerism?

- a)  $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$
- b)  $[\text{Co}(\text{en})_2\text{Cl}_2]$
- c)  $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_3$
- d)  $[\text{Cr}(\text{en})_2\text{Cl}_2]^+$

25. Exchange of co-ordination group by a water molecule in complex molecule results in ----

- (a) Ionization isomerism
- (b) Ligand isomerism
- (c) Hydration isomerism**
- (d) Geometrical isomerism

26. Which would exhibit co-ordination isomerism?

- a)  **$[\text{Cr}(\text{NH}_3)_6] \quad [\text{Co}(\text{CN})_6]$**
- b)  $[\text{Co}(\text{en})_2\text{Cl}_2]$
- c)  $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_3$
- d)  $[\text{Cr}(\text{en})_2\text{Cl}_2]$

27. Nucleophilic substitution near takes place when halogeno alkanes is added with aq. solution of

- a) Sodium Chloride
- b) Sodium Manganate
- c) Sodium Hydroxide**
- d) Sodium chlorate

28. Which of the following is also known as X-ray photoelectron spectroscopy?

- a. Auger electron spectroscopy
- b. Electron impact spectroscopy
- c. Electron spectroscopy for chemical analysis**
- d. Secondary ion mass spectroscopy

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29. Which of the following methods use soft X-rays to eject electrons from inner shell

orbitals?

- a. Auger electron spectroscopy
- b. Electron impact spectroscopy
- c. X-ray crystallography
- d. X-ray photoelectron spectroscopy**

30. The energy required to remove an electron from the highest occupied atomic orbital

is known as \_\_\_\_\_

- a. Ionization energy**
- b. Kinetic energy
- c. Binding energy
- d. Vibrational energy

31. X-ray diffractometers are not used to identify the physical properties of which of the

following?

- a. Metals
- b. Liquids**
- c. Polymeric materials
- d. Solids

32. The Bragg's equation for diffraction of X-rays is \_\_\_\_\_

- a.  $n\lambda = 2d^2 \sin\theta$
- b.  $n\lambda = 2ds \sin\theta$**
- c.  $n\lambda = 2d \sin^2\theta$
- d.  $n\lambda = d^2 \sin\theta$

33. Obtain a Miller indices of a plane whose intercepts are 4, 4 and 2 units along the three axes.

- a. (122)

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- b. (211)  
c. (121)  
**d. (112)**
34. The size of Mo is very similar to W due to \_\_\_\_\_  
a. Shielding effect  
b. Actinide contraction  
**c. Poor Shielding by 4f electrons**  
d. Poor shielding by 4d electrons
35. Choose the correct order ionization energy  
a. N > O > F  
b. F > O > N  
**c. N > O < F**  
d. O > F > N
36. Choose the incorrect order with respect to the properties indicated  
a. Electro negativity F > Cl > Br  
b. Electron affinity Cl > F > Br  
c. Oxidizing power F<sub>2</sub> > Cl<sub>2</sub> > Br<sub>2</sub>  
**d. Bond enthalpy F<sub>2</sub> > Cl<sub>2</sub> > Br<sub>2</sub>**
37. Choose the correct statement  
**a. As shielding effect increases electro negativity decreases**  
b. As shielding effect increases electro negativity increases  
c. As ionization potential increases metallic property increases  
d. As +ve charge on species increases ionic radii increases
38. Choose the correct statement with respect to oxidising property of F  
a. It is the strongest oxidising agent because it has highest electron gain enthalpy  
b. It is the strongest oxidising agent due to its small size  
**c. It is the strongest oxidising agent because it has maximum electron negativity**  
d. It is the strongest oxidising agent due to high lattice enthalpy.

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39. In a period with increase in atomic number, the metallic character of an element

- a. **Decrease across period increases in group**
- b. increase across period& decreases in group
- c. increase across period& increases in group
- d. Decrease across period and decreases in group

40. Which of the following species has the highest ionization potential?

- a. **Li<sup>+</sup>**
- b. Mg<sup>+</sup>
- c. Al<sup>+</sup>
- d. Ne

41. The source for XPS is -----

- a. Mercury- arc
- b. Nernst glower
- c. Globar source
- d. AlK $\alpha$**

42. Compute the miller indices for the intercepts X 1/4, Y=1 and Z=1/2

- a. (412)**
- b. (632)
- c. (101)
- d. (110)

43. The correction factor for modified Van der Waals equation of state is

- a. a/b
- b. a/V<sup>2</sup>**
- c. a/V
- d. V-nb

44. The second ionisation energy is always higher than the first ionization energy because the

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- a. electron is attracted more by the core electrons
  - b. electron is more tightly bound to the nucleus in an ion**
  - c. becomes more stable attaining the octet or duplet configuration
  - d. atomic radii is large
45. 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
46. Repeatable entity of a crystal structure is known as
- a. crystal
  - b. Lattice
  - c. unit cell**
  - d. miller indices
47. If the angle of incidence is  $30^\circ$ , then the wavelength for first-order spectrum is equal to
- 
- a. **a.d**
  - b.  $2d$
  - c.  $d/2$
  - d.  $d/3$
48. Identify reducing agent the following
- a)  $\text{OSO}_4$
  - b) PCC
  - c)  $\text{LiAlH}_4$**
  - d)  $\text{K}_2\text{Cr}_2\text{O}_7$
49. The different types of energies associated with a molecule are
- a) Electronic, Vibrational and Rotational energies**

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b) Dissociation energy

c) Potential energy

d) Kinetic energy

50. The nuclei with spin quantum number greater than \_\_\_\_\_ can exhibit the NMR phenomenon.

**a) 0**

b) 5

c) 10

d) -5

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

a)  $2I$

b)  $2I-1$

**c)  $2I+1$**

d)  $4I$

52. 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)  $\Delta V = +1$

53. Which of the following electronic transitions is forbidden in the H atom spectrum?

a)  $1S \rightarrow nP$

**b)  $1S \rightarrow nS$**

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c)  $2P \rightarrow nS$

d)  $2P \rightarrow nD$

54. Which of the following transitions between rotational energy levels is not allowed?

a)  $J=1 \rightarrow J=0$

b)  $J=1 \leftarrow J=2$

c)  $J=0 \leftarrow J=1$

**d)  $J=1 \leftarrow J=3$**

55. The wavenumbers are expressed in-----.

a)  $\text{sec}^{-1}$

**b)  $\text{cm}^{-1}$**

c)  $\text{cm} \cdot \text{sec}^{-1}$

d)  $\text{cm}^2 \cdot \text{sec}^{-1}$

56. The electronic spectra are caused by -----.

a) Microwave

b) Radio waves

**c) UV-Visible rays**

d) Infra-red rays

57. In  $K_4[Fe(CN)_6]$  the number of unpaired electrons in iron are ?

**(a) 0**

(b) 2

(c) 3

(d) 5.

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58. The tetrahedral complexes have coordination number

(a) 3

(b) 6

**(c) 4**

(d) 8

59. The spin only magnetic moment value (in Bohr magneton units) of Cr(CO)<sub>6</sub> is

**(a) 0**

(b) 2.84

(c) 4.90

(d) 5.92

60. Potassium ferrocyanide is an example of

(a) Tetrahedral

**(b) Octahedral**

(c) Square Planar

(d) Linear

61. In the complex compound K<sub>4</sub>[Ni(CN)<sub>4</sub>] oxidation state of nickel is ?

(a) -1

**(b) 0**

(c) +1

(d) +2

62. The spin only formula ( $\mu_s$ ) for octahedral complexes is

**a)  $(4S(S+1))^{1/2}$**

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b)  $(4S(S+1))^{1/2} + (L(L+1))^{1/2}$

c)  $(L(L+1))^{1/2}$

d)  $L(L+1)$

63. The selection rule for microwave spectroscopy is

a)  $\Delta J = \pm 1$

b)  $\Delta V = \pm 1$

c)  $\Delta J = +1$

d)  $\Delta V = \pm 2$ .

64. The spin only magnetic moment value (in Bohr magneton units) of  $\text{Cr}(\text{CO})_6$  is

a) 0

b) 2.84

c) 4.90

d) 5.92

65. The number of unpaired electrons in d<sub>6</sub> low spin octahedral complex is

a) 0

b) 1

c) 2

d) 3

66. The vibrational rotational spectrum is observed \_\_\_\_\_ region.

a) near IR

b) microwave region

c) visible region

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d) radiofrequency region

67. Chiral molecules are those which are

- a. Shows geometrical isomerism
- b. Superimposable on their mirror images
- c. Not superimposable on their mirror images**
- d. Unstable molecules

68. Which of the following is not an example of chiral object?

- a. Cylindrical helix
- b. Square box**
- c. Sandal or shoe
- d. Glove

69. Chiral molecules which are non-super-imposable mirror images of each other are called

- a. Diastereomers
- b. Meso compounds
- c. Racemic mixture
- d. Enantiomers**

70. Select the correct statement from the following option

- a. Enantiomer rotate plane of polarised light in opposite direction and to different extent
- b. Enantiomer rotate plane of polarised light in same direction but to different extent
- c. Enantiomer rotate plane of polarised light in same direction and to same extent
- d. Enantiomer rotate plane of polarised light in opposite direction but to same extent**

71. The plane which divides the molecule into two equal parts so that each half is the mirror image of other half is called -----.

- a. Centre of symmetry
- b. Plane of symmetry**
- c. Axis of symmetry
- d. Angle of symmetry

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72. When a molecule has a plane of symmetry, it will be \_\_\_\_\_

- a. Optically inactive
- b. Optically active
- c. Both optically active and optically inactive
- d. Enantiomer

73. Diastereomers are

- a. Geometrical isomers
- b. Mirror images
- c. Non-mirror images
- d. Unstable molecules

74. Which of the following is not a priority rule for R, S-Configuration?

- a. If the four atoms attached to the chiral centre are all different, priority depends on atomic number, with the atom of lower atomic numbers getting lower priority.
- b. If the two atoms attached to chiral centre are same, the atoms attached to each of these first atoms are compared.
- c. When there is a double bond or triple bond, both atoms are considered to be duplicated or triplicated.
- d. **If the four atoms attached to the chiral centre are all different, priority depends on atomic number, with the atom of higher atomic numbers getting lower priority.**

75. Which of the following compounds will exhibit cis-trans isomerism?

- a. 2-butene
- b. 2-butyne
- c. 2-butanol
- d. Butanal

76. The isomers which can be inter converted through rotation around a single bond are:

- a. conformers
- b. diastereomers

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- c. enantiomers  
d. positional isomers
77. Passivity on a metal is due to  
(a) Higher EMF  
b) Lower EMF  
**c) Oxide film formation**  
d) stability
78. The process of gaining of electrons by metal ions with discharge of metal is called \_\_\_\_\_  
**a) De-electronation**  
b) Electronation  
c) Reduction  
d) Cathode
79. The anode of the galvanic cell has \_\_\_\_\_  
a) Positive polarity  
**b) Negative polarity**  
c) No polarity  
d) Neutral
80. According to the convention, the Daniel cell is represented as \_\_\_\_\_  
**a) Zn | ZnSO<sub>4</sub> || CuSO<sub>4</sub> | Cu, E = 1.09 volt**  
b) Zn | ZnSO<sub>4</sub> || Cu | CuSO<sub>4</sub>, E = 1.09 volt  
c) ZnSO<sub>4</sub> | Zn || CuSO<sub>4</sub> | Cu, E = 1.09 volt  
d) Zn | ZnS || CuSO<sub>4</sub> | Cu, E = 1.09 volt
81. Decrease in free energy can be given by  $-\Delta G =$  \_\_\_\_\_

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- a) nFE**
- b) n/FE**
- c) nF/E**
- d) F/nE**
82. Generally electrode potential refers to \_\_\_\_\_
- a) Reduction potential**
- b) Oxidation potential**
- c) Electron potential**
- d) Cannot be determined**
83. The following are state functions EXCEPT
- a) H – enthalpy
- b) q – heat**
- c) E – internal energy
- d) S – entropy
84. Gibbs function G is given by
- a) H-TS**
- b) U+PV**
- c) E+PV**
- d) U-TS**
85. Which of the following is the correct equation?
- a)  $E = E^\circ [(2.303RT)/nF] \log_{10} [H^+]$ .
- b)  $E = E^\circ + [(2.303RT)/nF] \log_{10} [H^+]$ .
- c)  $E = E^\circ - [(2.303RT)/nF] \log_{10} [H^+]$ .**
- d)  $E = E^\circ / [(2.303RT)/nF] \log_{10} [H^+]$ .
86. If the standard hydrogen electrode is used as the reduction electrode, then the emf is given by\_\_\_\_\_
- a)  $E_{red} = -E^\circ + (5/n) \log_{10} [H^+]$ .

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- b)  $E_{\text{red}} = -E^{\circ} - (0.0591/n) \log_{10} [H^+]$ .  
c)  $E_{\text{red}} = E^{\circ} + (0.0591/n) \log_{10} [H^+]$ .  
d)  $E_{\text{red}} = E^{\circ} - (0.0591/n) \log_{10} [H^+]$ .
87. \_\_\_\_\_ is the device used to measure the emf of the cell.  
a) Voltmeter  
**b) Potentiometer**  
c) Ammeter  
d) Multimeter
88. In corrosion, as a result of decay, the metals are not converted into  
a) Oxides  
b) Hydroxides  
c) Carbonates  
**d) Peroxides**
89. Iron undergoes corrosion to produce \_\_\_\_\_ coloured hydrated ferric oxide  
a) Red  
**b) Brown**  
c) Green  
d) Blue
90. The rusting iron of Iron is \_\_\_\_\_  
a) Oxidation corrosion  
b) Liquid metal corrosion  
**c) Wet corrosion**  
d) Corrosion by other gases

**Moderate Questions**

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91. MoO layer is ----- layer that leads to corrosion.

- a) Stable
- b) Unstable
- c) **Volatile**
- d) Porous

92. Helmholtz free energy A is expressed as

- a)  $A=U+TS$
- b)  $A=H+TS$
- c)  **$A=U-TS$**
- d)  $A=H-TS$

93. In a reversible process  $\Delta_{sys} + \Delta_{surr}$  is

- a.  $> 0$
- b.  $< 0$
- c.  $\geq 0$
- d) =0**

94. Identify the hard acid from the following:

- a)  **$AlCl_3$**
- b)  $N_2H_4$
- c)  $H_2O$
- d)  $OH^{(-)}$

95. Entropy change for a spontaneous process is

- a) (-) ve
- b) (+) ve**

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c) 0

d) Both a and b

96. In a reversible process, entropy of the system

a. increases

b. decreases

**c) zero**

d) remains constant

97. The name of the equation showing relation between electrode potential standard potential ( $E^\circ$ ) and concentration of ions in solution is

a) Kohlrausch equation

**b) Nernst equation**

c) Faradays equation

d) Ohm's equation

98. Corrosion of metals involves

a) Physical reaction

**b) Chemical reaction**

c) Both a and b

d) Only A

99. The filling up of Molecular orbital takes place according to

a) Huckel's rule

**b) Hund's rule**

c) Fajan's rule

d) Cahn Ingold Prelog rule

100. Which of the following molecule does not exist due to its zero bond order?

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- a)  $\text{H}_2^+$
- b)  $\text{He}_2^+$
- c) **He<sub>2</sub>**
- d)  $\text{H}_2^-$

101. According to Heisenberg the product of uncertainty in the position & moment run of the body is

- a. Equal to  $h/p$
- b. Equal to  $E-V$
- c.  **$\geq h/4\pi$**
- d.  $\geq E-V$

101. CO has 10 bonding electrons and 4 anti-bonding electrons and its bond order is

- a) **3**
- b) 7
- c) 1
- d) 5/2

102. Two electrons occupying the same orbital are distinguished by

- a) Azimuthal quantum number
- b) **Spin quantum number**
- c) Magnetic quantum number
- d) Orbital quantum number

103. The interaction will be attractive between the orbital [Provided x is the principal axis]

- a)  $2p_y-2p_z$
- b)  $1s-2s$
- c)  $2p_x-2p_y$

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**d)  $2s-2p_x$**

104. Organic compounds which contain more than one benzene rings are termed as -----.

**e) Arenes**

b) Aryls

c) Acyls

d) Alkyl

105. The crystal field splitting energy for octahedral and tetrahedral complexes is related as

**a)  $\Delta t \approx 4/9 \Delta o$**

b)  $\Delta t \approx 1/2 \Delta o$

c)  $\Delta o \approx 2 \Delta t$

d)  $\Delta o \approx 4/9 \Delta t$

106. A low concentration of nucleophile favours the

a)  $S_N2$  mechanism

**b)  $S_N1$**  mechanism

c) Both a and b

d)  $E1$  mechanism

107. Which of the following is rate determining step in electrophilic substitution reaction?

a) Generation of electrophile

**b) Attack by an electrophilic reagent on benzene ring**

c) Formation of product

d) both a and c

108. Which of the following is an example of optically active compounds without chirality?

a) Tartaric acid

**b) Sulfonium salt**

c) Diphenic acid

d) Glyceraldehyde

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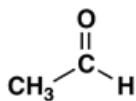
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109. Which of the following is not an optically active compound?
- 1,7- Dicarboxylic Spiro Cycloheptane
  - 1,3- Diphenylpropadiene
  - Meso-tartaric acid**
  - Glyceraldehyde
110. What type of reaction takes place upon treatment of a ketone with HCN to form a cyanohydrin?
- Nucleophilic addition**
  - Nucleophilic substitution
  - Electrophilic addition
  - Electrophilic substitution
111. Identify the compound with the highest ring strain
- Cyclomethane
  - Cyclopropane**
  - Cyclobutane
  - Cyclopentane
112.  $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{Cl}_2$  and  $[\text{Co}(\text{NH}_3)_5(\text{ONO})]\text{Cl}_2$  are related to each other as?
- Geometrical isomers
  - Optical isomers
  - Linkage isomers**
  - Coordination isomers
113. The dehydration of alcohols is an example of \_\_\_\_\_
- Bimolecular elimination/E2 reaction
  - $\text{S}_{\text{N}}2$  reaction
  - $\text{S}_{\text{N}}1$  reaction
  - Unimolecular elimination/E1 reaction**
115. Which is unreactive in hydride reduction with  $\text{NaBH}_4$ ?

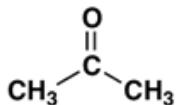
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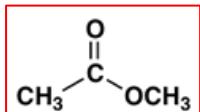
a)



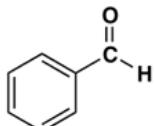
b)



c)



d)



116. The most electronegative element possess the electronic configuration?

a.  $\text{ns}^2 \text{np}^2$

b.  $\text{ns}^2 \text{np}^4$

**c.  $\text{ns}^2 \text{np}^5$**

d.  $\text{ns}^2 \text{np}^3$

117. Minimum interplanar spacing required for Bragg's diffraction is \_\_\_\_\_

a.  $\lambda/4$

**b.  $\lambda/2$**

c.  $4\lambda$

d.  $2\lambda$

118. The first, 2<sup>nd</sup>and 3<sup>rd</sup>ionization enthalpies of gallium are 579KJmol<sup>-1</sup>, 1979 KJmol 1and

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2962 KJmol<sup>-1</sup> even though the 3<sup>rd</sup> I.P is highest, Ga<sup>3+</sup> is the most stable because

- a. The energy loss is maximum resulting greater stability
- b. The size of Ga<sup>3+</sup> is smallest
- c. Ga<sup>3+</sup> is most reactive
- d. It attains a stable configuration**

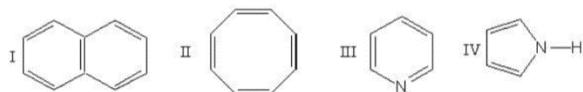
119. The co-ordination number and oxidation number of X in [X(SO<sub>4</sub>)(NH<sub>3</sub>)<sub>4</sub>]Cl is

- a. 10 and 3
- b. 2 and 6
- c. 6 and 3**
- d. 6 and 4

120. Calculate the Zero-point energy for a particle in an infinite potential well for an electron confined to a 1 nm atom.

- a. 3.9 X 10<sup>-29</sup> J
- b. 4.9 X 10<sup>-29</sup> J
- c. 5.9 X 10<sup>-29</sup> J**
- d. 6.9 X 10<sup>-29</sup> J

121. Which of the following compound is aliphatic? [Based on Huckel's rule]



- a. I
- b. II**
- c. III

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d. IV

122. Among the ligands NH<sub>3</sub>, en, CN<sup>-</sup> and CO the correct order of their increasing field strength, is

- (a) CO < NH<sub>3</sub> < en < CN<sup>-</sup>
- (b) NH<sub>3</sub> < en < CN<sup>-</sup> < CO**
- (c) CN<sup>-</sup> < NH<sub>3</sub> < CO < en
- (d) en < CN<sup>-</sup> < NH<sub>3</sub> < CO

123. Which of the following octahedral complexes of Co (at. no.27) will be magnitude of Δ<sub>oct</sub> be the highest?

- (a) [Co(CN)<sub>6</sub>]<sup>3-</sup>**
- (b) [Co(C<sub>2</sub>O<sub>4</sub>)<sub>3</sub>]<sup>3-</sup>
- (c) [Co(H<sub>2</sub>O)<sub>6</sub>]<sup>3+</sup>
- (d) [Co(NH<sub>3</sub>)<sub>6</sub>]<sup>3+</sup>

124. The magnetic moment of [Co(NH<sub>3</sub>)<sub>6</sub>]Cl<sub>3</sub> is

- (a) 1.73
- (b) 2.83
- (c) 6.6
- (d) Zero**

125. The magnetic moment (spin only) of [NiCl<sub>4</sub>]<sup>2-</sup> is

- (a) 1.82 BM**
- (b) 5.46 BM
- (c) 2.82 BM
- (d) 1.41 BM

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

- a) Microwave
- b) Radio frequency**
- c) Infrared
- d) UV-rays

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

- a) OCS
- b) H<sub>2</sub>O
- c) CO<sub>2</sub>
- d) CH<sub>2</sub> = C H<sub>2</sub>**

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

- a) Chromatography
- b) IR spectroscopy**
- c) Mass spectroscopy
- d) X-ray diffraction

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

- a) CO<sub>2</sub>
- b) N<sub>2</sub>**
- c) H<sub>2</sub>O
- d) SO<sub>2</sub>

130. Which of the following compounds is frequently used as an internal reference in

proton NMR spectroscopy?

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**a) TMS**

b) TNS

c) DMF

d) DMSO

131. The electronic spectra lies within the region of \_\_\_\_\_

a) Infrared

b) Radiowave

c) Microwave

**d) Ultraviolet or Visible**

132. Which of the following molecule is not homonuclear?

a. H<sub>2</sub>

b. N<sub>2</sub>

**c. NO**

d. O<sub>2</sub>

133. Identify the incorrect statement regarding aromaticity

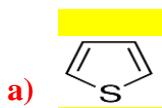
a. It is the extra stability possessed by a molecule

b. p-orbitals must be planar and overlap

c. Cyclic delocalization takes place

**d. It does not follow Huckel's rule**

134. Which of the following molecule is aromatic?



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d.

135. On the basis of molecular orbital theory, select the most appropriate option.

- a. The bond order of  $O_2$  is 2.5 and it is paramagnetic
- b. The bond order of  $O_2$  is 1.5 and it is paramagnetic
- c. The bond order of  $O_2$  is 2 and it is diamagnetic

**d. The bond order of  $O_2$  is 2 and it is paramagnetic**

136. Which of the following is known as the Schrödinger equation?

- a.  $E = mc^2$
- b. b)  $\lambda = h/p$
- c. c)  $\hat{H}\psi = E\psi$
- d. d)  $-\frac{\hbar^2}{2m} \nabla^2$

137. The CFSE for a high spin  $d^4$  octahedral complex is

- a) -0.6  $\Delta_{oct}$**
- b) -1.8  $\Delta_{oct}$**
- c)  $-1.6 \Delta_{oct} + P$
- d)  $-1.2 \Delta_{oct}$

138. Which of the following molecules is IR active?

- a)  $H_2$
- b)  $N_2$
- c)  $O_2$
- d)  $CO_2$**

139. The allowed electronic transition of hydrogen atom

- a)  $3d \rightarrow 1s$

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- b)  $2p \rightarrow 1s$**
- c)  $2p_z \rightarrow 2p_y$
- d)  $2p_y \rightarrow 2p_x$
140. A centre of symmetry is equivalent to \_\_\_\_\_ fold alternating axis of symmetry.
- One
  - Two**
  - Three
  - Four
141. Select the **incorrect** statement from the following option.
- The physical properties of enantiomers are identical
  - In symmetrical environment, the chemical properties of enantiomers are identical
  - The enantiomers react at same rate and form products in same amounts in asymmetrical environment**
  - Enantiomers have different solubility in same chiral solvent
142. A plane of symmetry is equivalent to fold alternating axis of symmetry.
- One**
  - Two
  - Three
  - Four
143. If our eyes travel in counter clockwise direction from the ligand of 128. highest priority to the ligand of lowest priority, the configuration is
- R-Configuration
  - S-Configuration**
  - E-Configuration
  - C-Configuration
144. According to the Cahn Ingold Prelog selection rules, the decreasing order of preference

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is

- a) **-NH<sub>2</sub>> -C<sub>6</sub>H<sub>5</sub>> -CH(CH<sub>3</sub>)<sup>2</sup>> -H**
- b) -CH(CH<sub>3</sub>)<sup>2</sup>> -C<sub>6</sub>H<sub>5</sub>> -H> -NH<sub>2</sub>
- c) -NH<sub>2</sub>> -CH(CH<sub>3</sub>)<sup>2</sup>> -C<sub>6</sub>H<sub>5</sub>> -H
- d) -C<sub>6</sub>H<sub>5</sub>> -CH(CH<sub>3</sub>)<sup>2</sup>>-NH<sub>2</sub>> -H

145. A spontaneous process

- a) Is reversible.
- b) Is irreversible.**
- c) May be reversible or irreversible depending on whether equilibrium is maintained throughout the process.
- d) May be reversible or irreversible depending on the value of  $\Delta S$ .

146. When heat is added to a pure liquid

- a. the temperature increases and the entropy is unchanged.
- b. the temperature increases and the entropy increases.**
- c. the temperature increases and the entropy decreases.
- d. the temperature is unchanged and the entropy increases.

147. Which statement is **incorrect**?

- (a) At constant pressure,  $\Delta H = \Delta E + P\Delta V$
- (b) The thermodynamic symbol for entropy is S.
- (c) Gibbs free energy is a state function.
- d) For an endothermic process,  $\Delta H$  is negative.**

148. For the reduction of silver ions with copper metal the standard cell potential was found to be +0.46V at 25° C. The value of standard Gibbs energy,  $\Delta G^\circ$  will be ( $F = 96500 \text{ C mol}^{-1}$ ) - -----.

- a. -44.5KJ
- b. -98.0KJ
- c. -89.0KJ**

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d. -89.0J

149. The Helmholtz function F is given by

**a) U-TS**

**b) U+TS**

**c) -U-TS**

**d) -U+TS**

150. In Pourbaix diagram the redox reaction,  $Fe^{2+} + 2e^- \rightarrow Fe_{(s)}$  is

a) pH dependent

**b) pH independent**

c) solvent dependent

d) solvent independent

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**Difficult Questions**

151. Anhydrous inorganic liquid metal surface in absence of moisture undergoes

a) Wet corrosion

**b) Dry corrosion**

c) Galvanic corrosion

d) Pitting corrosion

152. The major product formed in the reaction of  with HI is

a)  $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH-I}$

|

$\text{CH}_3$

b)  $\text{CH}_3\text{-CH-CH}_2\text{-CH}_2$

|

|

$\text{I}$        $\text{CH}_3$

**I**

|

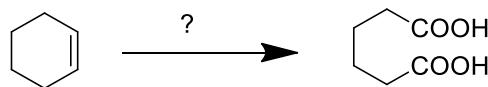
**c)  $\text{CH}_3\text{-CH}_2\text{-C-CH}_3$**

|

**$\text{CH}_3$**

d)  $\text{CH}_3\text{-CH}_2\text{-CH=CH}_2 + \text{CH}_3\text{I}$

153. The most suitable reagent for the following transformation is



a) **KMnO<sub>4</sub>**

b) OsO<sub>4</sub>

c) K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>

d) PCC

154.  $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{C}_2\text{O}_4)_3]$  and  $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{C}_2\text{O}_4)_3]$  is an example for

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**a) Coordination isomerism**

- b) Ionisation isomerism
- c) hydrate isomerism
- d) linkage isomerism

155. The ionisation isomer of  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}(\text{NO}_2)\text{C}]$  is

- a)  $[\text{Cr}(\text{H}_2\text{O})_4(\text{O}_2\text{N})]\text{Cl}_2$
- b)  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2](\text{NO}_2)$**
- c)  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}(\text{ONO})\text{Cl}]$
- d)  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2(\text{NO}_2)] \text{H}_2\text{O}$

156. The ionisation isomer of  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}(\text{NO}_2)\text{C}]$  is

- a)  $[\text{Cr}(\text{H}_2\text{O})_4(\text{O}_2\text{N})]\text{Cl}_2$
- b)  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2](\text{NO}_2)$**
- c)  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}(\text{ONO})\text{Cl}]$
- d)  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2(\text{NO}_2)] \text{H}_2\text{O}$

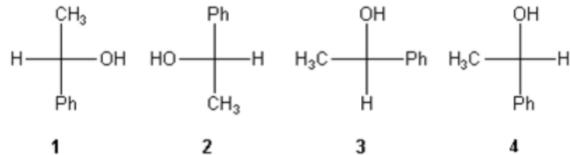
157. Draw a Newman projection of butane ( $\text{C}_4\text{H}_{10}$ ) viewed along the central C–C bond and showing the lowest energy conformation. One of the following statements describes the diagram, provided it is drawn correctly. Which statement is correct?

- a. The Newman projection shows two methyl groups mutually eclipsed.
- b. The Newman projection shows a methyl group and an H atom mutually staggered.
- c. The Newman projection shows a methyl group and an H atom mutually eclipsed.
- d. The Newman projection shows two methyl groups mutually staggered.**

158. Which of the following Fischer projections is different from the other three?

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- a. 1
- b. 2
- c. 3
- d. 4**

159. What is the coordination number and oxidation state for the cobalt atom in the compound  $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ ?

- a) 4 ; +2
- b) 5 ; +2
- c) 6 ; +2
- d) 6 ; +3**

160. Which of the following species will be diamagnetic?

- a)  $[\text{Fe}(\text{CN})_6]^{4-}$**
- b)  $[\text{FeF}_6]^{3+}$
- c)  $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$
- d)  $[\text{CoF}_6]^{3-}$

161. How many unpaired electrons are there in a strong field complex  $[\text{Co}(\text{NH}_3)\text{Cl}_2]$ ?

- a) Zero**
- b) One
- c) Two
- d) three

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

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a) 12C

**b) 14N**

c) 16O

d) 32S

163.  $\text{Co}[(\text{NH}_3)_6]^{3+}$  ion is:

(a) Paramagnetic

**(b) Diamagnetic**

(c) Ferromagnetic

(d) Ferri magnetic.

164. Which of the following molecules have infrared active vibrations?

**a) NO**

b)  $\text{CH}_4$

c)  $\text{H}_2$

d)  $\text{N}_2$

165. 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)  $E_{tr} >> E_{vib} >> E_{rot} >> E_{el}$

166. The entropy of an isolated system always \_\_\_\_\_ and reaches \_\_\_\_\_ when equilibrium is reached.

a) remains constant, maximum

b) decreases, minimum

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**c) increases, maximum**

d) decreases, constant

167. Choose the incorrect statement from the following options.

a) **In bonding molecular orbital, electron density is low in the region between the nuclei of bonded atoms**

b) The energy of anti-bonding molecular orbital is higher than that of atomic orbitals from which it is formed

c) Every electron in bonding molecular orbital contributes toward stability of the molecule

d) Anti-bonding takes place when lobes of atomic orbitals have different signs.

168. If the sign of the wave function is unchanged when the orbital is reflected about its centre, the orbital is

a) **Gerade**

b) Ungerade

c) Gerade as well as Ungerade

d) Anti-Symmetric

169. For a homonuclear diatomic molecule the bonding orbital is

a)  **$\sigma g$  of lowest energy**

b)  $\sigma u$  of second lowest energy

c)  $\pi g$  of lowest energy

d)  $\pi u$  of lowest energy

170. The relative energies of molecular orbitals in increasing order have been found to be as follows:

$$(\sigma_{1s}) < (\sigma^*_{1s}) < (\sigma_{2s}) < (\sigma^*_{2s}) < [(\pi_{2py})(\pi_{2pz})] < (\sigma_{2px}) < [(\pi^*_{2py})(\pi^*_{2pz})] < (\sigma^*_{2px})$$

a) For O<sub>2</sub> to Ne<sub>2</sub>

b) **For H<sub>2</sub> to N<sub>2</sub>**

c) For H<sub>2</sub> to Ne<sub>2</sub>

d) For N<sub>2</sub> to Ne<sub>2</sub>

171. Which among the following is the strongest oxidising agent?

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a) H<sub>2</sub>O<sub>2</sub>

**b) O<sub>3</sub>**

c) K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>

d) KMnO<sub>4</sub>

172. Which is unreactive in hydride reduction with NaBH<sub>4</sub>?

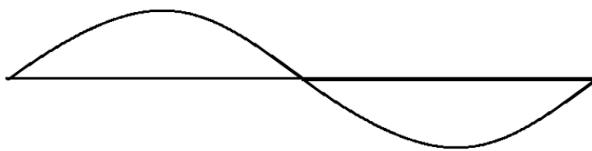
a) CH<sub>3</sub>CHO

b) CH<sub>3</sub>COCH<sub>3</sub>

**c) CH<sub>3</sub>COOCH<sub>3</sub>**

d) CH<sub>4</sub>

173. The wave function for which quantum state is shown in the figure?



a) 1

**b) 2**

c) 3

d) 4

174. What is the other name for the intra-molecular Claisen condensation?

a) Perkin condensation

b) Stobbe condensation

c) Knoevenagel condensation

**d) Dieckmann condensation**

175. Cyclopropane with bromine in the presence of UV light undergoes— reaction ?

a) Addition

**b) Substitution**

c) Redox

d) Elimination

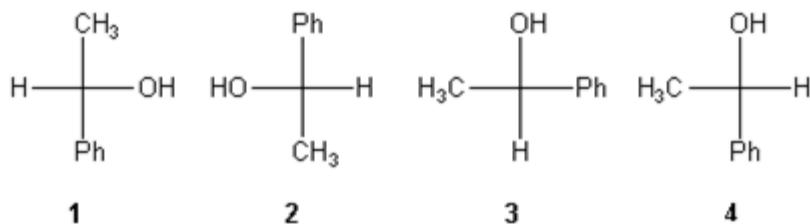
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176. Identify the compound with the highest ring strain?

- a) Cyclomethane
- b) Cyclopropane**
- c) Cyclobutane
- d) Cyclopentane

177. Which of the following Fischer projections is different from the other three?



- a) 1
- b) 2
- c) 3
- d) 4**

178. The dehydration of alcohols is an example of \_\_\_\_\_

- a) Bimolecular elimination/E2 reaction
- b) SN2 reaction
- c) SN1 reaction
- d) Uni-molecular elimination/E1 reaction**

179. Which statement is incorrect about H<sub>2</sub>O?

- a) It has four degrees of vibrational freedom.**
- b) It is non-linear.
- c) It undergoes symmetric and asymmetric stretching modes of vibration.
- d) It has three IR active modes of vibration.

180. For which of the following molecules could a pure rotational spectrum not be observed in the gas phase?

- a) HCl

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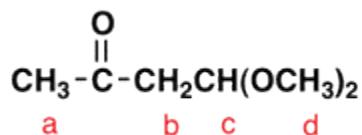
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b) NO

**c) N<sub>2</sub>**

d) CO

181. Which of hydrogens a-d in the following molecule gives a triplet signal in a normal 1H NMR spectrum?



a) Hydrogen a

b) Hydrogen b

**c) Hydrogen c**

d) Hydrogen d

182. What's the indication for acetaminophen?

**a) Mild to moderate pain**

b) Fever

c) Nausea

d) Allergic reaction

183. Draw a Newman projection of butane ( $\text{C}_4\text{H}_{10}$ ) viewed along the central C–C bond and showing the lowest energy conformation. One of the following statements describes the diagram, provided it is drawn correctly. Which statement is correct?

a) The Newman projection shows two methyl groups mutually eclipsed.

b) The Newman projection shows a methyl group and an H atom mutually staggered.

c) The Newman projection shows a methyl group and an H atom mutually eclipsed.

**d) The Newman projection shows two methyl groups mutually staggered.**

184. Calculate the Zero-point energy for a particle in an infinite potential well for an electron confined to a 1 nm atom?

a)  $3.9 \times 10^{-29} \text{ J}$

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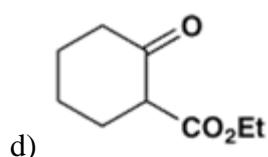
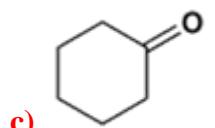
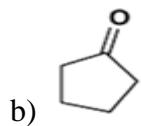
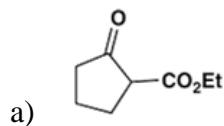
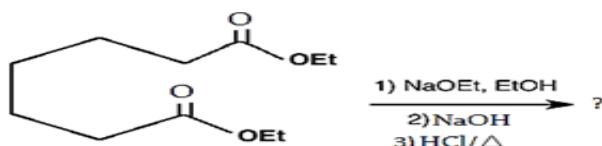
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b)  $4.9 \times 10^{-29} \text{ J}$

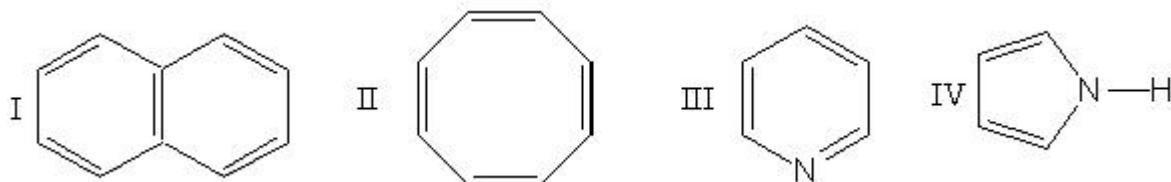
**c)  $5.9 \times 10^{-29} \text{ J}$**

d)  $6.9 \times 10^{-29} \text{ J}$

185. What will be the product of the following intramolecular Claisen condensation?



186. Which of the following compound is aliphatic? [Based on Huckel's rule]



a) I

**b) II**

c) III

d) IV

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187. If the angle of incidence is  $30^\circ$ , then the wavelength for first-order spectrum is equal to \_\_\_\_\_

a) d

b) 2d

c)  $d/2$

d)  $d/3$

188. What is a common brand name for acetaminophen?

a) Aspirin

**b) Panadol**

c) Thyroxin

d) Neurobion

189. Cardiovascular effects can be prevented or treated [ if the patients already had a heart attack or stroke] only by taking

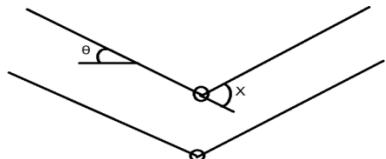
a) Ibuprofen

b) Acetaminophen

c) Ketoprofen

**d) Acetylsalicylic acid**

190. What should be the value of X?



a)  $\theta$

b)  $\theta/2$

**c) 2θ**

d)  $\theta/3$

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**Semester-I**



**MCQ**

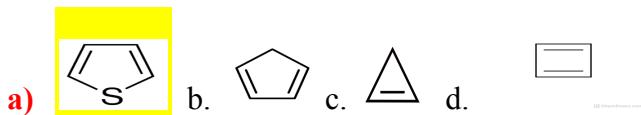
**Module I**

1. If the sign of the wave function is unchanged when the orbital is reflected about its centre, the orbital is

- a) **Gerade**
- b) Ungerade
- c) Gerade as well as Ungerade
- d) Anti-Symmetric

[Explanation: If the sign of the wave function is unchanged when the orbital is reflected about its center (i.e., x, y and z are replaced by -x, -y and -z), the orbital is **gerade**.]

2. Which of the following molecules are aromatic?



3. The filling up of Molecular orbital takes place according to

- a) Huckel's rule **b) Hund's rule** c) Fajan's rule d) Cahn Ingold Prelog rule

4. Bond Order of O<sub>2</sub>, F<sub>2</sub>, N<sub>2</sub> respectively are

- a) +1, +2, +3
- b) +2, +3, +1
- c) **+2, +1, +3**
- d) +3, +2, +1

5. Arrange the following molecules in decreasing bond length.

a)  $O_2 > O_2^- > O_2^+ > O_2^{2-}$

b)  $O_2^{2-} > O_2^- > O_2 > O_2^+$

c)  $O_2^{2-} > O_2^- > O_2^+ > O_2$

d)  $O_2 > O_2^+ > O_2^{2-} > O_2$  [Explanation: The bond length is inversely proportional to the bond order. Therefore, the correct is:  $O_2^{2-} > O_2^- > O_2 > O_2^+$ .]

6. Arrange the following molecules in the order of increasing stability.

a)  $N_2^+ < N_2 < N_2^- < N_2^{2-}$

b)  $N_2^{2-} < N_2^- < N_2 < N_2^+$

c)  $N_2^{2-} < N_2^- = N_2^+ < N_2$

d)  $N_2 < N_2^+ = N_2^- < N_2^{2-}$  [Explanation: The order of stability is directly proportional to the bond order. Therefore, the correct order of stability is  $N_2^{2-} < N_2^- = N_2^+ < N_2$ .]

7. On the basis of molecular orbital theory, select the most appropriate option.

a) The bond order of  $O_2$  is 2.5 and it is paramagnetic

b) The bond order of  $O_2$  is 1.5 and it is paramagnetic

c) The bond order of  $O_2$  is 2 and it is diamagnetic

d) **The bond order of  $O_2$  is 2 and it is paramagnetic**

8. Which of the following molecule does not exist due to its zero bond order?

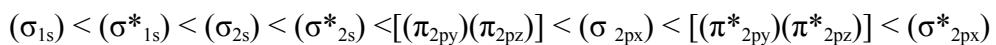
a)  $H_2^+$

b)  $He_2^+$

c) **He<sub>2</sub>**

d)  $H_2^-$  [Explanation: Molecular orbital electronic configuration of  $He_2$  molecule =  $(\sigma_{1s})^2 (\sigma^*_{1s})^2$ . Bond order = 0, so  $He_2$  molecule does not exist.]

9. The relative energies of molecular orbitals in increasing order have been found to be as follows:



a) For O<sub>2</sub> to Ne<sub>2</sub>

b) **For H<sub>2</sub> to N<sub>2</sub>**

c) For H<sub>2</sub> to Ne<sub>2</sub>

d) For N<sub>2</sub> to Ne<sub>2</sub>

10. Choose the incorrect statement from the following options.

a) **In bonding molecular orbital, electron density is low in the region between the nuclei of bonded atoms**

b) The energy of antibonding molecular orbital is higher than that of atomic orbitals from which it is formed

c) Every electron in bonding molecular orbital contributes toward stability of the molecule

d) Antibonding takes place when lobes of atomic orbitals have different signs.

11. Which of the following molecule is not homonuclear?

a) H<sub>2</sub>

b) N<sub>2</sub>

c) **NO**

d) O<sub>2</sub>

12. Bond order of NO<sup>+</sup> molecule is

a) 2

**b) 3**

c) 2.5

d) 4 [Explanation: Bond order = (10-4)/ 2 = 3]

13. The molecular orbital electronic configuration of HF molecule is

a) **1s<sup>2</sup> 2s<sup>2</sup> σ<sub>spx</sub><sup>2</sup> [2<sub>py</sub><sup>2</sup> 2<sub>pz</sub><sup>2</sup>] σ<sub>spx</sub>\***

- b)  $1s^2 2s^2 \sigma_{\text{spx}}^2 [2_{\text{px}}^2 2_{\text{py}}^2] \sigma_{\text{spx}}^*$
- c)  $1s^2 2s^2 \sigma_{\text{spx}}^2 [2_{\text{px}}^2 2_{\text{pz}}^2] \sigma_{\text{spx}}^*$
- d)  $1s^2 2s^2 \sigma_{\text{spx}}^2 [2_{\text{px}}^4] \sigma_{\text{spx}}^*$  [Explanation: HF molecule has 10 electrons and its electronic configuration is  $1s^2 2s^2 \sigma_{\text{spx}}^2 [2_{\text{py}}^2 2_{\text{pz}}^2] \sigma_{\text{spx}}^*$ .]

14. From the following options, choose the heteronuclear diatomic molecules which are paramagnetic in nature?

- a) HF and NO
- b) HF and O<sub>2</sub>
- c) NO and O<sub>2</sub>
- d) Only NO**

15. The combination of H (1s<sup>1</sup>) and F (2px<sup>1</sup>) gives

- a) Bonding orbital
- b) Anti-bonding orbital
- c) Both bonding and anti-bonding orbital**
- d) Non-bonding orbital

[Explanation: The combination of H (1s1) and F (2px1) gives both bonding ( $\sigma_{\text{spx}}$ ) and antibonding ( $\sigma_{\text{spx}}^*$ ) orbitals.]

16. Choose the **incorrect option** from the following.

- a) Valence bond theory does not explain the paramagnetic nature of O<sub>2</sub>
- b) Molecular orbital theory explains the extra stability of O<sub>2</sub><sup>+</sup>cation over O<sub>2</sub>
- c) Valence bond theory explains the ionization or gain of electrons, giving O<sub>2</sub><sup>+</sup> and O<sub>2</sub><sup>-</sup> ions, if O<sub>2</sub> has the stable octet**
- d) Resonance has no role in Molecular orbital theory

17. The interaction will be attractive between the ----- orbital [Provided x is the principal axis]

- a)  $2p_y$ - $2p_z$
  - b)  $1s$ - $2s$
  - c)  $2p_x$ - $2p_y$
  - d)  $2s$ - $2p_x$**
18. Identify the incorrect statement regarding aromaticity
- a) It is the extra stability possessed by a molecule
  - b) p-orbitals must be planar and overlap
  - c) Cyclic delocalization takes place
  - d) It does not follow Huckel's rule**

19. According to Heisenberg the product of uncertainty in the position & moment run of the body is

- a) Equal to  $h/p$
- b) Equal to  $E-V$
- c)  $\geq h/4\pi$**
- d)  $\geq E-V$

20. CO has 10 bonding electrons and 4 anti-bonding electrons and its bond order is

- a) 3** b) 7 c) 1 d) 5/2

21. Which of the following is known as the Schrödinger equation

a)  $E = mc^2$

b)  $\lambda = h/p$

c)  $\hat{H}\psi = E\psi \quad \hat{H}\psi = E\psi$

d) -

$$\frac{\hbar^2}{2m} \nabla^2 \frac{\hbar^2}{2m} \nabla^2$$

22. The CFSE for a high spin d<sup>4</sup> octahedral complex is

- a)  $-0.6 \Delta_{\text{oct}}$    b) **-1.8  $\Delta_{\text{oct}}$**    c)  $-1.6 \Delta_{\text{oct}} + P$    d)  $-1.2 \Delta_{\text{oct}}$

24. Two electrons occupying the same orbital are distinguished by

- a) azimuthal quantum number b) **spin quantum number** c) Magnetic quantum number d) orbital quantum number

25. Organic compounds which contain more than one benzene rings are termed

- a) **arenes** b) Aryls c) acyls d) benzenes

26. The de- broglie hypothesis is associated with

- a) wave nature of electrons only  
b) wave nature of protons only  
c) wave nature of radiation  
**d) wave nature of all material particles**

27. For a homonuclear diatomic molecule the bonding orbital is

- a)  $\sigma g$  of lowest energy** b)  $\sigma u$  of second lowest energy c)  $\pi g$  of lowest energy d)  $\pi u$  of lowest energy

28. The crystal field splitting energy for octahedral and tetrahedral complexes is related as

- a)  $\Delta t \approx 4/9 \Delta o$**  b)  $\Delta t \approx 1/2 \Delta o$  c)  $\Delta o \approx 2 \Delta t$  d)  $\Delta o \approx 4/9 \Delta t$



## DEPARTMENT OF CHEMISTRY

### SRM INSTITUTE OF SCIENCE AND TECHNOLOGY B.TECH (2018-2019)

**Subject/Code: Chemistry/ 18CYB101J MCQ**

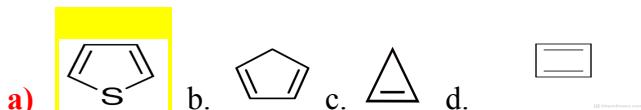


#### **Module I**

1. If the sign of the wave function is unchanged when the orbital is reflected about its centre, the orbital is
  - a) **Gerade**
  - b) Ungerade
  - c) Gerade as well as Ungerade
  - d) Anti-Symmetric

[Explanation: If the sign of the wave function is unchanged when the orbital is reflected about its center (i.e., x, y and z are replaced by -x, -y and -z), the orbital is **gerade**.]

2. Which of the following molecule is aromatic?



3. The filling up of Molecular orbital takes place according to

- a) Huckel's rule **b) Hund's rule** c) Fajan's rule d) Cahn Ingold Prelog rule

4. On the basis of molecular orbital theory, select the most appropriate option.

- a) The bond order of O<sub>2</sub> is 2.5 and it is paramagnetic
- b) The bond order of O<sub>2</sub> is 1.5 and it is paramagnetic
- c) The bond order of O<sub>2</sub> is 2 and it is diamagnetic
- d) The bond order of O<sub>2</sub> is 2 and it is paramagnetic**

5. Which of the following molecule does not exist due to its zero bond order?

- a) H<sub>2</sub><sup>+</sup>
- b) He<sub>2</sub><sup>+</sup>
- c) He<sub>2</sub>**

d) H<sub>2</sub><sup>-</sup> [Explanation: Molecular orbital electronic configuration of He<sub>2</sub> molecule = ( $\sigma_{1s}$ )<sup>2</sup> ( $\sigma^*_{1s}$ )<sup>2</sup>. Bond order = 0, so He<sub>2</sub> molecule does not exist.]

6. The relative energies of molecular orbitals in increasing order have been found to be as follows:

$$(\sigma_{1s}) < (\sigma^*_{1s}) < (\sigma_{2s}) < (\sigma^*_{2s}) < [(\pi_{2py})(\pi_{2pz})] < (\sigma_{2px}) < [(\pi^*_{2py})(\pi^*_{2pz})] < (\sigma^*_{2px})$$

- a) For O<sub>2</sub> to Ne<sub>2</sub>
- b) For H<sub>2</sub> to N<sub>2</sub>**

- c) For H<sub>2</sub> to Ne<sub>2</sub>  
d) For N<sub>2</sub> to Ne<sub>2</sub>
7. Choose the incorrect statement from the following options.
- a) **In bonding molecular orbital, electron density is low in the region between the nuclei of bonded atoms**  
b) The energy of antibonding molecular orbital is higher than that of atomic orbitals from which it is formed  
c) Every electron in bonding molecular orbital contributes toward stability of the molecule  
d) Antibonding takes place when lobes of atomic orbitals have different signs.
8. Which of the following molecule is not homonuclear?
- a) H<sub>2</sub>  
b) N<sub>2</sub>  
c) **NO**  
d) O<sub>2</sub>
9. The interaction will be attractive between the ----- orbital [Provided x is the principal axis]  
a) 2p<sub>y</sub>-2p<sub>z</sub>  
b) 1s-2s  
c) 2p<sub>x</sub>-2p<sub>y</sub>  
**d) 2s-2p<sub>x</sub>**
10. Identify the incorrect statement regarding aromaticity
- a) It is the extra stability possessed by a molecule  
b) p-orbitals must be planar and overlap  
c) Cyclic delocalization takes place  
**d) It does not follow Huckel's rule**
11. According to Heisenberg the product of uncertainty in the position & moment run of the body is
- a) Equal to h/p  
b) Equal to E-V  
**c)  $\geq h/4\pi$**   
d)  $\geq E-V$
12. CO has 10 bonding electrons and 4 anti-bonding electrons and its bond order is
- a) 3** b) 7 c) 1 d) 5/2
13. Which of the following is known as the Schrödinger equation
- a) E = mc<sup>2</sup>      b)  $\lambda = h/p$       c)  **$\hat{H}\psi = E\psi$**   $\hat{H}\psi = E\psi$       d) -  

$$\frac{\hbar^2}{2m} \nabla^2 + \frac{\hbar^2}{2m} \nabla^2$$
14. The CFSE for a high spin d<sup>4</sup> octahedral complex is

a)

-0.6  $\Delta_{\text{oct}}$

**b) -1.8  $\Delta_{\text{oct}}$**

c) -1.6  $\Delta_{\text{oct}} + \mathbf{P}$

d) -1.2  $\Delta_{\text{oct}}$

24. Two electrons occupying the same orbital are distinguished by  
a) azimuthal quantum number **b) spin quantum number** c) Magnetic quantum number d)  
orbital quantum number
25. Organic compounds which contain more than one benzene rings are termed  
**a) arenes** b) Aryls c) acyls d) benzenes
26. For a homonuclear diatomic molecule the bonding orbital is  
**a)  $\sigma g$  of lowest energy** b)  $\sigma u$  of second lowest energy c)  $\pi g$  of lowest energy d)  $\pi u$  of  
lowest energy
27. The crystal field splitting energy for octahedral and tetrahedral complexes is related as  
**a)  $\Delta t \approx 4/9 \Delta o$**  b)  $\Delta t \approx 1/2 \Delta o$  c)  $\Delta o \approx 2 \Delta t$  d)  $\Delta o \approx 4/9 \Delta t$

## **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)  $25000\text{-}72000\text{ cm}^{-1}$
- b)  $25000\text{-}50000\text{ cm}^{-1}$

**c) 12500-25000 cm<sup>-1</sup>**

d) 15000-30000 cm<sup>-1</sup>

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<sup>-1</sup>

b) 300-3000 cm<sup>-1</sup>

**c) 400-4000 cm<sup>-1</sup>**

d) 500-5000 cm<sup>-1</sup>

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

**a) NO**

b) CH<sub>4</sub>

c) H<sub>2</sub>

d) N<sub>2</sub>

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

a) OCS

b) H<sub>2</sub>O

c) CO<sub>2</sub>

**d) C H<sub>2</sub>=C H<sub>2</sub>**

**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  $-\text{CH}_3$  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  $-\text{CH}_3$  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 ( $\delta$ )?

a) Frequency of unknown group of protons

b) Frequency of TMS

**c) Operating frequency of the instrument**

d) Frequency of  $\text{CDCl}_3$

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

a)  $\text{CO}_2$  **b) N<sub>2</sub>** c)  $\text{H}_2\text{O}$  d)  $\text{SO}_2$

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

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

**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)  $1\text{S} \rightarrow n\text{P}$  **b)  $1\text{S} \rightarrow n\text{S}$**  c)  $2\text{P} \rightarrow n\text{S}$  d)  $2\text{P} \rightarrow n\text{D}$

**20.** Which of the following transitions between rotational energy levels is not allowed?

**a)  $J=1 \rightarrow J=0$**  b)  $J=1 \leftarrow J=2$  c)  $J=0 \leftarrow J=1$  **d)  $J=1 \leftarrow J=3$**

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<sup>-1</sup> b) cm<sup>-1</sup>      c) cm.sec<sup>-1</sup>      d) cm<sup>2</sup>.Sec<sup>-1</sup>

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<sub>3</sub>)<sub>6</sub>]<sup>3+</sup> ion is:

(a) Paramagnetic

**(b) Diamagnetic**

(c) Ferromagnetic

(d) Ferri magnetic.

28. In K<sub>4</sub>[Fe(CN)<sub>6</sub>] 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) K<sub>4</sub>[Fe(CN)<sub>6</sub>]

(b)  $K_3[Fe(CN)_6]$

**(c)  $[Ni(CO)_4]$**

(d)  $[Pt(NH_3)_4]Cl_2$

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) Hexadentate ligand.dinitrate

32. The magnetic moment (spin only) of  $[NiCl_4]^{2-}$  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)  $CO < NH_3 < en < CN^-$

**(b)  $NH_3 < en < CN^- < CO$**

(c)  $CN^- < NH_3 < CO < en$

(d)  $en < CN^- < NH_3 < CO$

34. 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

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)  $[\text{Fe}(\text{CN})_6]^{4-}$**

(b)  $[\text{FeF}_6]^{3+}$

(c)  $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$

(d)  $[\text{CoF}_6]^{3-}$

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

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

(b)  $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$

(c)  $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$

(d)  $[\text{Co}(\text{NH}_3)_6]^{3+}$

38. The magnetic moment of  $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$  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 ( $\mu_s$ ) for octahedral complexes is

a) **(4S(S+1))<sup>1/2</sup>**

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 transition of hydrogen atom

**a)  $3d \rightarrow 1s$**

b)  $2p \rightarrow 1s$

c)  $2p_z \rightarrow 2p_y$

d)  $2p_y \rightarrow 2p_x$

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  $\text{Cr}(\text{CO})_6$  is  
a) 0  
**b) 2.84**  
c) 4.90  
d) 5.92
48. How many impaired electrons are there in a strong field complex  $[\text{Co}(\text{NH}_3)\text{Cl}_2]$ ?  
**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) radio frequency region
51. In a rotational spectrum transitions are only observed between rotational levels of  $\Delta J = ?$   
**a)  $\pm 1$**  b)  $\pm 2$  c)  $\pm \frac{1}{2}$  d)  $\pm 3$
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



**DEPARTMENT OF CHEMISTRY**

**SRM INSTITUTE OF SCIENCE AND TECHNOLOGY**  
**B.TECH (2018-2019)**

**Subject/Code: Chemistry/ 18CYB101J**  
**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. Which of the following molecule have infrared active vibrations?
  - a) **NO**
  - b)  $\text{CH}_4$
  - c)  $\text{H}_2$
  - d)  $\text{N}_2$
5. Which of the following **cannot** show a vibrational absorption spectrum?
  - a) OCS
  - b)  $\text{H}_2\text{O}$
  - c)  $\text{CO}_2$
  - d)  **$\text{C}_2\text{H}_2 = \text{C}_2\text{H}_2$**
6. Presence of functional group in a compound can be established by using
  - a) Chromatography
  - b) **IR spectroscopy**
  - c) Mass spectroscopy
  - d) X-ray diffraction
7. The nuclei with spin quantum number greater than \_\_\_\_\_ can exhibit the NMR phenomenon.
  - a) **0**
  - b) 5
  - c) 10
  - d) -5

8. The number of different orientations which a magnetic nucleus can take is  
 a)  $2I$   
 b)  $2I-1$   
**c)  $2I+1$**   
 d)  $4I$
9. Which of the following molecules will not display an infrared spectrum?  
 a)  $\text{CO}_2$       **b)  $\text{N}_2$**       c)  $\text{H}_2\text{O}$       d)  $\text{SO}_2$
10. Which one of the following nuclei has a magnetic moment?  
 a)  $^{12}\text{C}$       **b)  $^{14}\text{N}$**       c)  $^{16}\text{O}$       d)  $^{32}\text{S}$
11. 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)  $\Delta V = +1$
12. Which of the following electronic transition is forbidden in H atom spectrum?  
 a)  $1\text{S} \rightarrow n\text{P}$       **b)  $1\text{S} \rightarrow n\text{S}$**       c)  $2\text{P} \rightarrow n\text{S}$       d)  $2\text{P} \rightarrow n\text{D}$
13. Which of the following transitions between rotational energy levels is not allowed?  
 a)  $J=1 \rightarrow J=0$     b)  $J=1 \rightarrow J=2$       c)  $J=0 \rightarrow J=1$       **d)  $J=1 \rightarrow J=3$**
14. The electronic spectra lies within the region of \_\_\_\_\_  
 a) Infrared    b) Radiowave    c) Microwave    **d) Ultraviolet or Visible**
15. The wavenumbers are expressed in  
 a)  $\text{sec}^{-1}$       **b)  $\text{cm}^{-1}$**       c)  $\text{cm.sec}^{-1}$     d)  $\text{cm}^2.\text{Sec}^{-1}$
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**a) TMS**    b) TNS    c) DMF    d) DMSO
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 (b)  $\text{K}_3[\text{Fe}(\text{CN})_6]$   
**(c)  $[\text{Ni}(\text{CO})_4]$**   
 (d)  $[\text{Pt}(\text{NH}_3)_4]\text{Cl}_2$
30. The tetrahedral complexes have coordination number  
 (a) 3

- (b) 6
- (c) 4**
- (d) 8

31. The magnetic moment (spin only) of  $[\text{NiCl}_4]^{2-}$  is

- (a) 1.82 BM
- (b) 5.46 BM
- (c) 2.82 BM**
- (d) 1.41 BM

32. Among the ligands  $\text{NH}_3$ , en,  $\text{CN}^-$  and CO the correct order of their increasing field strength, is

- (a)  $\text{CO} < \text{NH}_3 < \text{en} < \text{CN}^-$
- (b)  $\text{NH}_3 < \text{en} < \text{CN}^- < \text{CO}$**
- (c)  $\text{CN}^- < \text{NH}_3 < \text{CO} < \text{en}$
- (d)  $\text{en} < \text{CN}^- < \text{NH}_3 < \text{CO}$

33. The spin only magnetic moment value (in Bohr magneton units) of  $\text{Cr}(\text{CO})_6$  is

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

34. Potassium ferrocyanide is an example of

- (a) Tetrahedral
- (b) Octahedral**
- (c) Square Planar
- (d) Linear

35. Which of the following species will be diamagnetic?

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- (b)  $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$
- (c)  $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$
- (d)  $[\text{Co}(\text{NH}_3)_6]^{3+}$

37. The magnetic moment of  $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$  is

- (a) 1.73
- (b) 2.83
- (c) 6.6
- (d) Zero**

38. In the complex compound  $\text{K}_4[\text{Ni}(\text{CN})_4]$  oxidation state of nickel is ?

- (a) -1
- (b) 0**
- (c) +1

(d) +2

39. The spin only formula ( $\mu_s$ ) for octahedral complexes is

- a) **(4S(S+1))<sup>1/2</sup>**
- b)  $(4S(S+1))^{1/2} + (L(L+1))^{1/2}$
- c)  $(L(L+1))^{1/2}$
- d)  $L(L+1)$

40. The selection rule for microwave spectroscopy is

- a)  **$\Delta J = \pm 1$**
- b)  $\Delta V = \pm 1$
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- a)  $H_2$
- b)  $N_2$
- c)  $O_2$
- d) **CO<sub>2</sub>**

42. The reference used in NMR is

- a) **TMS**
- b) Water
- c) KBr
- d) Hexane

43. The allowed electronic transition of hydrogen atom

- a) 3d- 1s
- b) **2p - 1s**
- c) 2p<sub>z</sub>- 2p<sub>y</sub>
- d) 2p<sub>y</sub>- 2p<sub>x</sub>

44. The spin only magnetic moment value (in Bohr magneton units) of Cr(CO)<sub>6</sub> is

- a) 0
- b) **2.84**
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45. How many impaired electrons are there in a strong field complex [Co(NH<sub>3</sub>)Cl<sub>2</sub>]?

- a) **Zero**
- b) One
- c) Two
- d) three

49. The number of unpaired electrons in d<sup>6</sup> 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  $\Delta J = ?$

a)  **$\pm 1$**  b)  $\pm 2$  c)  $\pm \frac{1}{2}$  d)  $\pm 3$

## **DEPARTMENT OF CHEMISTRY**

### **SRM INSTITUTE OF SCIENCE AND TECHNOLOGY** **B.TECH (2018-2019)**

**Subject/Code: Chemistry/ 18CYB101J**

#### **Semester-I**

#### **MODULE III**

1. Which of the following is also known as X-ray photoelectron spectroscopy?
  - a) Auger electron spectroscopy
  - b) Electron impact spectroscopy
  - c) **Electron spectroscopy for chemical analysis**
  - d) Secondary ion mass spectroscopy
2. Which of the following methods use soft X-rays to eject electrons from inner shell orbitals?
  - a) Auger electron spectroscopy
  - b) Electron impact spectroscopy
  - c) X-ray crystallography
  - d) **X-ray photoelectron spectroscopy**
3. The energy required to remove an electron from the highest occupied atomic orbital is known as \_\_\_\_\_
  - a) **Ionization energy**
  - b) Kinetic energy
  - c) Binding energy
  - d) Vibrational energy
4. X-ray diffractometers are not used to identify the physical properties of which of the following?
  - a) Metals
  - b) **Liquids**
  - c) Polymeric materials
  - d) Solids
5. Minimum interplanar spacing required for Bragg's diffraction is \_\_\_\_\_

a)  $\lambda/4$

**b)  $\lambda/2$**

c)  $4\lambda$

d)  $2\lambda$

6. Which of the following is amorphous solid?

a) Table salt

b) Diamond

**c) Plastic**

d) Graphite

7.  $\text{Na}^+\text{Cl}^-$ ,  $\text{Cs}^+\text{Cl}^-$  are the examples of

a) **cubic crystal system**

b) tetragonal crystal system

c) orthorhombic

crystal system

d) rhombohedral crystal system

8. The Bragg's equation for diffraction of X-rays is \_\_\_\_\_

a)  $n\lambda = 2d^2 \sin\theta$

**b)  $n\lambda = 2ds \sin\theta$**

c)  $n\lambda = 2d \sin^2\theta$

d)  $n\lambda = d^2 \sin\theta$

9. Obtain a Miller indices of a plane whose intercepts are 4,4 and 2 units along the three axes.

a) (122) b) (211)c) (121)**d) (112)**

10. The most electronegative element possess the electronic configuration is

a)  $\text{n}^2 \text{np}^2$  b)  $\text{ns}^2 \text{np}^4$  **c)  $\text{ns}^2 \text{np}^5$**  d)  $\text{ns}^2 \text{np}^3$

11. The size of Mo is very similar to W due to \_\_\_\_\_

a) Shielding effect

b) Actinide contraction

**c) Poor Shielding by 4f electrons**

d) Poor shielding by 4d electrons

12. Choose the correct order ionization energy

a) N > O > F

b) F > O > N

**c) N > O < F**

d) O > F > N

13. The first, 2<sup>nd</sup> and 3<sup>rd</sup> ionization enthalpies of gallium are 579 KJmol<sup>-1</sup>, 1979 KJmol<sup>-1</sup> and 2962 KJmol<sup>-1</sup> even though the 3<sup>rd</sup> I.P is highest, Ga<sup>3+</sup> is the most stable because-----

- a) The energy loss is maximum resulting greater stability
- b) The size of Ga<sup>3+</sup> is smallest
- c) Ga<sup>3+</sup> is most reactive

**d) It attains a stable configuration**

14. Choose the incorrect order with respect to the properties indicated

- a) Electro negativity F > Cl > Br
- b) Electron affinity Cl > F > Br
- c) Oxidizing power F<sub>2</sub> > Cl<sub>2</sub> > Br<sub>2</sub>

**d) Bondenthalpy F<sub>2</sub> > Cl<sub>2</sub> > Br<sub>2</sub>**

15. Choose the correct statement

- a) As shielding effect increases electro negativity decreases**
- b) As shielding effect increases electro negativity increases
- c) As ionization potential increases metallic property increases
- d) As +ve charge on species increases ionic radii increases

16. Choose the correct statement with respect to oxidising property of F

- a) It is the strongest oxidising agent because it has highest electron gain enthalpy
- b) It is the strongest oxidising agent due to its small size
- c) It is the strongest oxidising agent because it has maximum electron negativity**
- d) It is the strongest oxidising agent due to high lattice enthalpy.

17. In a period with increase in atomic number, the metallic character of an element

- a) Decrease across period increases in group**
- b) increase across period & decreases in group

c) increase across period & increases in group

d) Decrease across period & decreases in group

18. The co-ordination number and oxidation number of X in  $[X(\text{SO}_4)(\text{NH}_3)_4]\text{Cl}$  is

(a) 10 and 3

(b) 2 and 6

**(c) 6 and 3**

(d) 6 and 4

19. Which of the following species has the highest ionization potential?

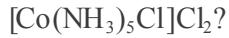
**a)  $\text{Li}^+$**

b)  $\text{Mg}^+$

c)  $\text{Al}^+$

d) Ne

20. What is the coordination number and oxidation state for the cobalt atom in the compound



a. 4 ; +2

b. 5 ; +2

c. 6 ; +2

d. **6 ; +3**

21. Repeatable entity of a crystal structure is known as -----

a. Crystal (b) Lattice **(c) Unit cell** (d) Miller indices

22. The source for XPS is -----

a) Mercury - arc

b) Nernst glower

c) Globar source

**d) AlK<sub>a</sub>**

23. Compute the miller indices for the intercepts X 1/4, Y=1 and Z=1/2

**a) (412)**

- b) (632)
- c) (101)
- d) (110)

24. The correction factor for modified Van der Waals equation of state is

- a) a/b
- b) a/V<sup>2</sup>**
- c) a/V
- d) V-nb

25. Calculate  $Z_{\text{eff}}$  for 4s electron in potassium atom ( $Z$  for Potassium=19)

- a) 2.2**
- b. 6.8
- c) 10
- d) 16.8

26. In the X-ray diffraction pattern for a bcc lattice  $h,k,l$  can have

- a) any value
- b) even value
- c) h+k+l even**
- d) odd values

27. The smallest interplanar spacing in a crystal which will give nth order Bragg reflection is

- a)  $d_{hkl} = h$
- b) d<sub>hkl</sub> = n/2**
- c)  $d_{hkl} = n/3$
- d)  $d_{hkl} = n/4$

28. The second ionisation energy is always higher than the first ionization energy because the

- a) electron is attracted more by the core electrons
- b) electron is more tightly bound to the nucleus in an ion**

c) becomes more stable attaining the octet or duplet configuration

d) atomic radii is large

29. First law of thermodynamics states that

a)  $\Delta U = q - w$  b)  $\Delta U = q + w$  c)  $\Delta U = q + \Delta w$  d)  $\Delta E = \Delta q + w$

## **DEPARTMENT OF CHEMISTRY**

### **SRM INSTITUTE OF SCIENCE AND TECHNOLOGY** **B.TECH (2018-2019)**



**Subject/Code: Chemistry/ 18CYB101J**

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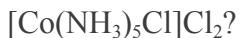
- (a) 10 and 3
- (b) 2 and 6
- (c) 6 and 3**
- (d) 6 and 4

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- a) Li<sup>+</sup>**
- b) Mg<sup>+</sup>
- c) Al<sup>+</sup>

d) Ne

20. What is the coordination number and oxidation state for the cobalt atom in the compound



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a) electron is attracted more by the core electrons

**b) electron is more tightly bound to the nucleus in an ion**

c) becomes more stable attaining the octet or duplet configuration

d) atomic radii is large

27. 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

28. Repeatable entity of a crystal structure is known as

a. crystal b. Lattice c. **unit cell** d. miller indices

## **DEPARTMENT OF CHEMISTRY**

## **SRM INSTITUTE OF SCIENCE AND TECHNOLOGY**

### **B.TECH (2018-2019)**

**Subject/Code: Chemistry/ 18CYB101J  
MODULE IV**



1. Chiral molecules are those which are
  - a) Shows geometrical isomerism
  - b) Superimposable on their mirror images
  - c) **Not superimposable on their mirror images**
  - d) Unstable molecules
2. Which of the following is not an example of chiral object?
  - a) Cylindrical helix
  - b) **Square box**
  - c) Sandal or shoe
  - d) Glove

[Explanation: A square box is not chiral as it gives super-imposable mirror image. All the other mentioned options does not give the super-imposable mirror images.]

3. Chiral molecules which are non-super-imposable mirror images of each other are called
  - a) Diastereomers
  - b) Meso compounds
  - c) Racemic mixture
  - d) **Enantiomers**
4. Select the correct statement from the following option.
  - a) Enantiomer rotate plane of polarised light in opposite direction and to different extent
  - b) Enantiomer rotate plane of polarised light in same direction but to different extent
  - c) Enantiomer rotate plane of polarised light in same direction and to same extent
  - d) **Enantiomer rotate plane of polarised light in opposite direction but to same extent**
5. Select the **incorrect** statement from the following option.
  - a) The physical properties of enantiomers are identical
  - b) In symmetrical environment, the chemical properties of enantiomers are identical
  - c) **The enantiomers react at same rate and form products in same amounts in asymmetrical environment**
  - d) Enantiomers have different solubility in same chiral solvent
6. The plane which divides the molecule into two equal parts so that each half is the mirror image of other half is called
  - a) Centre of symmetry

**b) Plane of symmetry**

- c) Axis of symmetry
- d) Angle of symmetry

7. When a molecule has a plane of symmetry, it will be \_\_\_\_\_

**a) Optically inactive**

- b) Optically active
- c) Both optically active and optically inactive
- d) Enantiomer

8. A centre of symmetry is equivalent to \_\_\_\_\_ fold alternating axis of symmetry.

- a) One

**b) Two**

- c) Three
- d) Four

9. Diastereomers are

- a) Geometrical isomers
- b) Mirror images
- c) Non-mirror images**
- d) Unstable molecules

10. A plane of symmetry is equivalent to \_\_\_\_\_ fold alternating axis of symmetry.

**a) One**

- b) Two
- c) Three
- d) Four

11. Which of the following is not a priority rule for R, S-Configuration?

- a) If the four atoms attached to the chiral centre are all different, priority depends on atomic number, with the atom of lower atomic numbers getting lower priority.
- b) If the two atoms attached to chiral centre are same, the atoms attached to each of these first atoms are compared.
- c) When there is a double bond or triple bond, both atoms are considered to be duplicated or triplicated.
- d) If the four atoms attached to the chiral centre are all different, priority depends on atomic number, with the atom of higher atomic numbers getting lower priority.**

12. If our eyes travel in counter clockwise direction from the ligand of highest priority to the ligand of lowest priority, the configuration is

- a) R-Configuration
- b) S-Configuration**
- c) E-Configuration
- d) C-Configuration

13. According to the Cahn Ingold Prelog selection rules, the decreasing order of preference is

- a)  $-\text{NH}_2 > -\text{C}_6\text{H}_5 > -\text{CH}(\text{CH}_3)^2 > -\text{H}$**

- b)  $-\text{CH}(\text{CH}_3)^2 > -\text{C}_6\text{H}_5 > -\text{H} > -\text{NH}_2$
- c)  $-\text{NH}_2 > -\text{CH}(\text{CH}_3)^2 > -\text{C}_6\text{H}_5 > -\text{H}$
- d)  $-\text{C}_6\text{H}_5 > -\text{CH}(\text{CH}_3)^2 > -\text{NH}_2 > -\text{H}$

[Explanation: The atom of higher atomic numbers gets higher priority. So,  $-\text{NH}_2$  group has the highest priority of all.]

**14. Which of the following compounds will exhibit cis-trans isomerism?**

- a) **2-butene**
- b) 2-butyne
- c) 2-butanol
- d) butanal

15. The isomers which can be inter converted through rotation around a single bond are:

- a) **conformers**
- b) diastereomers
- c) enantiomers
- d) positional isomers

16. Passivity is due to

- (a) Higher EMF (b) Lower EMF (c) **Oxide film** (d) All

17. The process of gaining of electrons by metal ions with discharge of metal is called

- 
- a) **De-electronation**
  - b) Electronation
  - c) Reduction
  - d) Cathode

18. The anode of the galvanic cell has \_\_\_\_\_

- a) Positive polarity
- b) **Negative polarity**
- c) No polarity
- d) Neutral

19. According to the convention, the Daniel cell is represented as \_\_\_\_\_

- a) **Zn | ZnSO<sub>4</sub>|| CuSO<sub>4</sub> | Cu, E = 1.09 volt**
- b) Zn | ZnSO<sub>4</sub>|| Cu | CuSO<sub>4</sub>, E = 1.09 volt
- c) ZnSO<sub>4</sub> | Zn || CuSO<sub>4</sub> | Cu, E = 1.09 volt
- d) Zn | ZnS| CuSO<sub>4</sub> | Cu, E = 1.09 volt

20. Decrease in free energy can be given by  $-\Delta G =$  \_\_\_\_\_

- a) **nFE**
- b) n/FE
- c) nF/E
- d) F/nE

23. Generally electrode potential refers to \_\_\_\_\_

- a) Reduction potential
- b) Oxidation potential
- c) Electron potential
- d) Cannot be determined

24. A spontaneous process

- a. is reversible.
- b. is irreversible.**
- c. may be reversible or irreversible depending on whether equilibrium is maintained throughout the process.
- d. may be reversible or irreversible depending on the value of  $\Delta S$ .

25. When heat is added to a pure liquid

- a. the temperature increases and the entropy is unchanged.
- b. the temperature increases and the entropy increases.**
- c. the temperature increases and the entropy decreases.
- d. the temperature is unchanged and the entropy increases.

26. The following are state functions EXCEPT

- a) H – enthalpy
- b) q – heat**
- c) E – internal energy
- d) S – entropy

27. Which statement is **incorrect**?

- (a) At constant pressure,  $\Delta H = \Delta E + P\Delta V$
- (b) The thermodynamic symbol for entropy is S.
- (c) Gibbs free energy is a state function.
- (d) For an endothermic process,  $\Delta H$  is negative.**

28. The Helmholtz function F is given by

- a) U-TS**
- b) U+TS
- c) -U-TS
- d) -U+TS

29. Gibbs function G is given by

- a) H-TS**
- b) U+PV
- c) E+PV
- d) U-TS

30. The entropy of an isolated system always \_\_\_\_\_ and reaches \_\_\_\_\_ when equilibrium is reached.

- a) remains constant, maximum
- b) decreases, minimum
- c) increases, maximum**
- d) decreases, constant

31. Which of the following is the correct equation?

- a)  $E = E^\circ [(2.303RT)/nF] \log_{10} [H^+]$ .
- b)  $E = E^\circ + [(2.303RT)/nF] \log_{10} [H^+]$ .
- c)  **$E = E^\circ - [(2.303RT)/nF] \log_{10} [H^+]$ .**
- d)  $E = E^\circ / [(2.303RT)/nF] \log_{10} [H^+]$ .

32. If the standard hydrogen electrode is used as the reduction electrode, then the emf is given by \_\_\_\_\_

- a)  $E_{\text{red}} = -E^\circ + (5/n) \log_{10} [H^+]$ .
- b)  $E_{\text{red}} = -E^\circ - (0.0591/n) \log_{10} [H^+]$ .
- c)  $E_{\text{red}} = E^\circ + (0.0591/n) \log_{10} [H^+]$ .
- d)  **$E_{\text{red}} = -E^\circ + (0.0591/n) \log_{10} [H^+]$ .**

33. \_\_\_\_\_ is the device used to measure the emf of the cell.

- a) Voltmeter
- b) **Potentiometer**
- c) Ammeter
- d) Multimeter

34. In corrosion, as a result of decay, the metals are not converted into \_\_\_\_\_

- a) Oxides
- b) Hydroxides
- c) Carbonates
- d) **Peroxides**

35. Iron undergoes corrosion to produce \_\_\_\_\_ coloured hydrated ferric oxide.

- a) Red
- b) **Brown**
- c) Green
- d) Blue

36. Anhydrous inorganic liquid metal surface in absence of moisture undergoes \_\_\_\_\_

- a) Wet corrosion
- b) **Dry corrosion**
- c) Galvanic corrosion
- d) Pitting corrosion

37. The rusting iron is the \_\_\_\_\_

- a) **Oxidation corrosion**
- b) Liquid metal corrosion
- c) Wet corrosion
- d) Corrosion by other gases

38. In Pourbaix diagram the redox reaction,  $Fe^{2+} + 2e^- \rightarrow Fe_{(s)}$  is

- a) pH dependent
- b) **pH independent**
- c) solvent dependent
- d) solvent independent

39. For the reduction of silver ions with copper metal the standard cell potential was found to be +0.46V at 25° C. The value of standard Gibbs energy,  $\Delta G^\circ$  will be ( $F = 96500 \text{ C mol}^{-1}$ )

- a) -44.5KJ
- b) -98.0 KJ
- c) **-89.0 KJ**
- d) -89.0 J

40. Passivity is due to

- a) Higher EMF
- b) Lower EMF
- c) **Oxide film**
- d) All

41. Helmholtz free energy A is expressed as

- a.  $A=U+TS$
- b)  $A=H+TS$
- c) **A=U-TS**
- d)  $A=H-TS$

42. In a reversible process  $\Delta_{\text{sys}} + \Delta_{\text{surr}}$  is

- a)  $>0$
- b)  $< 0$
- c)  $\geq 0$
- d) =0**

43. Identify the hard acid from the following:

- a) AlCl<sub>3</sub>**
- b) N<sub>2</sub>H<sub>4</sub>
- c) H<sub>2</sub>O
- d) OH<sup>(-)</sup>

44. Entropy change for a spontaneous process is

- a) (-)ve
- b) (+)ve**
- c) 0
- d) both a and b

45. Identify from the following the compound that exhibits geometrical isomers

- a) Propene
- b) 3-hexene
- c) Butenedioic acid**
- d) Lactic acid

46. In a reversible process, entropy of the system

- a) increases
- b) decreases
- c ) zero**
- d) remains constant

47. The name of the equation showing relation between electrode potential (E) standard potential ( $E^\circ$ ) and concentration of ions in solution is

- a) Kohlrausch equation
- b) Nernst equation**
- c) Faradays equation
- d) Ohm's equation

48. Corrosion of metals involves

- a) Physical reaction
- b) chemical reaction
- c) Both a and b**
- d) none

49. Enantiomers are

- a) molecules that have a mirror image
- b) molecules that have at least one stereogenic center
- c) non-superimposable molecules
- d) non-superimposable molecules that are mirror images of each other**

## **DEPARTMENT OF CHEMISTRY**

### **SRM INSTITUTE OF SCIENCE AND TECHNOLOGY** **B.TECH (2018-2019)**



**Subject/Code: Chemistry/ 18CYB101J**  
**MODULE V**

1. Select the **incorrect** statement from the following option.
  - a) Racemic modification is an equimolar mixture of dextrorotatory and levorotatory isomers
  - b) Meso compounds contains more than one chiral carbon centre
  - c) **Meso compounds are externally compensated**
  - d) Racemic mixture is designated as dl-pair

[Explanation: Meso compounds are internally compensated form whereas racemic mixtures are externally compensated modification. All the other options are correct.]

2. How many optical isomers are possible in a compound with one chiral carbon?
  - a) 5
  - b) 4
  - c) 2
  - d) 3**

[Explanation: A compound with one chiral carbon has three optical isomers (+), (-) and ( $\pm$ ).]

3. Which of the following compound would show optical isomerism?
  - a) **CH<sub>3</sub> – CH(OH) COOH**
  - b) H<sub>2</sub>N CH(CH<sub>3</sub>)<sub>2</sub>
  - c) (CH<sub>3</sub>)<sub>2</sub> CHCHO
  - d) H<sub>2</sub>N CH<sub>2</sub> COOH
4. The number of configurationally isomers of molecules having (n) different chiral carbons is
  - a) 2n
  - b) 2<sup>n</sup>**
  - c) 2<sup>n-1</sup>
  - d) 2<sup>n+1</sup>
5. The number of racemic forms of molecules having (n) different chiral carbons is
  - a) 2n
  - b) 2<sup>n</sup>
  - c) 2<sup>n-1</sup>**
  - d) 2<sup>n+1</sup>
6. For a molecule with two like chiral carbon atoms, the number of optically inactive form is

- a) 1**
- b) 2
- c) 3
- d) 4
7. For a molecule with two like chiral carbon atoms, the number of optically active form is
- a) 4
- b) 3
- c) 1
- d) 2**
8. Find the number of stereoisomers for  $\text{CH}_3 - \text{CHOH} - \text{CH} = \text{CH} - \text{CH}_3$ .
- a) 1
- b) 2
- c) 3
- d) 4**

[Explanation: The number of stereoisomers for  $\text{CH}_3 - \text{CHOH} - \text{CH} = \text{CH} - \text{CH}_3$  is four.

This is calculated by the formula  $2^{n+1}$ .]

9. Which of the following is an example of optically active compounds without chirality?
- a) Tartaric acid
- b) Sulphonium salt**
- c) Diphenic acid
- d) Glyceraldehyde

[Explanation: Sulphonium salt is an example of optically active compounds without chirality. It is a special case. There are various such molecules which are optically active compounds without chirality.]

10. Which of the following is not optically active compound?
- a) 1,7- Dicarboxylic spirocycloheptane
- b) 1,3- Diphenylpropadiene
- c) Meso-tartaric acid**
- d) Glyceraldehyde

[Explanation: Meso-tartaric acid is optically inactive molecule with chiral carbon atom. It is a special case of optical activity.]

11. The infinity of intermediate conformations are called
- a) Skew conformations**
- b) Staggered conformations
- c) Eclipsed conformations
- d) Gauche
12. The potential energy of n-butane is minimum for
- a) Skew conformations
- b) Staggered conformations**
- c) Eclipsed conformations
- d) Gauche

[Explanation: The potential energy of n-butane is minimum for staggered conformations.

It is because of no steric hindrance.]

13. The potential energy of n-butane is maximum for

- a) Skew conformations
- b) Staggered conformations
- c) Eclipsed conformations**
- d) Gauche

[Explanation: The potential energy of n-butane is maximum for eclipsed conformations. It is because of overlapping of functional groups.]

14. The relative instability of any of the intermediate skew conformations is due to

- a) Lateral strain
- b) Shear strain
- c) Longitudinal strain
- d) Torsional strain**

15. In gauche conformations, the methyl groups are

- a)  $60^\circ$  apart**
- b)  $90^\circ$  apart
- c)  $180^\circ$  apart
- d)  $360^\circ$  apart

16. Which of the following is least stable?

- a) Anti conformation
- b) Gauche conformation
- c) Staggered conformation
- d) Eclipsed conformation**

17. When the nucleophile :OR attacks the RX, the resultant product will be

- a) R – OH
- b) ROR**
- c) R:CN
- d) RNHR

18. Which step in S<sub>N</sub>1 reaction is a slow rate determining step?

- a) Attack of nucleophile
- b) Formation of racemic mixture
- c) Formation of transition state**
- d) Both a and b

19. A low concentration of nucleophile favours the

- a) S<sub>N</sub>2 mechanism
- b) S<sub>N</sub>1 mechanism**
- c) Both a and b
- d) E1 mechanism

20. Which of the following is rate determining step in electrophilic substitution reaction?

- a) Generation of electrophile
- b) Attack by an electrophilic reagent on benzene ring**

- c) Formation of product
  - d) both a and c
21. Which of the following act as electrophile in halogenation?
- a) Nitronium ion
  - b) Sulphonium ion
  - c) Halonium ion**
  - d) Acylium ion
- [Explanation: Halonium ion act as electrophile in halogenation. Nitronium ion is used in nitration. Sulphonium ion is used in sulphonation. Acylium ion is used in acylation.]
22. What type of reaction takes place upon treatment of a ketone with HCN to form a cyanohydrin?
- a) Nucleophilic addition**
  - b) Nucleophilic substitution
  - c) Electrophilic addition
  - d) Electrophilic substitution
23. Identify the compound with the highest ring strain
- a) Cyclomethane
  - b) Cyclopropane**
  - c) Cyclobutane
  - d) Cyclopentane
24. Which of the following is an initiator molecule in the free radical polymerisation?
- a) Benzoyl peroxide**
  - b) Sulphuric acid
  - c) Potassium permanganate
  - d) Chromium oxide
25. When the nucleophile  $\text{RO}^-$  attacks the RX, the resultant product will be
- a) ROH
  - (b) ROR**
  - (c) RCN
  - (d) RNHR
26. Losing of small molecule from original organic molecule is
- a) **Elimination reaction**
  - (b) Substitution reaction
  - (c) Addition reaction
  - (d) Both A and D
27.  $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{C}_2\text{O}_4)_3]$  and  $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{C}_2\text{O}_4)_3]$  is an example for(b)
- a) **Coordination isomerism**
  - (b) Ionisation isomerism
  - (c) hydrate isomerism
  - (d) linkage isomerism
28. In a free radical reaction, free radicals are formed at
- (a) Initiation step
  - (b) propagation step
  - (c) termination step
  - (d) both A and B**
29. An acceptor of pair of electron is termed as
- a) Nucleophile
  - (b) electrophile**
  - (c) carbocation
  - (d) Anion
30. Drugs that are used to diagnose, cure and prevent disease are called
- a) pharmaceutical drugs**
  - b) addictive drugs
  - c) industrial drugs
  - d) single cell drugs

31. Which of the following would exhibit co-ordination isomerism?

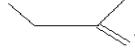
- a)  $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$
- b)  $[\text{Co}(\text{en})_2\text{Cl}_2]$
- c)  $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_3$
- d)  $[\text{Cr}(\text{en})_2\text{Cl}_2]^+$

32.  $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{Cl}_2$  and  $[\text{Co}(\text{NH}_3)_5(\text{ONO})]\text{Cl}_2$  are related to each other as

- a) Geometrical isomers
- b) Optical isomers
- c) **Linkage isomers**
- d) Coordination isomers

44. Exchange of co-ordination group by a water molecule in complex molecule results in

- (a) Ionization isomerism
- (b) Ligand isomerism
- (c) **Hydration isomerism**
- (d) Geometrical isomerism

45. The major product formed in the reaction of  with HBr is

- a)  $\begin{array}{c} | \\ \text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2\text{I} \\ | \\ \text{CH}_3 \end{array}$
- b)  $\begin{array}{c} | \quad | \\ \text{CH}_3-\text{CH}-\text{CH}_2-\text{CH}_3 \\ | \quad | \\ \text{I} \quad \text{CH}_3 \\ | \\ \text{I} \end{array}$
- c)  $\text{CH}_3-\text{CH}_2-\text{C-CH}_3$   
 $\quad \quad \quad |$   
 $\quad \quad \quad \text{CH}_3$
- d)  $\text{CH}_3-\begin{array}{c} | \\ \text{CH}_2-\text{CH=CH}_2 + \text{CH}_3\text{I} \\ | \\ \text{CH}_3 \end{array}$

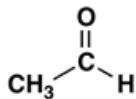
46. The most suitable reagent for the following transformation is



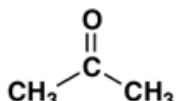
- a) **KMnO<sub>4</sub>**
- b) OsO<sub>4</sub>
- c) K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>
- d) PCC

47. Which is unreactive in hydride reduction with NaBH<sub>4</sub>?

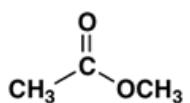
a)



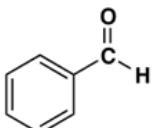
b)



c)



d)



48. The ionisation isomer of  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}(\text{NO}_2)\text{C}]$  is

- a)  $[\text{Cr}(\text{H}_2\text{O})_4(\text{O}_2\text{N})]\text{Cl}_2$
- b)  **$[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2](\text{NO}_2)$**
- c)  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}(\text{ONO})\text{Cl}]$
- d)  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2(\text{NO}_2)] \text{H}_2\text{O}$

49. Which would exhibit co-ordination isomerism?

- a)  **$[\text{Cr}(\text{NH}_3)_6]$**     **$[\text{Co}(\text{CN})_6]$**       b)  $[\text{Co}(\text{en})_2\text{Cl}_2]$     c)  $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_3$       d)  
 $[\text{Cr}(\text{en})_2\text{Cl}_2]$

50. Nucleophilic substitution near takes place when halogeno alkanes is added with aq. solution of

- a) NaCl   b) Sodium manganate   **c) NaOH**   d) Na chlorate

51. Identify reducing agent the following

- a) OS O<sub>4</sub>   b) PCC   **c) LiAlH<sub>4</sub>**   d) K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>

52. Drugs that are used to disguised, cure and prevent disease are called-----

- a) **Pharmaceutical drugs**   b) Addictive drug   c) Industrial drugs   d) single cell drugs

53. The ionisation isomer of  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}(\text{NO}_2)\text{C}]$  is

- e)  $[\text{Cr}(\text{H}_2\text{O})_4(\text{O}_2\text{N})]\text{Cl}_2$
- f)  **$[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2](\text{NO}_2)$**
- g)  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}(\text{ONO})\text{Cl}]$
- h)  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2(\text{NO}_2)] \text{H}_2\text{O}$



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**MULTIPLE CHOICE QUESTIONS**

**PROGRAM : B.Tech [Common]**

**Sem: I and II**

**SUBJECT/ CODE: CHEMISTRY PRACTICAL/18CYB101J**

1. The color of phenolphthalein indicator in acid solution is
  - a. Pink
  - b. Yellow
  - c. Colourless
  - d. Orange

**Answer: c. Colourless**

2. The equivalent weight of Sodium Carbonate  $[Na_2CO_3]$  is
  - a. 40
  - b. 53
  - c. 55.85
  - d. 63

**Answer: b. 53**

3. When basic solution is titrated against HCl in the burette with Methyl orange indicator, the end point is the color change from
  - a. Yellow to Violet
  - b. Orange to Yellow
  - c. Appearance of Pink color
  - d. Yellow to Orange

**Answer: Yellow to Orange**

4. Methyl orange is
  - a. Pink in acidic medium, yellow in basic medium
  - b. Yellow in acidic medium, pink in basic medium
  - c. Colourless in acidic medium, pink in basic medium
  - d. Pink in acidic medium, colourless in basic medium.

**Answer: a. Pink in acidic medium, yellow in basic medium**

5. Phenolphthalein color in basic medium is
  - a. Pink
  - b. Orange
  - c. Yellow
  - d. Colourless

**Answer: a. Pink**

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6. When mixture of sodium carbonate and sodium hydroxide solution is titrated against HCl solution, the Phenolphthalein end point correspond to
- Neutralization of OH<sup>-</sup> ions and CO<sub>3</sub><sup>2-</sup> ions
  - Neutralization of OH<sup>-</sup> ions only
  - Neutralization of CO<sub>3</sub><sup>2-</sup> ions only
  - Neutralization of OH<sup>-</sup> ions and half of CO<sub>3</sub><sup>2-</sup> ions

**Answer: d. Neutralization of OH<sup>-</sup> ions and half of CO<sub>3</sub><sup>2-</sup> ions**

7. A neutralization reaction is a ----- reaction taking place between the acids and the bases.
- double displacement
  - Displacement
  - Substitution
  - Addition

**Answer: a. double displacement**

8. A precipitation reaction is a double displacement reaction taking place between
- Acids and bases
  - two aqueous ionic compounds
  - two bases
  - two acids

**Answer: b. two aqueous ionic compounds**

9. In determination of mixture of bases by titration method, the amount of Sodium Hydroxide is calculated as---.
- N x Equivalent mass of Sodium Carbonate / 10
  - N [OH and CO<sub>3</sub><sup>2-</sup> portion] x Equivalent mass of Sodium Hydroxide and Sodium carbonate / 10
  - N [OH portion] x Equivalent mass of Sodium Hydroxide / 10
  - N [CO<sub>3</sub><sup>2-</sup> portion] x Equivalent mass of Sodium carbonate /10

**Answer: c. N [OH portion] x Equivalent mass of Sodium Hydroxide / 10**

10. When pH is below 8.5 the indicator ---- is colourless.
- EBT
  - Methyl orange
  - Phenolphthalein
  - K<sub>2</sub>CrO<sub>4</sub>

**Answer: c. Phenolphthalein**

11. What is the indicator used for estimation of hardness?
- Phenolphthalein

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- b) Methyl orange
- c) Eriochrome Black – T
- d) Potassium dichromate

**Answer: c. Eriochrome Black – T**

12. Hardness of water is conventionally expressed in terms of equivalent amount of \_\_\_\_\_.

- a)  $\text{H}_2\text{CO}_3$
- b)  $\text{MgCO}_3$
- c)  $\text{CaCO}_3$**
- d)  $\text{Na}_2\text{CO}_3$

**Answer: c.  $\text{CaCO}_3$**

13. One ppm is equal to \_\_\_\_\_.

- a) 100 mg / L
- b) 10 mg / L
- c) 1 mg / L**
- d) 500 mg / L

**Answer: c. 1 mg / L**

14. Which of the following does not cause the permanent hardness in water?

- a) Nitrates
- b) Sulphates
- c) Chlorides
- d) Bicarbonates**

**Answer: d. Bicarbonates**

15. Soft water + Buffer + EBT ----- →

- a. Appearance of wine-red colour
- b. Appearance of steel blue colour
- c. Formation of weak complex
- d. Formation of brown precipitate

**Answer: b. Appearance of steel blue colour**

16. Temporary hardness in water can be removed by:

- a) adding soda

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- b) distillation
- c) boiling
- d) adding lime-soda

**Answer: c. boiling**

17. In EDTA method, the purpose of adding buffer is \_\_\_\_\_.

- a) to maintain the pH of 6-8 range
- b) to maintain the pH of 8-10 range
- c) to maintain the pH of 4-6 range
- d) to maintain the conc. of the reagent

**Answer: b. to maintain the pH of 8-10 range**

18. Which of the following is not a unit of hardness?

- a) Parts per million
- b) Degree centigrade**
- c) Degree clarke
- d) Degree French

**Answer: b. Degree centigrade**

19. Temporary hardness of water is caused due to the presence of dissolved

- a) calcium hydrogen carbonates only
- b) magnesium hydrogen carbonates only
- c) Sulphates and chlorides of calcium or magnesium
- d) calcium hydrogen carbonates and magnesium hydrogen carbonates**

**Answer: d. calcium hydrogen carbonates and magnesium hydrogen carbonates**

20. Permanent hardness of water cannot be removed by

- a) Adding soda
- b) Adding lime soda
- c) Distillation
- d) Boiling**

**Answer: d. Boiling**

21. When sodium hydroxide is added to HCl, the H<sup>+</sup> ions are replaced by

- a) slow moving Na<sup>+</sup> ions**
- b) fast moving Na<sup>+</sup> ions
- c) slow moving OH<sup>-</sup> ions

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- d) fast moving  $\text{OH}^-$  ions

**Answer: a. slow moving  $\text{Na}^+$  ions**

22. When a strong base is added to a strong acid after the neutralization point

- a) conductance decreases
- b) conductance increases
- c) conductance remains constant
- d) conductance decreases initially and then increases gradually

**Answer: b. conductance increases**

23. Conductance of a solution depends upon

- a) mobility of ions
- b) charge of the ions
- c) size of the ions
- d) colour of the ions

**Answer: a. mobility of ions**

24. The end point in the conductometric titration of strong acid Vs strong base can be determined by plotting

- a) Conductance Vs Volume of acid
- b) Conductance Vs Volume of base
- c) pH Vs volume of acid
- d) pH Vs volume of base

**Answer: b. Conductance Vs Volume of base**

25. Which among the following reagents is NOT required in conductometric titration of strong acid Vs strong base

- a) HCl
- b) NaOH
- c) distilled water
- d)  $\text{K}_2\text{Cr}_2\text{O}_7$

**Answer: d.  $\text{K}_2\text{Cr}_2\text{O}_7$**

26. Which among the following apparatus is NOT used in conductometric titration

- a) conductivity meter
- b) conductivity cell
- c) beaker

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d) pH meter

**Answer: d. pH meter**

27. In order to get accurate values in titration of HCl Vs NaOH, the NaOH is added in increments of

- a) 2ml near and beyond the end point
- b) 1 ml near and beyond the end point
- c) 0.2 ml near and beyond the end point
- d) 0.5ml near and beyond the end point

**Answer: c. 0.2 ml near and beyond the end point**

28. When NaOH is added to HCl after the neutralization point the conductance increases rapidly

- a) because of fast moving OH<sup>-</sup> ions
- b) because of fast moving H<sup>+</sup> ions
- c) Because of fast moving Na<sup>+</sup> ions
- d) because of fast moving Cl<sup>-</sup> ions

**Answer: a. because of fast moving OH<sup>-</sup> ions**

29. In the pilot titration of NaOH Vs HCl by condcutometry, the base is added in increments of

- a) 0.1ml
- b) 0.2ml
- c) 1ml
- d) 2ml

**Answer: c. 1ml**

30. Conductance is measured in the unit

- a. ohm
- b. mho
- c. volts
- d. ml

**Answer: b. mho**

31. Which indicator is used in potentiometric titration?

- a. Methyl orange

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- b. Potassium Chromate
- c. Eriochrome Black T (EBT)
- d. No indicator is used.

**Answer: d. No indicator is used**

32. Name the reference electrode and working electrode used in the estimation of Fe(II) ions by potentiometry.

- a. Platinum electrode and Standard Calomel Electrode
- b. **Standard Calomel Electrode and Platinum electrode**
- c. Standard Calomel Electrode and Glass electrode
- d. Glass electrode and Platinum electrode

**Answer: b. Standard Calomel Electrode and Platinum electrode**

33. Estimation of Fe(II) ions by potentiometry is-----titration.

- a. Redox
- b. Acid-base
- c. Precipitation
- d. Complexometric

**Answer: a. Redox**

34. Oxidation states of Cr in Potassium Dichromate and Fe in FAS are respectively.

- a. (+VII) and (+II)
- b. (+V) and (+II)
- c. (+VI) and (+II)
- d. (+VII) and (+III)

**Answer: c. (+VI) and (+II)**

35. Which of the following chemical agent is added during the estimation of Fe(II) ions by potentiometry to avoid the hydrolysis reaction during the titration?

- a. FAS
- b. Phenolphthalein
- c. dil.  $\text{H}_2\text{SO}_4$
- d. dil. HCl

**Answer: c. dil.  $\text{H}_2\text{SO}_4$**

36. In the experiment, “Estimation of Fe(II) ions by potentiometry”,  $\text{K}_2\text{Cr}_2\text{O}_7$  acts as ---.

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- a. Reducing agent
- b. Oxidizing agent**
- c. Indicator
- d. Catalyst

**Answer: b. Oxidizing agent**

37. Which of the following represents the equivalence point in the graph of EMF vs volume of titrant?

- a. Point at the highest EMF
- b. Point at the lowest EMF
- c. Point at the greatest magnitude of the slope of the curve
- d. Point at the least magnitude of the slope of the curve

**Answer: c. Point at the greatest magnitude of the slope of the curve**

38. All of the following statements are correct regarding potentiometric titration except

- a. They are suitable for colored or turbid solutions
- b. The EMF of the cell is zero at the equivalence point
- c. The results obtained are accurate
- d. Acid base titration can also be carried out by potentiometry

**Answer: b. The EMF of the cell is zero at the equivalence point**

39. Basically, potentiometer is a device for ---.

- a. Comparing two voltages
- b. Measuring a current
- c. Comparing two currents
- d. Measuring a voltage

**Answer: a. Comparing two voltages**

40. The significance of first derivative and second derivative plot in potentiometric titration is -.

- a. To get additional information about the redox reaction
- b. To get the voltage of reference electrode
- c. To get the value of standard electrode potential
- d. To get more accurate equivalence point in case of colored and dilute solutions

**Answer: d. To get more accurate equivalence point in case of colored and dilute solutions**

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41. What is the working principle of conductometry?

- a. measurement of potential.
- b. measurement of conductivity of solution.
- c. measurement of emf.
- d. measurements of pH

**Answer: b. measurement of conductivity of solution**

42. Among the following applications for which the conductometry titration is not used?

- a. To determine of moisture
- b. Purity of water
- c. Ionic product of water.
- d. Precipitation titration

**Answer: a. To determine of moisture**

43. If the ion size decreases in solutions then

- a. conductance decreases
- b. conductance increases
- c. does not affect the conductance
- d. first decreases and then increases

**Answer: b. conductance increases**

44. Conductivity cell is made up of...

- a. Two silver rods
- b. Two parallel sheets of platinum
- c. Glass membrane of Ag/AgCl
- d. Sb-Sb<sub>2</sub>O<sub>3</sub>

**Answer: b. Two parallel sheets of platinum**

45. The units for specific conductance is...

- a. Ohms
- b. Ohms.cm
- c. Mhos
- d. Mhos.cm

**Answer: b. Ohms.cm**

46. Conductivity of a solution is directly proportional to

- a. dilution
- b. current density
- c. number of ions
- d. volume of the solution

**Answer: c. number of ions**

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47. In conductometric titration, after both the acids are consumed, there is a steep increase in conductivity due to...

- a. increase in total volume of solution
- b. increase in temperature
- c. increase in  $\text{OH}^-$  ions
- d. increase in  $\text{H}^+$  ions

**Answer: c. increase in  $\text{OH}^-$  ions**

48. At the same concentration and temperature, dilute aqueous solution of strong acid will conduct electricity....

- a. better than dilute aqueous solution of weak acid
- b. as much as dilute aqueous solution of weak acid
- c. lower than the dilute aqueous solution of weak acid
- d. two-fold higher than the weak acid

**Answer: a. better than dilute aqueous solution of weak acid**

49. In conductometric titration when KOH is titrated against mixture of  $\text{H}_2\text{SO}_4$  and malonic acid, which one will be reacting first?

- a. Malonic acid
- b. Sodium malonate
- c. Disodium malonate
- d.  $\text{H}_2\text{SO}_4$

**Answer: d.  $\text{H}_2\text{SO}_4$**

50. If 20 g of NaOH is dissolved in 1 L distilled water, then what is the concentration of the solution?

- a. 1 N
- b. 2 N
- c. 0.5 N
- d. 0.05 N

**Answer: c. 0.5 N**

51. A pH value less than 7.0 means that the solution is

- a) Conductive
- b) Caustic
- c) Alkaline
- d) Acidic

**Answer: d. Acidic**

52. Which of the following is the formula for pH calculation?

- a)  $\log_{10}[\text{H}^+]$
- b)  $-\log_{10}[\text{H}^+]$

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c)  $\log_2[H^+]$

d)  $-\log_{10}[H^+]$

**Answer: b.  $-\log_{10}[H^+]$**

53. The pH meter is a

a) Ammeter

b) Voltmeter

c) Potentiostat

d) Spectrophotometer

**Answer: b. Voltmeter**

54. What is the pH value of pure water?

a) Less than 7

b) Greater than 7

c) Equal to 7

d) Greater than 14

**Answer: c. Equal to 7**

55. How we will come to know that a given solution is acidic?

a) If its pH value is less than 7

b) If its pH value is greater than 7

c) If its pH value is less than 5

d) If its pH value is 5

**Answer: a. if its pH value is less than 7**

56. What happens when a base is added to an acid?

a) the pH value increases

b) the pH value decreases

c) no change in pH

d) the pH value becomes zero

**Answer: a. the pH value increases**

57. A buffer solution is used with pH measuring instruments to

a) protect the equipment

b) standardize the equipment

c) clean the electrodes

d)钝化 the reference electrode

**Answer: b. standardize the equipment**

58. The pH of a liquid solution is a measure of

a) dissolved salt content

b) hydrogen ion activity

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- c) hydroxyl ion molarity
- d) electrical conductivity

**Answer: b. hydrogen ion activity**

59. The electrolyte solution within the glass electrode (reference) of the pH meter is

- a) saturated KCl
- b) concentrated HCl
- c) dilute HCl
- d) dilute NaCl

**Answer: a. saturated KCl**

60. A buffer solution comprises which of the following?

- a) a weak acid in solution
- b) a strong acid in solution
- c) a weak base in solution
- d) a weak acid and its conjugate base in solution

**Answer: d. a weak acid and its conjugate base in solution**

61. Which one of the following methods is not related to calculate the molecular weight of a polymer?

- a) Number average molecular weight,
- b) Weight average molecular weight,
- c) Gel permeation chromatography,
- d) High performance liquid chromatography

**Answer: d. High performance liquid chromatography**

62. Measurement of solution viscosity offers a simple and convenient method for molecular weight determination if

- a) Polymer is insoluble in solvent
- b) Polymer is soluble in solvent
- c) Polymer is sparingly soluble in solvent
- d) Polymer is used as neat

**Answer: b. Polymer is soluble in solvent**

63. The Staudinger – Mark-Houwink equation is

- a)  $\eta_i = K(M)^a$
- b)  $I = \eta / p$
- c)  $E = mc^2$
- d)  $E = \eta u$

**Answer: a.  $\eta_i = K(M)^a$**

64. Viscosity is due to one of the following

- a) Potential energy stored in fluid

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- b) Resistance to fluid motion
- c) Roughness of the surface
- d) The pressure difference between the two fluids

**Answer: b. Resistance to fluid motion**

65. What is the SI unit of viscosity?

- a) Candela
- b) Poiseiulle
- c) Newton/m
- d) No units

**Answer: b. Poiseiulle**

66. Which of these fluids has the highest viscosity?

- a) Water
- b) Honey
- c) petrol
- d) brine solution

**Answer: b. Honey**

67. Which one of the following equations is used to calculate the relative viscosity?

- a)  $\eta / \eta_0 = t/t_0$
- b)  $\eta_{sp} = \eta / \eta_0 - 1$
- c)  $\eta_{red} = \eta_{sp}/C \times 100$
- d)  $\eta_i = K(M)^a$
- e) **Answer: a.  $\eta / \eta_0 = t/t_0$**

68. On increasing the temperature, the viscosity of the fluid \_\_\_\_\_

- a) Decreases
- b) Increases
- c) Initially decreases then increases
- d) Neither decrease nor increase

**Answer: a. Decreases**

69. A plot of  $\eta_{sp} / C$  (reduced viscosity) Vs C is a ..... for dilute polymer solutions

- a) "S" shape curve
- b) Triangle
- c) Straight line
- d) "V" shape curve

**Answer: c. Straight line**

70. Volume of different concentrations of polymer solution used (0.1, 0.2, 0.3 , 0.4 and 0.5 %) for each viscosity measurement

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- a) Varies with respect to concentration
- b) Varies with respect to the size of the Ostwald viscometer
- c) Varies with respect to polymer used
- d) Remains fixed

**Answer: d. Remains fixed**

71. To prepare 25 ml of 0.2 % diluted solution from a 1% solution, we need

- a) 2.5 ml of 1 % solution
- b) 5 ml of 1 % solution
- c) 7.5 ml of 1 % solution
- d) 10 ml of 1 % solution

**Answer: b. 5 ml of 1 % solution**

72. What is the role of chromate ions in chloride estimation?

- a. It acts as a reducing agent
- b. It acts as a buffer
- c. It acts as an indicator
- d. It acts as an oxidizing agent

**Answer: c. It acts as an indicator**

73. What is the pH range in which chloride determination using Mohr's method is conducted?

- a. < 3
- b. 5
- c. > 12
- d. 6 -9

**Answer: d. 6 -9**

74. Which of the following is not a primary standard?

- a. NaCl
- b. Anhydrous Na<sub>2</sub>CO<sub>3</sub>
- c. AgNO<sub>3</sub>
- d. Oxalic acid

**Answer: c. AgNO<sub>3</sub>**

75. Which indicator is used in Mohr's method?

- a. Potassium Chromate
- b. Silver Nitrate
- c. Potassium dichromate
- d. Silver Chromate

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**Answer: a. Potassium Chromate**

76. Estimation of chloride reaction is

- a. Redox reaction
- b. Equilibrium reaction
- c. Precipitation reaction
- d. Catalytic reaction

**Answer: c. Precipitation reaction**

77. Which type of reaction occurs in the following reaction  $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$ ?

- a. Displacement reaction
- b. Single replacement
- c. Decomposition
- d. Double displacement reaction

**Answer: d. Double displacement reaction**

78. Why do we have to standardize  $\text{AgNO}_3$  solution?

- a. To find the normality of  $\text{NaCl}$
- b. To calculate the normality of  $\text{AgCl}$
- c. To find the normality of  $\text{AgNO}_3$
- d. To calculate the volume of  $\text{NaCl}$

**Answer: c. To find the normality of  $\text{AgNO}_3$**

79. What is the oxidation state of Mn in  $\text{KMnO}_4$  ?

- a. +6
- b. +7
- c. +9
- d. +5

**Answer: b. +7**

80. What is the advantage of Mohr's method?

- a. A Very clear colour change
- b. Simple method
- c. Capability for different PH
- d. Must be 1M nitric acid solution.

**Answer: b. Simple method**

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81. In Mohr's method the solution needs to be near neutral, because
- a. Silver chloride forms at high pH,
  - b. Silver precipitates at low pH
  - c. Chromate forms  $H_2CrO_4$  at low pH, which delays the formation of the precipitate.
  - d. Potassium chromate dissolves at high pH.

**Answer: c. Chromate forms  $H_2CrO_4$  at low pH, which delays the formation of the precipitate.**