

DEPARTMENT OF CHEMISTRY
SRM INSTITUTE OF SCIENCE AND TECHNOLOGY
B.TECH - I year (2018 Regulation)

Subject/Code: Chemistry/ 18CYB101J

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) **CH₃ – CH(OH) COOH**
b) H₂N CH(CH₃)₂
c) (CH₃)₂ CHCHO
d) H₂N CH₂ 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) 2ⁿ

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?

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

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

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° apart**
- b) 90° apart
- c) 180° apart
- d) 360° 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 SN1 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

- a) Nitronium ion
- b) Sulphonium ion
- c) Halonium ion**

d) Acylium ion

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 alcohols

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

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

- a) **[Cr(NH₃)₆][Co(CN)₆]**
- b) [Co(en)₂Cl₂]
- c) **[Cr(NH₃)₆]Cl₃**
- d) [Cr(en)₂Cl₂]⁺

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) [Cr (NH₃)₆] [Co (CN)₆]**
- b) [Co(en)₂Cl₂]
- c) [Cr(NH₃)₆]Cl₃**
- d) [Cr(en)₂Cl₂]

27. Nucleophilic substitution takes place when haloalkanes 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

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)
- 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 F₂ > Cl₂ > Br₂
 - d. Bond enthalpy F₂ > Cl₂ > Br₂**

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.**

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⁺**

- b. Mg⁺
- c. Al⁺
- d. Ne

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

- a. Mercury- arc

- b. Nernst glower
- c. Globar source

- d. AlK α**

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/V²**

- c. a/V
- d. V-nb

44. 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
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° , 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) OSO_4
 - b) PCC
 - c) 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**
 - 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) $1S \rightarrow nS$

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) sec^{-1}

b) cm^{-1}

c) cm.sec^{-1}

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

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

a) Microwave

b) Radio waves

c) UV-Visible rays

d) Infra-red rays

57. In $\text{K}_4[\text{Fe}(\text{CN})_6]$ the number of unpaired electrons in iron are ?

(a) 0

(b) 2

(c) 3

(d) 5.

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)₆ 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 K₄[Ni(CN)₄] oxidation state of

nickel is ? (a) -1

(b) 0

(c) +1

(d) +2

62. The spin only formula (μ_s) for octahedral complexes is

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

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

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

d) $L(L+1)$

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 Cr(CO)₆ is **a) 0**

b) 2.84

c) 4.90

d) 5.92

65. The number of unpaired electrons in d₆ 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

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
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

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 | ZnSO₄|| CuSO₄ | Cu, E = 1.09 volt**

b) Zn | ZnSO₄|| Cu | CuSO₄, E = 1.09 volt

c) ZnSO₄ | Zn || CuSO₄ | Cu, E = 1.09 volt

d) Zn | ZnS|| CuSO₄ | Cu, E = 1.09 volt

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

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) $E_{red} = -E^\circ + (5/n) \log_{10} [H^+]$.

b) $E_{red} = -E^\circ - (0.0591/n) \log_{10} [H^+]$.

c) $E_{red} = E^\circ + (0.0591/n) \log_{10} [H^+]$.

d) $E_{red} = E^\circ - (0.0591/n) \log_{10} [H^+]$.

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

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 $\Delta_{\text{sys}} + \Delta_{\text{surr}}$ is

a. > 0

b. < 0

c. ≥ 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

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°) 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?

a) H_2^+

b) He_2^+

c) He2

d) 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) 2py-2pz

b) 1s-2s

c) 2px-2py

d) 2s-2px

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) SN2 mechanism

b) SN1 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

109. Which of the following is not an optically active compound? a) 1,7- Dicarboxylic Spiro Cycloheptane

- b) 1,3- Diphenylpropadiene
- c) Meso-tartaric acid**
- d) Glyceraldehyde

110. 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**

111. Identify the compound with the highest ring strain

- a) Cyclomethane
- b) Cyclopropane**
- c) Cyclobutane
- d) 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? a) Geometrical isomers

- b) Optical isomers
- c) Linkage isomers**
- d) Coordination isomers

113. The dehydration of alcohols is an example of _____

- a) Bimolecular elimination/E2 reaction**
- b) SN2 reaction
- c) SN1 reaction

d) Unimolecular elimination/E1 reaction

115. Which is unreactive in hydride reduction with NaBH4?

a)

b)

c)

d)

116. The most electronegative element possess the electronic

configuration? a. $ns^2 np^2$

b. $ns^2 np^4$

c. $ns^2 np^5$

d. $ns^2 np^3$

117. Minimum interplanar spacing required for Bragg's

diffraction is _____ a. $\lambda/4$

b. $\lambda/2$

c. 4λ

d. 2λ

118. The first, 2ndand 3rdionization enthalpies of gallium are 579KJmol⁻¹, 1979 KJmol⁻¹ and

2962 KJmol⁻¹ even though the 3rd I.P is highest, Ga³⁺ is the most stable because
a. The energy loss is maximum resulting greater stability

b. The size of Ga³⁺ is smallest

c. Ga³⁺ is most reactive

d. It attains a stable configuration

119. The co-ordination number and oxidation number of X in [X(SO₄)(NH₃)₄]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 10⁻²⁹ J

b. 4.9 X 10⁻²⁹ J

c. 5.9 X 10⁻²⁹ J

d. 6.9 X 10⁻²⁹ 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 NH₃, en, CN- and CO the correct order of their increasing field strength, is

- (a) CO < NH₃ < en < CN-
- (b) NH₃ < en < CN- < CO**
- (c) CN- < NH₃ < CO < en
- (d) en < CN- < NH₃ < CO

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

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

124. The magnetic moment of [Co(NH₃)₆]Cl₃ is

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

125. The magnetic moment (spin only) of [NiCl₄]²⁻ 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) H₂O

c) CO₂

d) CH₂ = C H₂

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) CO₂

b) N₂

c) H₂O

d) SO₂

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

reference in proton NMR spectroscopy?

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. H₂

b. N₂

c. NO

d. O₂

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?

a)

b.

c.

d.

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

a. The bond order of O₂ is 2.5 and it is paramagnetic

b. The bond order of O₂ is 1.5 and it is paramagnetic

c. The bond order of O₂ is 2 and it is diamagnetic

d. The bond order of O₂ is 2 and it is paramagnetic

136. Which of the following is known as the Schrödinger

equation? a. E = mc²

b. b) $\lambda = h/p$

c. c)

d. d) -

137. The CFSE for a high spin d⁴octahedral complex is

a) -0.6 Δ_{Oct}

b) -1.8 Δ_{Oct}

c) -1.6 Δ_{Oct} + P

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

138. Which of the following molecules is IR active?

- a) H₂
- b) N₂
- c) O₂
- d) CO₂**

139. 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

140. A centre of symmetry is equivalent to _____ fold alternating axis of symmetry.

- a. One
- b. Two**
- c. Three
- d. Four

141. 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**

142. A plane of symmetry is equivalent to fold alternating axis of symmetry. **a. One**

- b. Two

c. Three

d. 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

a. R-Configuration

b. S-Configuration

c. E-Configuration

d. C-Configuration

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

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

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 ΔS .

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, $H = E + PV$
- (b) The thermodynamic symbol for entropy is S.
- (c) Gibbs free energy is a state function.

d) For an endothermic process, ΔH 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, ΔG° will be ($F = 96500 \text{ C mol}^{-1}$) - -----.

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

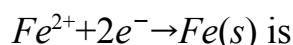
149. The Helmholtz function F is

given by

a) U-TS

- b) U+TS
- c) -U-TS
- d) -U+TS

150. In Pourbaix Diagram the redox reaction,



- a) pH dependent
- b) pH independent**
- c) solvent dependent
- d) solvent independent

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



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

||

I CH₃

I

|

c) CH₃-CH₂-C-CH₃

|

CH₃

d) CH₃-CH₂-CH=CH₂ + CH₃I

153. The most suitable reagent for the following transformation is

a) KMnO₄

b) OsO₄

c) K₂Cr₂O₇

d) PCC

154. [Co(NH₃)₆][Cr(C₂O₄)₃] and [Cr(NH₃)₆][Co(C₂O₄)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 [Cr(H₂O)₄Cl(NO₂)C] is

a) [Cr(H₂O)₄(O₂N)]Cl₂

b) [Cr(H₂O)₄Cl₂](NO₂)

c) [Cr(H₂O)₄Cl(ONO)Cl

d) [Cr(H₂O)₄Cl₂(NO₂)] H₂O

156. The ionisation isomer of [Cr(H₂O)₄Cl(NO₂)C] is

a) [Cr(H₂O)₄(O₂N)]Cl₂

b) [Cr(H₂O)₄Cl₂](NO₂)

- 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 (C_4H_{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?

- 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?

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) CH₄

c) H₂

d) N₂

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

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 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) 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) σg of lowest energy**
- b) σu of second lowest energy
- c) πg of lowest energy
- d) πu 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 O₂ to Ne₂
- b) For H₂ to N₂**
- c) For H₂ to Ne₂
- d) For N₂ to Ne₂

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

- a) H₂O₂
- b) O₃**

c) K₂Cr₂O₇

d) KMnO₄

172. Which is unreactive in hydride reduction with NaBH₄?

a) CH₃CHO

b) CH₃COCH₃

c) CH₃COOCH₃

d) CH₄

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

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 H₂O?

- 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
- b) NO

c) N2

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 (C_4H_{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) $3.9 \times 10^{-29} J$
- b) $4.9 \times 10^{-29} J$
- c) $5.9 \times 10^{-29} J$**

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

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

condensation?

a)

b)

c)

d)

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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DEPARTMENT OF CHEMISTRY
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187. If the angle of incidence is 30° , 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) θ

b) $\theta/2$

c) 2θ

d) $\theta/3$