PG-TRB

CHEMISTRY

(MODEL TEST -1)
Choose The Best Alternative From The Choices Given:

1. Which of the following DOES NOT contain any asymmetric carbon but can show enantiomerism
   a. Lactic acid  b. 1,3-pentadiene  c. Tartaric acid  d. 1,3-pentadiene

2. The most stable conformation of 1,3-dimethylcyclohexane is
   a.  b.  c.  d.

3. The correct order of priority of ligands –NO₂, –C=N, –NH₂ and –CH₂NH₂ in absolute configuration of enantiomer is
   a. NO₂>–NH₂>–C=N>CH₂NH₂  b. NO₂>–C=N>NH₂>CH₂NH₂  c. NO₂>–C=N>–NH₂>CH₂NH₂  d. NH₂>–NO₂>–CH₂NH₂>–C=N

4. The geometry of chiral center of allenes can be
   a. Tetrahedral  b. linear  c. trigonal planar  d. pyramidal

5. The octahedral complex which shows both fac- & mer isomers are
   a. trans[en] cobalt(III)  b. triglycinecobalt(III)  c. dichlorodiglycinecobalt(III)  d. tris oxalate cobaltate (III)

6. Epoxidation of cis-2-butene in presence of peracid gives
   a. racemic mixture  b. H₂O₂  c. trans-epoxybutene  d. none of these

7. In the Nessler’s reagent, the ion is
   a. HgCl₂  b. HgCl₃  c. HgCl₄²⁻  d. [HgCl₆]³⁻

8. The complexes [Co(NH₃)₆]³⁺ [Cr(CN)₆]³⁻ and [Co(NH₃)₆][Cr(CN)₆] are example of
   a. coordination isomerism  b. Hydration isomerism  c. linkage isomerism  d. none

9. Incorrect statement about the stability of complexes is
   a. chelation increases stability increases  b. greater charge and smaller size increase the stability  c. higher electronegativity and high oxidation of metal ion increase the stability  d. more basic ligand, greater stability

10. Optically inactive compound from the following
    a. cis-decalin  b. trans-decalin  c. trans-cyclooctene  d. none of these

11. When cyclohexene is brominated, the product is
    a. racemic mixture  b. cis-1,2-dibromo-cyclohexane  c. 60% cis & 40% trans  d. meso

12. Among the following species, the one having highest bond strength is
    a. O₂  b. B²⁺O₅⁻  c. O₂⁻  d. O₂²⁻

13. Metal-deficiency defects observed in
    a. FeO  b. NaCl  c. CsCl  d. AgBr

14. The most stable ionic compound from the following is
    a. LiF  b. KCl  c. LiBr  d. LiI

15. In which of the following, the structure parameter λ<0
    a. Ni₃AlO₄  b. Ni₃Fe₂O₄  c. CoFe₂O₄  d. all of these

16. The radius of Zn²⁺ and S²⁻ ions are 0.74Å and 1.84Å respectively. Then, the C.N and geometry of ZnS solid is
    a.  b. 2; trigonal  c. 8; bcc  d. 6, Oh

17. Non-aqueous polar aprotic solvent and high dielectric non-aqueous solvent from the following is
    a. SO₂ & HF  b. SO₂ & NH₃  c. NH₃ & HF  d. SO₂ & H₂O

18. When lone pairs are present in a molecule, the bond angles are
    a. smaller than expected  b. larger than expected  c. no change in bond angle  d. not determined

19. Photo luminescent material Williminate from the following is
    a. Zn₂SiO₄  b. CaMg(SiO₄)₂  c. Ca₆(PO₄)₂  d. Ca₆(PO₄)₃
20. Which of the following has largest ionic radius?
   a. Na⁺  
   b. Mg²⁺  
   c. Al³⁺  
   d. Cs⁺

21. Which one of the following has high bond energy?
   a. HF  
   b. HCl  
   c. HBr  
   d. HI

22. Need temperature is related to
   a. ferromagnetism  
   b. hysteresis  
   c. anti-ferromagnetism  
   d. paramagnetism

23. Treatment of 2-methyl-2-butene with HBr in the presence of peroxide yields
   a. 1°-alkyl bromide  
   b. 2°-alkyl bromide  
   c. 3°-alkyl bromide  
   d. dibromide

24. Hydrolysis of epoxides gives
   a. trans-diols  
   b. cis-diols  
   c. both cis and trans diols  
   d. dicarboxylic acid

25. Skaup synthesis to prepare
   a. pyrole  
   b. quinoline  
   c. isoquinoline  
   d. Indole

26. Electrophilic substitution in nitration on pyrrole gives
   a. 2-nitropyrole  
   b. 3-nitro pyrrole  
   c. 2,3,4,5-tetra nitro pyrrole  
   d. N-nitropyrole

28. The repeating unit of Nucleic acid is
   a. Nucleotides  
   b. nucleosides  
   c. carbohydrates  
   d. phosphate groups

29. Cellulose has
   a. 1,4-β-glycosidic linkage  
   b. 1,4-α-glycosidic linkage  
   c. 1,2-β-glycosidic linkage  
   d. 1,2-α-glycosidic linkage

30. 1-Butyne on hydroboration followed by oxidation gives
   a. ketone  
   b. alcohol  
   c. aldehyde  
   d. all of these

31. Acetylene undergo Ozonolysis gives
   a. 1-mole CHO + 1 mole CO₂  
   b. 2 moles of CHO  
   c. 2 moles of HCO₂H  
   d. 7 moles of ketone

32. Hydration of 2-methyl-2-butene in presence of acid gives
   a. 2-methyl-2-butanol  
   b. 3-methyl-2-butanol  
   c. 2-methyl-1-butanol  
   d. 1-methyl -2-butanol

33. In which of the following is used as both nucleophile as well as solvent in solvolysis reaction
   a. H₂O  
   b. NH₃  
   c. ethanol  
   d. all of these

34. The type of radiation emitted during the conversion of Na⁺⁺⁺ to Mg²⁺ is
   a. α-ray  
   b. β-ray  
   c. γ-ray  
   d. positron

35. Nuclear shell model deals with
   a. binding energy  
   b. stability of nuclei  
   c. both a & b  
   d. none of these

36. Fermi units is the measurement of
   a. nuclear size  
   b. nuclear density  
   c. nuclear radius  
   d. Q-value

37. Half life period of ³²P is 60 days. What % of original radioactivity would be present after 180 days.
   a. 12.5%  
   b. 25%  
   c. 25%  
   d. 50%

38. ⁴¹H → ⁴¹He + x, x is:
   a. γ-ray  
   b. β-ray  
   c. positron  
   d. none of these

39. If the half-life of a radioactive nucleus is 10⁵s, the disintegration constant λ is equal to
   a. 6.93x10⁻²⁵s⁻¹  
   b. 6.93x10⁻⁵s⁻¹  
   c. 6.93x10⁻⁵s⁻¹  
   d. 6.93x10⁻⁶s⁻¹

40. ⁴⁰K species from the following is
   a. Ferromagnetic  
   b. anti-ferromagnetic  
   c. Nickeloscar  
   d. Cobaltoscar

41. This compound is a liquid
   a. cyclic trifluoro methane  
   b. terminal aldehyde  
   c. cyclohexene  
   d. cyclohexane

42. The geometry of SnCl₂⁺ is
   a. Td  
   b. square planar  
   c. Oh  
   d. square pyramidal

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43. In the presence of free rotation in ferrocene, it undergo friedel-crafts acetylation gives
   a. only one isomer of 1,1'-diacetyl ferrocene   b. two isomer of 1,1'-diacetyl ferrocene   c. three
   isomer of 1,1'-diacetyl ferrocene   d. no product

44. Wilkinson catalyst is
   a. square planar 18e- species   b. square planar 16e-species   c. Td 16e-species   d. Oh 16e-
   species

45. The second lowest state of particle in a cubic box is
   a. non-degenerate   b. doubly-degenerate   c. triply degenerate   d. six-fold degenerate

46. The eigen value of \( d^2/dx^2 \) (\( e^K \)) is
   a. ik   b. 0   c. \( -k^2 \)   d. \(-ik^2 \)

47. The radiation observed in the visible-region of H-spectrum is

48. The energy of photon having a wavelength \( 1.5 \times 10^{-3} \) m \( \text{is} \) \( \hbar = 6.63 \times 10^{-34} \) J \( \text{is} \)
   a. \( 10.64 \times 10^{-16} \) J   b. \( 13.25 \times 10^{-16} \) J   c. \( 18.29 \times 10^{-16} \) J   d. \( 1.678 \times 10^{-16} \) J

49. The radius of orbit of an \( e^+ \) in the first excited state of hydrogen atom is
   a. \( a_0 \)   b. \( 2a_0 \)   c. \( 3a_0 \)   d. \( 4a_0 \)

50. In the Compton effect, the Compton wavelength corresponding to the scattering angle equal to
   a. \( 90^\circ \)   b. \( 50^\circ \)   c. \( 45^\circ \)   d. \( 180^\circ \)

51. The speed of 1.0g projectile is known to be within \( 1 \times 10^6 \) m/s. The minimum uncertainty in position is
   a. \( 28.10^{-35} \) m   b. \( 3 \times 10^{-35} \) m   c. \( 6 \times 10^{-35} \) m   d. \( 4 \times 10^{-35} \) m

52. Staggered conformation of ferrocene has a point group
   a. D5h   b. \( D_5d \)   c. D2h   d. Oh

53. The eigenvector of \( d^2/dx^2 \) (\( \sin2x \)) is
   a. 4   b. 16   c. 4   d. 24

54. The selection rule for combined vibrational and rotational transitions are
   a. \( \Delta v = \pm 1 \) & \( \Delta J = \pm 1 \)   b. \( \Delta v = \pm 2 \) & \( \Delta J = \pm 2 \)   c. \( \Delta v = \pm 1 \) & \( \Delta J = \pm 1 \)   d. \( \Delta v = \pm 2 \) & \( \Delta J = \pm 1 \)

55. Which of the following diatomic molecules will not give a rotational spectrum and gives vibrational
   raman spectrum?  
   a. \( N_2 \)   b. \( O_2 \)   c. \( H_2 \)   d. all of these

56. Reduced phase rule for 3-component system is
   a. F = 5-P   b. F = 4-P   c. F = 2-P   d. F = 3-P

57. Mean activity co-efficient of an electrolyte is given by
   a. \( \log z = -Az.z. \sqrt{l} \)   b. \( \log z = -Az.z. \sqrt{c} \)   c. \( \log z = -Az.z. \sqrt{A} \)   d. none of these

58. How many peaks would you expect for \( \text{CuSO}_4 \cdot 5\text{H}_2\text{O} \) in DTA?
   a. 6   b. 5   c. 4   d. 2

59. For inert gas \( C_p/C_v \) value is
   a. 1.66   b. 1.02   c. 24   d. 12.47

60. Ferro and anti-ferro magnetic materials can be investigated by
   a. X-ray e- diffraction   b. X-ray neutron diffraction   c. DTA   d. TGA

61. \( R_T \) value is always
   a. zero   b. \( >1 \)   c. \(<1 \)   d. cannot be predicted

62. In a reversible isothermal process, the change in internal energy is
   a. zero   b. positive   c. negative   d. not determined

63. Which of the following particles is called fermions
   a. Proton and electron   b. particles are distinguishable   c. having integral spin   d. all of these

64. The number of component present in \( \text{KCl-NaBr-H}_2\text{O} \) system is
   a. 3   b. 5   c. 4   d. 2

65. The state function which is intensive property from the following
   a. internal energy   b. chemical potential   c. free energy   d. entropy
66. Temperature dependence equilibrium constant is called
67. Freundlich Isotherm is not applicable at
   a. High pressure  b. Low pressure  c. 273K  d. Room temperature
68. The Ea for the forward reaction is 40 kJ/mol and that for the reverse reaction is 60kJ/mol. The reaction is
   a. Exothermic  b. Endothermic  c. Chain reaction  d. Spontaneous
69. The wrong statement from the following against catalysis is
   a. A catalyst can initiate the reaction  b. It does not alter the equilibrium constant
c. A catalyst remains unchanged at the end of reaction  d. Catalysts are sometime very specific in respect of a reaction
70. Generally adsorption increases when
   a. Temperature increases  b. Temperature decreases  c. Temperature remains constant  d. None of these
71. Debye–Hückel–Onsager equation is applicable to
   a. Weak electrolytes  b. Strong electrolytes  c. Non-electrolytes  d. All electrolytes
72. The reduction potentials of Cu^{2+}/Cu and Cd^{2+}/Cd are 0.34 and -0.40 V respectively. Then, the emf of the cell Cd/Cd^{2+} | Cu^{2+}/Cu is
   a. 0.06 V  b. 0.06 V  c. -0.74 V  d. 0.74 V
73. In polarography method of analysis, the current measured is
   a. Migration current  b. Limiting current  c. Eddy current  d. Diffusion current
74. Collision theory is applicable to
   a. Only gaseous molecules  b. Only liquid  c. Only solid  d. Gas & liquid
75. Ostwalds dilution law holds good for a weak electrolytes is
   a. Kc = a/V  b. Kc = a/V  c. Kc = a/V  d. None of these
76. The spherical electrode used in the polarography technique is
   a. DME  b. Calomel  c. Pt  d. Supporting electrolyte
77. The hydrogen over voltage is maximum for
   a. Hg  b. Pt  c. Glassy carbon  d. Zn
78. Which one of the following high spin complexes has the largest CFSE value
   a. Mn(H2O)6^{3+}  b. [Cr(H2O)6]^{3+}  c. Mn(H2O)6^{3+}  d. Cr(H2O)6^{3+}
79. John–Teller distortion is not observed in the high spin complexes of
   a. d^5  b. d^5  c. d^5  d. d^5
80. The expected spin only magnetic moments for [Fe(CN)6]^{3-} and [Fe(V)]^{3+} respectively are
   a. 0.6 & 5.92 BM  b. 0.6 & 1.73 BM  c. 1.73 & 5.92 BM  d. 1.73 & 1.73 BM
81. Which of the following complexes have large CFSE value and _______ has zero CFSE value?
   a. OH & Zn  b. Square planar & Ni^{2+}  c. Square planar & Zn  d. Td & Pt
82. Selection rule for electronic spectra of complexes is
   a. ΔS = 0; ΔI = ±1  b. ΔS = 0; ΔI = 0  c. ΔS = ±1; ΔI = 0  d. ΔS = 0; ΔI = ±1
83. The term symbol for Si atom is _______ and the number of microstates for V^{3+} ions is
   a. 3P, 4S  b. 9P, 12S  c. 3P, 45  d. 3P, 45  e. 3P, 4S & 45
84. From the following, the complex which exhibits lowest energy electronic absorption band is _______ and which one has absorption at shorter wavelength
85. Unlike d-d transitions, charge transfer bands are highly intense and rich in color and it is due to
   a. Fully allowed transitions  b. Partially allowed  c. Spin forbidden and in part allowed
   d. Spin allowed and in part forbidden
86. Which of the following ligands shows FERMITURE
   a. CO  b. NO  c. CN  d. All of these
87. Which of the following are complex having high boiling properties
   a. Ni(CO)4  b. Fe(CO)5  c. Mn(CO)5  d. Cu(CO)4

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   a. High pressure  b. low pressure  c. 273K  d. room temperature
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   a. a catalyst can initiate the reaction  b. it does not alter the equilibrium constant  c. a catalyst remains unchanged at the end of reaction  d. catalysts are sometime very specific in respect of a reaction
70. Generally adsorption increases when
   a. temperature increases  b. temperature decreases  c. temperature remains constant  d. none of these
71. Delbye - Hückel-Onsager equation is applicable to
   a. weak electrolytes  b. strong electrolytes  c. none-electrolytes  d. all electrolytes
72. The reduction potentials of Cu²⁺/Cu and Cd²⁺/Cd are 0.34 and -0.40 V respectively. Then, the emf of the cell Cd/Cd²⁺ | Cu/Cu²⁺ is
   a. -0.06 V  b. 0.06 V  c. -0.74 V  d. 0.74 V
73. In polarography method of analysis, the current measured is
   a. migration current  b. limiting current  c. eddy current  d. diffusion current
74. Collision theory is applicable to
   a. only gaseous molecules  b. only liquid  c. only solid  d. gas & liquid
75. Ostwalds dilution law holds good for a weak electrolytes is
   a. K_c = a/V  b. K_c = a^2/V  c. K_c = a/V^2  d. none of these
76. The spherical electrode used in the polarography technique is
   a. DME  b. calomel  c. Pt  d. supporting electrolyte
77. The hydrogen over voltage is maximum for
   a. Hg  b. Pt  c. glassy carbon  d. Zn
78. Which one of the following high spin complexes has the largest CFSE value
   a. [Mn(H₂O)₆]²⁺  b. [Cr(H₂O)₆]³⁺  c. [Mn(H₂O)₆]³⁺  d. [Cr(H₂O)₆]³⁺
79. John-Teller distortion is not observed in the high spin complexes of
   a. d⁴  b. d⁶  c. d⁷  d. d⁵
80. The expected spin only magnetic moments for [Fe(CN)₆]⁴⁻ and [Fe(CN)₅]⁻ respectively are
   a. 0 & 9.92 BM  b. 0 & 1.73 BM  c. 1.73 & 5.92 BM  d. 1.73 & 1.73 BM
81. Which of the following complexes have large CFSE value and ---- has zero CFSE value?
   a. Fe₂⁺  b. Zn  c. Square planar & Ni²⁺  d. Td & Pt
82. Select ion for electronic spectra of complexes is
   a. ΔS=0; Δl = 1  b. ΔS=0; Δl = 0  c. ΔS= ± 1; Δl = 0  d. ΔS=0; Δl = 1
83. The term symbol for Si atom is ........ and the number of microstates for V₃⁺ ions is
   a. 3p₁ & 45  b. 3p₁ & 120  c. 5p₁ & 45  d. 3p₁ & 10
84. From the following, the complex which exhibits lowest energy electronic absorption band is ........ and which one absorption at shorter wavelength
   a. Ni(CO)₄  b. [Fe(CN)]⁴⁻  c. [Ni(H₂O)₆]²⁺ & [Fe(CN)]⁴⁻  d. a & b
85. Unlike d-d transitions, charge transfer bands are highly intense ad rich in color and it is due to
   a. totally allowed transitions  b. partially allowed  c. spin forbidden and is not allowed
86. Which of the following higher spin transition metal ion does not exhibit d⁷ configuration
   a. Cr³⁺  b. Fe³⁺  c. Mn³⁺  d. Co³⁺
87. Which of the following transition metal ion consists of higher spin absorption transition
   a. Ni(CO)₄  b. Fe(CO)₅  c. Mn(CO)₅  d. Co(CO)₅

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88. UV-Visible absorption bands of Hydrogen bonding present in a molecule shifts
a. shorter wavelength  b. longer wavelength  c. unchanged  d. cannot be predicted
89. The product of Birch reduction of benzoic acid is ..........and ..........are not reduced.

90. The rearrangement of aromatic α-diketones in the presence of base to give α-hydroxy acid is

91.

92. Fries rearrangement takes place in presence of ....and gives ........
a. only ortho hydroxy ketone  b. ortho and para-hydroxy ketone  c. ortho-ester  d. ortho and para ester product
93. Strong deactivating group towards aromatic electrophilic substitution reaction is
a. –CHO  b. CN  c. –CCl₃  d. all of these

94.

95. Conversion of allylphenyl ether into ortho and para-allylphenyl alcohol is an example of
96. Para-bromo toluene reacts with NaN₃/NH₃ mixture gives para- and meta-toluidine as the product, this
mechanism is operated through
a. –Benzene mechanism  b. S/NAr mechanism  c. carbocation mechanism  d. none
97. Aromatic compound from the following is
a. Tropylium cation  b. azulene  c. [14]-annulene  d. all of these
98. The most reactive towards aromatic nitration reaction from the following is
a. Phenol  b. toluene  c. nitrobenzene  d. bromobenzene
99. The method of preparation of an alkyne from carbonyl compound is........reaction
100. The frequency at which a proton will resonate in NMR spectrum is given by the equation
a. \( v = 2H_0 \)  b. \( v = yH_0/2\pi \)  c. \( v = yH_0/2\pi \)  d. \( v = H_0(1-\sigma)/2\pi \)
101. The fingerprint region in IR spectroscopy is........and the IR frequency of symmetry and asymmetry
stretching coincide with fundamental modes of different vibrations are called
a. 900-1400 cm⁻¹  b. 900-1400 cm⁻¹ & Fermi resonance  c. below 900cm⁻¹  d. none of these
102. The number of signals appeared in the H-NMR spectrum of Iso-butylene and diethylether is
a. 2 & 2  b. 3 & 3  c. 4 & 4  d. 2 & 4
103. The molecules do not possess a permanent dipole moment will show raman spectra, due to
a. absorption is more  b. absorption is less  c. change in polarizability  d. change in dielectric constant
104. The number of esr lines for [CF₂H]²⁺ and [CF₂D]²⁺ is
a. 9 & 9  b. 9 & 6  c. 6 & 6  d. 9 & 9
105. The shift of the resonance curve from zero velocity observed in the Mossbauer spectroscopy is called
a. Chemical Shift  b. stokes shift  c. isomer shift  d. quadrupole shift
106. The number of NMR signals corresponds to Vinyl acetate and furfural is
a. 4 & 4  b. 3 & 3  c. 4 & 3  d. 3 & 4
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