

- Which one of the following statements about ferrocene is false?
 - It obeys the 18-electron rule
 - It is diamagnetic
 - It is an orange solid
 - It resists electrophilic substitution
- The spinels CoFe_2O_4 and FeFe_2O_4 , respectively, are
 - Inverse and inverse
 - Inverse and normal
 - Normal and normal
 - Normal and inverse
- According to Wade's rule, the structures of $\text{C}_2\text{B}_{10}\text{H}_{12}$ and $[\text{C}_2\text{B}_9\text{H}_{11}]^{2-}$, respectively are
 - Closo and arachno
 - Nido and closo
 - Closo and nido
 - Nido and arachno
- The overall charge present on the cyclic silicate anion $[\text{Si}_6\text{O}_{18}]^{n-}$ is
 - 6
 - 12
 - 18
 - 24
- The reagent required for the synthesis of cyclic phosphazene $\text{N}_4\text{P}_4\text{Cl}_8$ are
 - PCl_5 and NH_3
 - POCl_3 and NH_4Cl
 - POCl_3 and NH_3
 - PCl_5 and NH_4Cl
- Metal which does not react with aqueous solution of copper sulphate is
 - Pb
 - Ag
 - Zn
 - Fe
- Which of the following is the salt of an organic acid?
 - Rochelle salt
 - Microcosmic salt
 - Mohr's salt
 - Zeise's salt
- Which of the following oxoacids of phosphorous is monobasic and reducing in nature?
 - Metaphosphoric acid
 - Pyrophosphoric acid
 - Hypophosphoric acid
 - Hypophosphorous acid
- The complex exhibiting a spin-only magnetic moment (μ_s) of 2.87 B. M is
 - $[\text{Co}(\text{H}_2\text{O})_3\text{F}_3]$
 - $\text{K}_4[\text{Fe}(\text{OH})_6]$
 - $\text{Na}_2[\text{Cr}(\text{NCS})_4(\text{NH}_3)_2]$
 - $\text{K}_2[\text{MnCl}_4(\text{H}_2\text{O})_2]$
- The correct order of ligand field strength is
 - $\text{H}_2\text{O} < \text{Cl} < \text{CO} < \text{NH}_3$
 - $\text{CO} < \text{NH}_3 < \text{Cl} < \text{H}_2\text{O}$
 - $\text{H}_2\text{O} < \text{CO} < \text{NH}_3 < \text{Cl}$
 - $\text{Cl} < \text{H}_2\text{O} < \text{NH}_3 < \text{CO}$

21. Which among the following are the remaining products of the reaction?

$$\text{K}_2\text{Cr}_2\text{O}_7 + 7\text{H}_2\text{SO}_4 + 6\text{FeSO}_4 \longrightarrow \text{K}_2\text{SO}_4 + \text{Cr}_2(\text{SO}_4)_3 + \text{?}$$
- A) $2\text{KHSO}_4 + 2\text{Fe}_2(\text{SO}_4)_3 + 6\text{H}_2\text{O}$
 B) $2\text{Fe}_2(\text{SO}_4)_3 + 8\text{H}_2\text{O}$
 C) $3\text{Fe}_2(\text{SO}_4)_3 + 7\text{H}_2\text{O}$
 D) $3\text{Fe}_2(\text{SO}_4)_3 + 6\text{H}_2\text{O}$
22. Which of the following statement is true?
 A) H_3PO_4 is a stronger acid than H_2SO_4
 B) In aqueous medium HF is a Stronger acid than HCl
 C) HClO_4 is weaker acid than HClO_3
 D) HNO_3 is a stronger acid than HNO_2
23. The hybridisation and shape of XeF_4 are respectively
 A) sp^3d^2 and octahedral B) sp^3d^2 and square planar
 C) sp^3 and tetrahedral D) dsp^2 and square planar
24. Which of the following statement is not correct?
 A) A combination of gold with colloidal stannic acid is called "purple of cassius"
 B) A mixture of $\text{Ca}(\text{OH})_2$ and $\text{Cu}(\text{SO}_4)$ is known as Bordeaux mixture
 C) Copper glance can be concentrated by froth floatation method
 D) The matte is a mixture of Cu_2S and FeO
25. Which of the following are ionisation isomers?
 A) $[\text{Pt}(\text{NH}_3)_4][\text{CuCl}_4]$ and $[\text{Cu}(\text{NH}_3)_4][\text{PtCl}_4]$
 B) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{NO}_2$ and $[\text{Co}(\text{NH}_3)_4\text{NO}_2\text{Cl}]\text{Cl}$
 C) $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{Cl}_2$ and $[\text{Co}(\text{NH}_3)_5\text{ONO}]\text{Cl}_2$
 D) $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$ and $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$
26. Which of the following crystals exhibit metal deficiency defect?
 A) NaCl and FeS B) FeO and NaCl
 C) FeS and AgBr D) FeO and FeS
27. The number of α and β – particles emitted when ${}_{92}\text{U}^{238}$ changes to ${}_{88}\text{Ra}^{226}$ is respectively
 A) 3 α , 4 β B) 2 α , 3 β
 C) 3 α , 2 β D) 3 α , 1 β
28. Which of the following isotope is wrongly matched with its use?
 A) Carbon-11 – Brain scan
 B) Mercury-197 – Kidney scan
 C) Gold-198 – Diagnosis of anaemia
 D) Cobalt-60 – Treatment of cancer

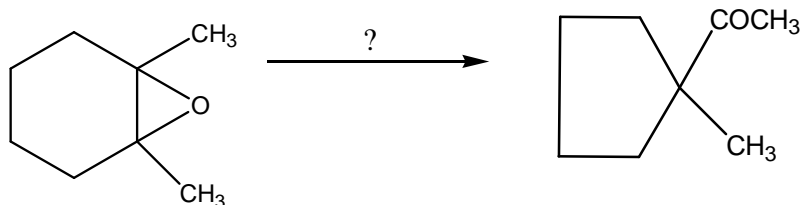
29. Which of the following reactions involves neither oxidation nor reduction?
- A) $\text{CrO}_4^{2-} \longrightarrow \text{Cr}_2\text{O}_7^{2-}$
 B) $\text{Cr} \longrightarrow \text{CrCl}_3$
 C) $2 \text{S}_2\text{O}_3^{2-} \longrightarrow \text{S}_4\text{O}_6^{2-}$
 D) $\text{VO}^{2+} \longrightarrow \text{V}_2\text{O}_5$
30. Supramolecular chemistry is the chemistry
- A) Beyond the molecule B) Of ionic bonds
 C) Of covalent bonds D) Of coordinate-covalent bonds
31. The ground spectroscopic state for the free $3d^2$ ion is
- A) 3F B) $^4A_{2g}$
 C) 4F D) $^3T_{1g}$
32. Intercalation of the metal complex with DNA leads to
- A) Hypochromism with red shift
 B) Hyperchromism with red shift
 C) Hyperchromism with blue shift
 D) Hypochromism with blue shift
33. The Miller indices of a plane which cuts the crystallographic axes at $a/2, b, c/3$ are
- A) (213) B) (312)
 C) (263) D) (362)
34. Which of the following statements are true?
- i) The negative ligands satisfy both primary and secondary valencies
 ii) The oxidation state of the central metal ion corresponds to non-ionisable valency
 iii) Non-ionisable valencies are directional in nature
 iv) The metal ion of the double salts is not free in solution.
- A) (i) and (ii) only B) (ii) and (iii) only
 C) (i), (iii) and (iv) only D) (i) and (iii) only
35. Which of the following is not correct?
- A) $\text{Zn}^{2+} + \text{K}_4[\text{Fe}(\text{CN})_6] \longrightarrow$ White precipitate
 B) $\text{Fe}^{2+} + \text{K}_4[\text{Fe}(\text{CN})_6] \longrightarrow$ Blue Colouration
 C) $\text{Fe}^{3+} + \text{K}_4[\text{Fe}(\text{CN})_6] \longrightarrow$ Blue Colouration
 D) $\text{Cu}^{2+} + \text{K}_4[\text{Fe}(\text{CN})_6] \longrightarrow$ Chocolate brown precipitate
36. Which of the following statement is true?
- A) Crystal can have five-fold axis of symmetry
 B) A molecule cannot have five-fold axis of symmetry
 C) A molecule can have five-fold axis of symmetry, but a crystal cannot have
 D) Both a molecule and crystal can have five-fold axis of symmetry

37. The pH of a 10^{-8} molar HCl is
 A) 8
 B) 7
 C) More than 7
 D) Just less than 7
38. Which one of the complex will exhibit lowest energy electronic absorption band?
 A) $[\text{NiCl}_4]^{2-}$
 B) $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$
 C) $[\text{Ni}(\text{CN})_4]^{2-}$
 D) $[\text{Ni}(\text{CO})_4]$
39. Bronze is an alloy of
 A) Cu and Sn
 B) Cu, Zn and Ni
 C) Cu, Zn and Sn
 D) Cu and Zn
40. The complex with maximum CFSE is
 A) $[\text{CoCl}_4]^{2-}$
 B) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$
 C) $[\text{CoF}_3(\text{H}_2\text{O})_3]$
 D) $[\text{CoF}_6]^{3-}$
41. Which of the following pentafluoride does not exist?
 A) PF_5
 B) AsF_5
 C) SbF_5
 D) BiF_5
42. Which of the following is the weakest base as per Bronsted concept?
 A) ClO^{4-}
 B) ClO^{3-}
 C) ClO^{2-}
 D) ClO^-
43. Which of the following is an example of zinc ore?
 A) Magnetite
 B) Malachite
 C) Cryolite
 D) Willemite
44. Which of the following errors cannot be avoided?
 A) Instrumental errors
 B) Personal errors
 C) Additive errors
 D) Indeterminate errors
45. Which technique does not assist in Greener synthesis of chemicals?
 A) Microwave assisted reactions
 B) Derivatization methods
 C) Ultrasound assisted reactions
 D) Use of catalytic reagents
46. Which of the following concept is used for the construction of electron microscope?
 A) Electron diffraction
 B) Dual nature of matter
 C) Photoelectric effect
 D) Black body radiation

47. Nylon 64 is made respectively from
 A) Adipic acid and tetramethylene diamine
 B) Hexamethylene diamine and succinic acid
 C) Tetramethylene diamine and adipic acid
 D) Succinic acid and hexamethylene diamine
48. Hess's law of constant heat summation is an application of
 A) Kirchoff's law
 B) First law of thermodynamics
 C) Second law of thermodynamics
 D) Entropy
49. Thermal decomposition of HI on gold surface is an example for
 A) First order
 B) Second order
 C) Third order
 D) Zero order
50. Which among the following molecules is microwave active?
 A) CO_2
 B) N_2
 C) BCl_3
 D) NH_3
51. Which among the following has the highest energy level spacing?
 A) Translation
 B) Rotation
 C) Vibration
 D) Electronic
52. Viscosity of a polymer solution increases when
 A) The polymer goes from linear to coil form
 B) The polymer goes from coil to linear form
 C) The polymer goes from ionic to non-ionic
 D) None of the above
53. To which point groups do the molecules ethylene and trans-ethylene dichloride belong?
 A) C_2h and D_2h
 B) C_2v and C_2h
 C) D_2h and C_2h
 D) D_4h and D_2h
54. The specific conductance of a solution
 A) Increases with decrease of concentration
 B) Increases with increase of concentration
 C) Decreases with increase of concentration
 D) Undergoes no change with change in concentration
55. The meta-stable peak is generally
 A) Low intense and sharp
 B) Highly intense and broad
 C) Low intense and broad
 D) Highly intense and sharp

56. An off resonance decoupled ^{13}C NMR spectrum of acetone will show
 A) A triplet and a singlet B) A quartet and a singlet
 C) Two quartets and a singlet D) Two singlets
57. A gas deviates most from ideal behaviour at
 A) Low temperature and high pressure
 B) Low temperature and low pressure
 C) High temperature and high pressure
 D) High temperature and low pressure
58. At the given temperature, which of the following molecule will have the largest mean square velocity?
 A) HCl B) H_2S C) SO_2 D) N_2O_5
59. The amount of copper deposited when 3.0115×10^{23} electrons have passed through CuSO_4 solution is
 A) 63.5 g B) 31.75 g C) 15.85 g D) 3.17 g
60. In units of $h^2/8ml^2$, the energy difference between levels corresponding to 3 and 2 node eigen functions for a particle of mass m in a one dimensional box of length l is
 A) 1 B) 3 C) 5 D) 7
61. The Onsager equation helps us to find out
 A) Dissociation constant of a weak electrolyte
 B) λ_o for a weak electrolyte
 C) λ_o for a strong electrolyte
 D) Transport number of an ion
62. An auxochrome is a group which
 A) Absorbs in UV region
 B) Absorbs in Visible region
 C) Absorbs in IR region
 D) Increases absorption wavelength of chromophores
63. The molar heat capacity at constant volume is
 A) $(\partial H/\partial T)_V$ B) $(\partial G/\partial T)_V$ C) $(\partial E/\partial T)_V$ D) $(\partial A/\partial T)_V$
64. The volume occupied by eight grams of oxygen at 546°K and 380 mm of Hg is.....litres
 A) 11.2 B) 44.8 C) 22.4 D) 2.24
65. Hollow cathode lamp is used to obtain
 A) Resonance line B) Multiple wavelengths
 C) Radio wave D) Visible radiation

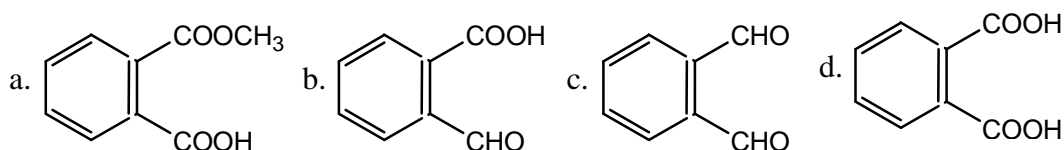
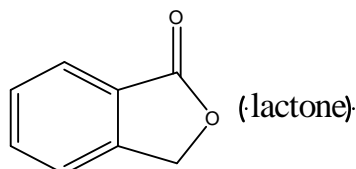
66. The third law entropy and the statistical entropy do not differ in the case of
 A) CO B) H₂ C) CO₂ D) N₂O
67. The spacing between the spin-spin splitting in NMR spectrum is dependent on the
 A) Electric field B) Magnetic field
 C) Frequency D) Number of protons
68. In homogeneous reaction,
 A) Order and molecularity are always the same
 B) Order and molecularity need not be the same
 C) Order is higher than the molecularity of a reaction
 D) Order is lower than the molecularity of a reaction
69. Limiting current in polarography depends on
 A) Residual current B) Diffusion current
 C) Kinetic current D) All the above
70. The momentum of a photon of frequency $5 \times 10^{20} \text{ s}^{-1}$ is nearly
 A) $1.1 \times 10^{-25} \text{ Kg m s}^{-1}$ B) $1.1 \times 10^{-21} \text{ Kg m s}^{-1}$
 C) $2.1 \times 10^{-21} \text{ Kg m s}^{-1}$ D) $2.1 \times 10^{-22} \text{ Kg m s}^{-1}$
71. The colloidal system in which the dispersed phase and dispersion medium are both liquids is known as
 A) A gel B) An aerosol
 C) An emulsion D) A foam
72. Amongst the following, conjugate pair of variable is
 A) Momentum & energy
 B) Potential energy & position
 C) Linear momentum & distance
 D) Time & energy
73. Bragg's equation has no solution when
 A) $n\lambda = 2d$ B) $n\lambda < 2d$ C) $n\lambda > 2d$ D) $n\lambda = d/2$
74. Which one of the following reagents is correct for the reaction?



- A. Cc1ccc(S(=O)(=O)Cl)cc1 in pyridine
 B) LiAlH₄ in H₂O
 C) H₂SO₄ in CH₃CN
 D) C₆H₅CO₃H in CH₂Cl₂

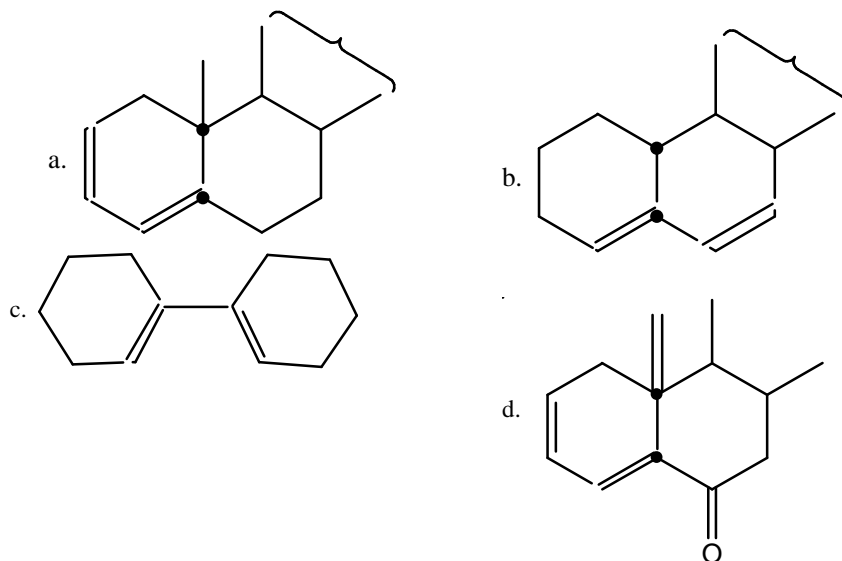
81. Acetyl value of an oil or Fat indicates
 A) Amount of free acids
 B) Degree of unsaturation
 C) Amount of free alcoholic groups
 D) Amount of free base
82. Which one of the following products is obtained from the reaction of catechol with chloroform and NaOH followed by hydrolysis?
 A) 2,3-dihydroxy benzaldehyde
 B) 3,4- dihydroxy benzylchloride
 C) 2,3- dihydroxy benzylchloride
 D) 3,4- dihydroxy benzaldehyde
83. Rapid interconversion of α - D - glucose and β - D - glucose in solution is known as
 A) Mutarotation
 B) Racemisation
 C) Asymmetric induction
 D) Fluxional isomerisation
84. The correct R - S notation of the structure given below is
- $$\begin{array}{c}
 \text{COOH} \\
 | \\
 \text{H} - \text{C} - \text{Br} \\
 | \\
 \text{Cl} - \text{C} - \text{H} \\
 | \\
 \text{CH}_3
 \end{array}$$
- A) 2S, 3R
 B) 2R, 3S
 C) 2S, 3S
 D) 2R, 3R
85. A thermal pericyclic reaction involving a Mobius system is allowed only if the total number of electron is
 A) $4n$
 B) $4n+2$
 C) $2n$
 D) 0
86. The incorrect term regarding molecules which are mirror images is
 A) Enantiomorphs
 B) Enantiomers
 C) Achiral
 D) Antimers
87. The deficiency of which vitamin leads to beri-beri disease
 A) Thiamine
 B) Riboflavin
 C) Pyridoxine
 D) Ascorbic acid
88. All steroids on heating with selenium give
 A) Phenanthrene
 B) Cholesterol
 C) Diels hydrocarbon
 D) Isoprene

89. Which of the following reaction is generally employed to establish the structure of any alkaloid?
- A) Cannizzaro reaction
 B) Hofmann degradation
 C) Hofmann rearrangement reaction
 D) Kosnowski colour reaction
90. The reaction of toluene with Cl_2 in presence of FeCl_3 gives predominantly
- A) Benzoyl chloride
 B) Benzyl chloride
 C) o-and p- chlorotoluenes
 D) m-chlorotoluene
91. Ethylacetoacetate is prepared from ethyl acetate by the
- A) Benzoin condensation
 B) Aldol condensation
 C) Claisen condensation
 D) Dieckmann condensation
92. Which of the following reactants on reaction with Conc.NaOH followed by acidification gives the following lactone as the only product?



93. Which one of the following is an example for monocyclic monoterpenoid?
- A) Camphor
 B) Carvone
 C) Geraniol
 D) Citral
94. Which of the following statements is true about a peptide bond (RCONHR')?
- A) It is non planar
 B) It is capable of forming a hydrogen bond
 C) The cis configuration is favoured over the trans configuration
 D) Single bond rotation is permitted between nitrogen and the carbonyl group
95. Which of the following is a Fenton's reagent?
- A) $\text{Br}_2/\text{CH}_3\text{COOH}$
 B) $\text{AgOH}/\text{NH}_4\text{OH}$
 C) $\text{H}_2\text{O}_2/\text{Fe}(\text{OCOCH}_3)_3$
 D) $\text{Ac}_2\text{O}/\text{SOCl}_2$

105. Which of the following has λ_{\max} value equal to 273 nm?



106. Which property is measured in derivative thermo-gravimetric analysis?

- A) Change in weight B) Rate of change of weight
 C) Heat evolved or absorbed D) Change of temperature

107. Which of the following is not true regarding fundamental requirements for nitrogen fixation?

- A) Enzyme nitrogenase B) Aerobic conditions
 C) A strong reductant D) Adenosine triphosphate

108. Which of the following iron complex is involved in electron transfer in plants and bacteria?

- A) Myoglobin B) Ferridoxins
 C) Ferritin D) Transferin

109. Which of the following allotropes of carbon is normally referred as zero dimensional?

- A) Diamond B) Carbon nanotube
 C) Graphite D) fullerene

110. Which of the following tranquilizers is not a derivative of barbituric acid?

- A) Equanil B) Veronal
 C) Seconal D) Luminal

111. Valinomycin is an ionophore that specially binds with

- A) Na^+ ion B) K^+ ion
 C) Na^+ and K^+ ion D) Any alkali metal ion

112. Which of the following is not a green house gas?

- A) O_3 B) CH_4 C) N_2 D) CO_2

113. The most common mobile phase used in gas – liquid chromatography is

- A) Nitrogen B) Helium C) Neon D) Oxygen

