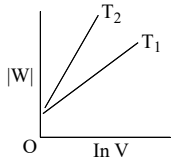
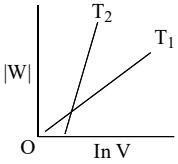
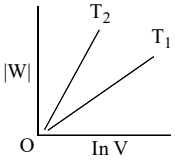
PGT I GIC I KVS I NVS I BPSC I DSSSB

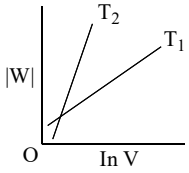
MOCK TEST

1. **Consider the reversible isothermal expansion of an ideal gas in a closed system at two different temperature T_1 and T_2 ($T_1 < T_2$). The correct graphical depiction of the dependence of work done (W) on the final volume (V) is :**

(a) 

(b) 

(c) 

(d) 

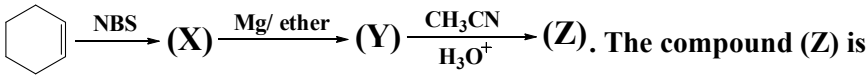
2. **A hypothetical reaction $A \rightarrow 2B$ proceeds through the following sequence of steps**

I. $A \rightarrow C;\ \Delta_r H = q_1$ **II.** $C \rightarrow D;\ \Delta_r H = q_2$

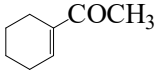
III. $\frac{1}{2}\Delta \rightarrow B;\ \Delta_r H = q_3$

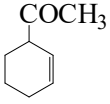
The heat of hypothetical reaction is :

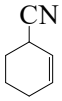
(a) $q_1 + q_2 - 2q_3$ (b) $q_1 + q_2 + 2q_3$ (c) $q_1 + 2q_2 - 2q_3$ (d) $q_1 - q_2 + 2q_3$

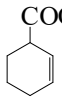
3. 

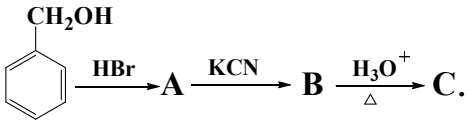
. The compound (Z) is :

(a) 

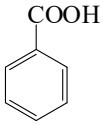
(b) 

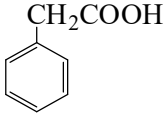
(c) 

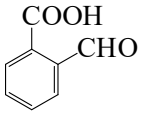
(d) 

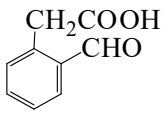
4. 

In the above sequence of reactions, C is

(a) 

(b) 

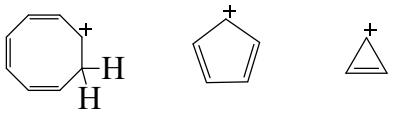
(c) 

(d) 

5. **Which transitions are studied by UV spectrometer?**

(a) Electronic (b) Vibrational (c) Nuclear (d) Rotational

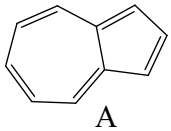
6. Among the carbocations given below



A B C

(a) A is homoaromatic, B is antiaromatic and C is aromatic
(b) A is aromatic, B is antiaromatic and C is homoaromatic
(c) A is antiaromatic, B is aromatic and C is homoaromatic
(d) A is homoaromatic, B is aromatic and C is antiaromatic

7. The compound is A is :



A

(a) Aromatic and has high dipole moment
(b) Aromatic and has no dipole moment
(c) Non–aromatic and has high dipole moment
(d) Anti–aromatic and has no dipole moment

8. On heating with conc. HNO_3 protein gives yellow colour. This test is called
(a) Millons test (b) Xanthoproteic test
(c) Ninhydrin test (d) Happens Cole test

9. During a disproportionation reaction,
(a) Simultaneous oxidation and reduction of metal ion takes place
(b) Metal ion goes to lower oxidation state
(c) Metal ion goes to higher oxidation state
(d) Metal ion remains unchanged in its oxidation state

10. Among the following group of oxides, the group of oxides that cannot be reduced by carbon to give the respective metals is
(a) CaO, K_2O (b) Fe_2O_3, ZnO (c) PbO, Fe_3O_4 (d) Cu_2O, SnO_2

11. Tritium is a radioisotope of hydrogen, it undergoes disintegration to give
(a) α –particles (b) β –particles (c) Neutrons (d) X–rays

12. A water drop is spherical in shape due to _____.
(a) Viscosity (b) Poise (c) Surface tension (d) Reflection

13. Vacuum is a measure of

(a) Leaking rate of air (b) Leaking rate of oil
(c) Leaking rate of moisture (d) Emptiness

14. An inorganic mixture dissolves in hot concentration HCl giving a blue colored solution which on addition of water becomes pink. The mixture contains

(a) Fe^{3+} (b) Cr^{3+} (c) Ni^{2+} (d) Co^{2+}

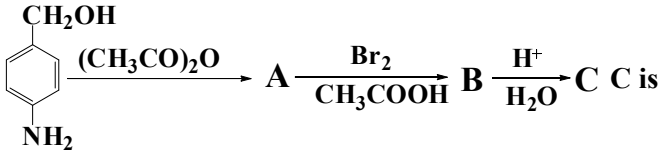
15. When O_2 changes to O_2^- the electron goes to which of the orbitals?

(a) π orbital (b) π^* orbital (c) σ orbital (d) σ^* orbital

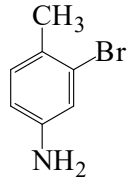
16. The product X in the following reaction $6LiH + 8BF_3 \rightarrow 6LiBF_4 + X$ is

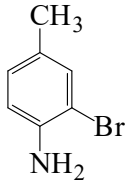
(a) B_4H_{10} (b) B_2H_6 (c) B_3H_8 (d) BH_3

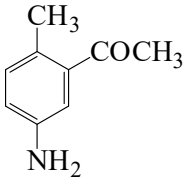
17.

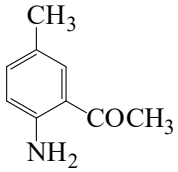


C is

(a) 

(b) 

(c) 

(d) 

18. What is the unit of specific resistance (or resistivity) of a conductor?

(a) $Ohmcm^{-1}$ (b) $Siemens^{-1}$ (c) Ohm^{-1} cm (d) $Siemens^{-1}$ cm

19. The maximum number of electrons that can fit in an orbital with n = 3 and l = 1?

(a) 6 (b) 2 (c) 8 (d) 10

20. In which of the following reaction migration of alkyl group from carbon to oxygen is observed?

(a) Pinacol–pinacolone rearrangement
(b) Prepration of phenol from cumene hydroperoxide
(c) Baeyer–villiger oxidation
(d) Both Baeyer–villiger oxidation and Prepration of phenol from cumene hydroperoxide

21. Which of the following is not a colligative property?
(a) Osmotic pressure (b) Relative increase in vapour pressure
(c) Depression of freezing point (d) Elevation of boiling point

22. Which one of the following is an example of adsorption?
(a) Ammonia in contact with water
(b) Anhydrous $CaCl_2$ with water
(c) Silica gel in contact with water vapours
(d) All of these

23. Pyrosilicates are the silicates in which the two tetrahedral units are linked at
(a) Three points (b) One point (c) Four points (d) Two points

24. Which of the ions have maximum hydration energy?
(a) Sr^{2+} (b) Ca^{2+} (c) Mg^{2+} (d) Be^{2+}

25. In a face–centre cubic (FCC) type of crystal lattice, the number of atoms belonging exclusively to each unit cell within the lattice is/are:
(a) 4 (b) 2 (c) 3 (d) 1

26. Which of the following is not an organometallic compound?
(a) Diethyl zinc (b) Dimethyl mercury
(c) Magnesium bromide (d) Grignard reagent

27. In organic compounds A on ozonolysis gives one molecule of acetone and one molecule of formaldehyde :
(a) 2–methyl propane (b) Propyne
(c) Butane (d) But–2–ene

28. The most Probable velocity of hydrogen molecules at 27 degrees Celsius will be(in cm/sec
(a) 15.8×10^4 (b) 19.3×10^4 (c) 17.8×10^8 (d) 24.93×10^9

29. Correct characteristics of the functional groups of adenine in DNA base pair are
(a) Both N(3) and C(6)NH_2 are hydrogen bond acceptors
(b) Both N(3) and C(6)NH_2 are hydrogen bond acceptors.
(c) N(3) is a hydrogen bond acceptor and C(6)NH_2 is a hydrogen bond donor
(d) N(1) is a hydrogen bond acceptor and C(6)NH_2 is a hydrogen bond donor

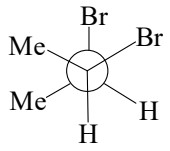
30. At 25° C the highest osmotic pressure is shown by 1M solution of :
(a) $CaCl_2$ (b) KCl (c) Glucose (d) Urea

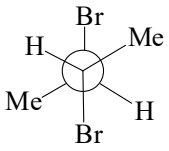
31. The method used for obtaining highly pure silicon used as a semiconductor material is
(a) Oxidation (b) Crystallization
(c) Zone refining (d) Electrochemical

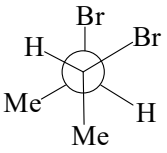
32. Two grams of hydrogen diffuse from a container in 10 minutes. How many grams of oxygen would diffuse through the same container in the same time under similar conditions?
(a) 0.5 g (b) 4 g (c) 6 g (d) 8 g

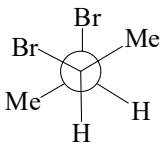
33. Which of the following statement is false?
(a) Oxidation reaction takes place at the cathode of a galvanic cell
(b) The potential of normal hydrogen electrode (NHE) is assigned a value of zero volts
(c) The EMF of a galvanic cell can be measured with a voltmeter
(d) Oxidation reaction takes place at the anode of a galvanic cell

34. The gauche interaction values for Me/Me, Me/Br and Br/Br are 3.3, 0.8 and 3.0 kJ/mol, respectively. Among the following, the most stable conformation of 2, 3–dibromobutane is

(a) 

(b) 

(c) 

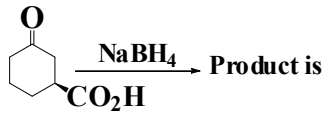
(d) 

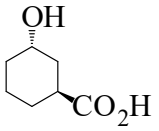
35. p – Hydroxyazobenzene is
(a) An orange dye (b) A yellow dye
(c) A red dye (d) An orange red dye

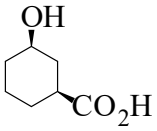
36. Isopropyl iodide is formed after reaction of propene with HI, this is due to :
(a) Homolysis (b) More stable free radical
(c) More stable carbanion (d) More stable carbocation

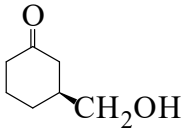
37. Why does aluminum not degrade in nature quickly?
(a) It reacts at low temperature (b) It has an octet configuration
(c) It has a tough oxide layer (d) It is an electronegative element

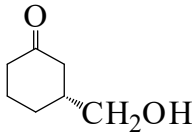
38. What is the major of the following reactions?



(a) 

(b) 

(c) 

(d) 

39. The set of ions expected to show John–Teller distortion in their complexes is :
(a) Ti(III), Cu(II), High–spin Fe(III) (b) Cu(I), Ni(II), High–spin Fe(III)
(c) Cu (II), Low–spin Fe(III), Ti(III) (d) Low–spin Fe(II), Mn(II), Cu(I)

40. Which of the following compound will form secondary amine on reaction with $LiAlH_4$?
(a) Methyl cyanide (b) Methyl isocyanide
(c) Acetamide (d) Nitroethane

41. Mixing up equal volumes of 0.1M NaOH and 0.1M CH_3COOH yields a solution which is :
(a) Basic (b) Acidic (c) Neutral (d) None

42. The volume of 0.025M H_3PO_4 required to neutralise 25ml of 0.03M $Ca(OH)_2$ is :
(a) 20ml (b) 25ml (c) 40ml (d) 50ml

43. The volume of gases H_2, CH_4, CO_2 and NH_3 adsorbed by 1 gm charcoal at 293 K can be given in the order?
(a) $CH_4 > CO_2 > NH_3 > H_2$ (b) $CO_2 > NH_3 > H_2 > CH_4$
(c) $NH_3 > CO_2 > H_2 > CH_4$ (d) $NH_3 > CO_2 > CH_4 > H_2$

44. The observation of equal Cu–O distances in the hexa–coordinated Cu(II) complex, $[Cu(H_2O)_6]^{2+}$ is best understood in terms of :
(a) Failure of the Jahn–Teller theorem to predict the structure of this complex
(b) Error in the crystallographic estimate of Cu–O distances
(c) Dynamic Jahn–Teller distortion of the Cu–O bonds
(d) Static Jahn–Teller distortion of the Cu–O bonds

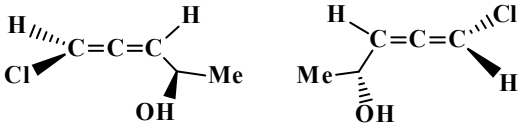
45. Which of the following is formed when phenol is exposed to air?
(a) o–Benzoquinone (b) p–Benzoquinone
(c) Phenoquinone (d) o–and p–Benzoquinone

46. Provide the suitable reagents for this conversion :

(a) m–CPBA, $HNO_3/H_2SO_4/PCl_3$ (b) $HNO_3/H_2SO_4/POCl_3$
(c) $NaNO_2/H_2SO_4/PCl_3$ (d) H_2O_2/OH^-, $HNO_3/H_2SO_4/PCl_3$

47. Which of the following is the definition of chirality?
(a) The superimposability of an object on its mirror image
(b) A molecule with a mirror image
(c) The non–superimposability an object on its mirror image
(d) A molecule that has a carbon atom with four different substituents

48. The correct relation between the following compounds is

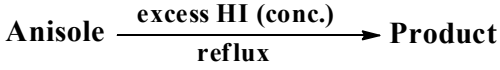


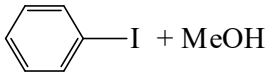
(a) Enatiomers (b) Homomers
(c) Constitutional isomers (d) Diastereomers

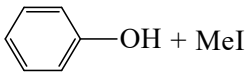
49. Which of the following compounds is a meso compound?
(a) (2R,3R)–dibromobutane (b) (2R,3S)–dibromobutane
(c) (2R,3S)–3–bromo–2–butanol (d) (2R,3R)–3–bromo–2–butanol

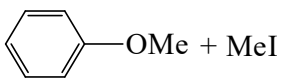
50. Identify the incorrect statement regarding cycloalkanes :
(a) These have sp^3 hybridized carbons
(b) These have tetrahedral bond angles
(c) Stability of the cycloalkanes varies directly with their respective size
(d) These undergo nucleophilic substitution reactions

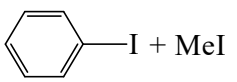
51. What is the principal product of the following reaction?



(a) 

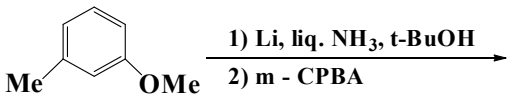
(b) 

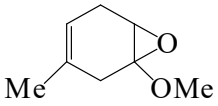
(c) 

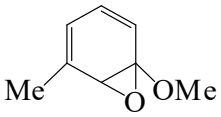
(d) 

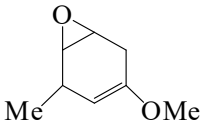
52. Which of the following does not give yellow ppt on iodoform test?
(a) Propan–2–ol (b) Butan–2–ol (c) Pentan–2–one (d) Pentan–3–one

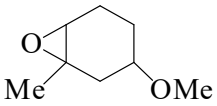
53. The major product formed in the following reaction sequence is :



(a) 

(b) 

(c) 

(d) 

54. In the cases of gases adsorbing on solid, which of the following statement/ is/ are true?
(a) Decrease in temperature of the system results in increase in adsorption
(b) Decrease in pressure of the system results in decrease in adsorption
(c) All of these (d) Adsorption is an exothermic process

55. Which of the following will produce H_2O_2 on hydrolysis?
(a) $H_4P_2O_7$ (b) $H_2P_2O_8$ (c) $H_4P_2O_6$ (d) $H_2S_2O_8$

56. The most probable candidate to form and octahedral complex is
(a) d^{10} (b) d^8 (high spin) (c) d^8 (low spin) (d) d^1 (low spin)

57. On electrolysis of dilute sulphuric acid using platinum electrodes, the product obtained at the anode will be :
(a) Oxygen (b) Hydrogen (c) Sulphur dioxide (d) Hydrogen sulphide

58. The weight of silver displaced by a quantity of electricity which displaces 5600ml of O_2 at STP will be :
(a) 5.4 g (b) 10.8 g (c) 54.9 g (d) 108.0 g

59. To initiate a reaction the minimum energy which is required to break bonds is called :
(a) Bond energy (b) Activation energy
(c) Breaking energy (d) Ionization energy

60. Hess's law states that a chemical reaction is independent of the route by which chemical reactions takes place while keeping the same :

(a) Initial conditions only (b) Mid–conditions
(c) Final conditions only (d) Initial and final conditions

61. The standard enthalpy change of neutralization involves the reaction of an acid with an alkali to form 1 mol of?
(a) Water (b) Oxygen (c) Nitrogen (d) Anhydrous salt

62. A mixture of o–nitrophenol and p–nitrophenol can be separated by :
(a) Sublimation (b) Crystallisation (c) Chromatography (d) Steam distillation

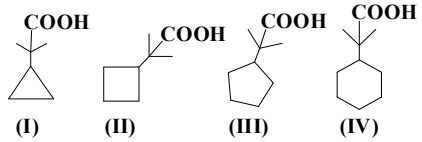
63. The number of unpaired electrons in gaseous species of Mn^{3+}, Cr^{3+} and V^{3+} respectively are :
(a) 4, 4 and 2 (b) 4, 3 and 2 (c) 3, 3 and 3 (d) 3, 3 and 2

64. Silver nitrate produces a black stain on the skin due to :
(a) Its corrosive action (b) Its reduction to metallic silver
(c) Being a strong reducing agent (d) Formation of complex compound

65. Release of O_2 from oxyhaemoglobin is favored by:
(a) High pH and low CO_2 conc. (b) Low pH and low CO_2 conc.
(c) High pH and high CO_2 conc. (d) Low pH and high conc. of CO_2.

66. Consider the following statements:
I) The size of the lanthanide M^{3+} ions decreases as the atomic number of M increases.
II) Electronic spectra of lanthanides show very broad band.
III) As with transition metals, coordination number six is very common in lanthanide complexes.
Which of the statements given above is/are correct?
(a) I only (b) III only (c) I and II (d) I and III

67. Arrange the following in decreasing order of their acidity



(a) IV > II > I > II (b) IV > III > II > I (c) I > II > III > IV (d) I > IV > III > II

68. Which of the following complexes shows orbital contribution in magnetic moment?
(a) $[Co(H_2O)_6]^{3+}$ (b) $[Fe(H_2O)_6]^{3+}$ (c) $[Co(H_2O)_6]^{2+}$ (d) $[Mn(H_2O)_6]^{3+}$

69. Which of the following is paramagnetic?

(a) $[CoBr_4]^{2-}$ (b) $Mo(Co)_6$ (c) $[Pt(en)Cl_2]$ (d) $[Co(NH_3)_6]^{3+}$

70. In some solutions, the concentration of H_3O^+ remains constant even when small amounts of strong acid or strong base are added to them. These solutions are known as :

(a) Ideal solution (b) True solution

(c) Buffer solution (d) Colloidal solution

71. Addition of which chemical will decrease the hydrogen ion concentration of an acetic acid solution?

(a) $AgNO_3$ (b) $Al_2(SO_4)_3$ (c) NH_4Cl (d) NaCN

72. Mercury is a liquid metal because

(a) It has a completely filled s–orbital.

(b) It has a small atomic size

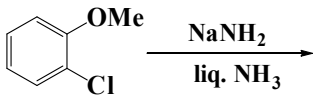
(c) It has a completely filled d–orbital that prevents d–d overlapping of orbitals.

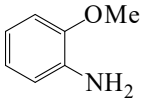
(d) It has a completely filled – orbital that causes overlapping.

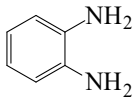
73. What would be the remaining concentration of 1 g of radioactive substance after 400 days if the half–life is 100 days?

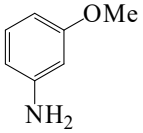
(a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{1}{8}$ (d) $\frac{1}{16}$

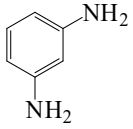
74. The major product formed in the following reaction is



(a) 

(b) 

(c) 

(d) 

75. Phenol reacts with bromine in CS_2 at low temperature to give :

(a) m–bromophenol (b) p–bromophenol

(c) 2,4,6–tribromophenol (d) o– and p–bromophenol

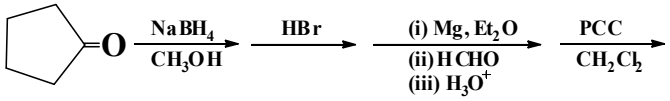
76. Which among the following product is formed when ethyne undergoes hydration?

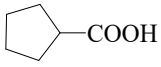
(a) Acetaldehyde (b) Formaldehyde (c) Acetic acid (d) Formic acid

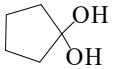
77. If the chemical reaction is: $aA + bB \rightarrow cC + dD$ and K is the equilibrium constant. Then what is the equilibrium constant of the reaction $naA + nbB \rightarrow ncC + ndD$?

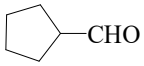
(a) K (b) nK (c) Kn (d) K/n

78. Which is the product of the following reaction?



(a) 

(b) 

(c) 

(d) 

79. What will be the value of ΔH, if the forward and reverse reactions have the same energy of activation?

(a) $\Delta S = 0$ (b) $\Delta G = 0$ (c) $\Delta H = 0$ (d) $\Delta H = \Delta G = \Delta S = 0$

80. What is the molar entropy change for melting of ice at $0^{o}C$, if $\Delta H_f = 1.435$ kcal/mol?

(a) 0.526 cal/(mol K) (b) 5.26 cal/(mol K)
(c) 10.52 cal/(mol K) (d) 21.04 cal/(mol K)

81. In case of condensation of polymers?

(a) High molecular weight polymers are formed all at once
(b) Lower molecular weight polymers are formed all at once
(c) Molecular weight of polymers rises throughout the reaction
(d) Have no specific relation to their molecular weight

82. Which of the following elements do not form a complex with EDTA?

(a) Be (b) Ca (c) Mg (d) Sr

83. The condensation product of phenol and formaldehyde is known as :

(a) Phenolic resins (b) Urea formaldehyde resins
(c) Polyvinyl chloride (d) Polystyrene

84. What does the term "metastable" indicate?

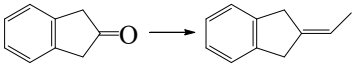
(a) A place where the composition of the system remains constant
(b) A place where the pressure remains constant with low value
(c) An area below which a vapor– liquid mixture is obtained
(d) A region where the temperature remains constant

85. With reference to a two component system, a vapor line indicates :
(a) A region where the temperature and pressure remains stable
(b) A region where the solubility remains constant
(c) An area below which components do not mingle
(d) An area above which both the components mingle to form a single mixture

86. What is the correct order of acidity of the following?
(a) Acetic acid > Acrylic acid > Propiolic acid
(b) Acetic acid > Propiolic acid > Acrylic acid
(c) Propiolic acid > Acrylic acid > Acetic acid
(d) Acrylic acid > Propiolic acid > Acetic acid

87. What is the correct order of pKa values of the following acids?
(a) Benzoic acid > m–Nitrobenzoic acid > p–Nitrobenzoic acid
(b) Benzoic acid > p–Nitrobenzoic acid > m–Nitrobenzoic acid
(c) p–Nitrobenzoic acid > m–Nitrobenzoic acid > Benzoic acid
(d) m–Nitrobenzoic acid > p–Nitrobenzoic acid > Benzoic acid

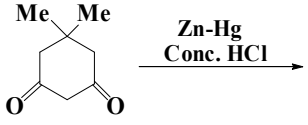
88. Which of the sets of reagents below should be used to effect the following transformation?

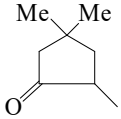


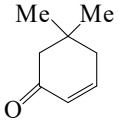
(a) $CH_3CH_2Br,PPh_3/C_4H_9Li/THF/–78°C$
(b) **1)** CH_3CH_2MgBr/Et_2O; **2)** H_2SO_4/D
(c) **1)** HCºCH/THF/–78°C; **2)** H_2SO_4/D
(d) **1)** Br_2/CH_3CO_2H; **2)** Mg/Et_2O; **3)** CH_3CHO; **4)** H_2SO_4/D

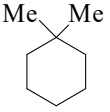
89. Identify the triprotic acid from the following?
(a) Carbonic acid (b) Bicarbonate (c) Glycine (d) Phosphoric acid

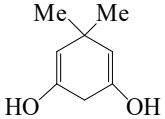
90. The product obtained in the following conversion is :



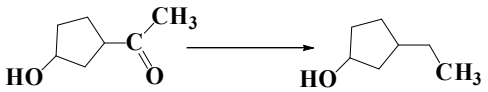
(a) 

(b) 

(c) 

(d) 

91. The appropriate reagent for the following transformation is :



(a) Zn–Hg/HCl
(b) NH_2–NH_2,KOH/ethylene glycol
(c) Ni/H_2
(d) $NaBH_4$

92. The correct order of acid strengths of benzoic acid (X), peroxybenzoic acid(Y),and p–nitrobenzoic acid(Z) is:

(a) Y > Z > X (b) Y > X > Z (c) Z > X > Y (d) Z > Y > X

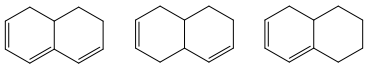
93. That type of isomerism shown by The complex $[CoCl_2(en)_2]$ is:

(a) Geometrical isomerism
(b) Coordination isomerism
(c) Ionisation isomerism
(d) Linkage isomerism

94. What is the correct order of boiling points of the following?

(a) $HCOOH > CH_3COOH > C_2H_5COOH$
(b) $C_2H_5COOH > CH_3COOH > HCOOH$
(c) $HCOOH > C_2H_5COOH > CH_3COOH$
(d) $CH_3COOH > HCOOH > C_2H_5COOH$

95. Rank the following alkenes on order of increasing maximum wavelength



(i) **(ii)** **(iii)**

(a) i < ii < iii (b) ii < i < iii (c) i < iii < ii (d) ii < iii < i

96. Heat flow into a system is ____, and heat flow out of the system is _____.

(a) Positive, Positive
(b) Negative, Negative
(c) Negative, Positive
(d) Positive, Negative

97. Molecules are held together in a crystal by :

(a) Hydrogen Bond
(b) Electrostatic Attraction
(c) Vander Waal's Attraction
(d) Dipole–Dipole Attraction

98. How can you say that glucose is cyclic compound?

(a) Glucose undergoes Tollen's reaction
(b) Glucose reacts with phenyl hydrazine
(c) Glucose fails to react with sodium hydrogen sulphite
(d) Glucose reacts with nitric acid

99. Tl^+ compounds are poisonous because

(a) Stop blood circulation (b) They attack liver
(c) Cut–off breathing capability (d) They can cause blood infection

100. Polyphosphates are used as water softening agents because they

(a) Form soluble complexes with anionic species
(b) Precipitate anionic species
(c) Form soluble complexes with cationic species
(d) Precipitate cationic species

101. When HCl gas passed, pure NaCl is precipitated, reasons.

(a) Common Electron Effect (b) Common Ion Effect
(c) Common Cation Effect (d) Common Proton Effect

102. The ferricyanide complex ion is :

(a) Paramagnetic (b) Outer orbital (c) Spin free (d) Tetrahedral

103. Identify the incorrect statement regarding VBT :

(a) It does not explain the colour of coordination compounds
(b) It is unreliable in the prediction of geometries of 4–coordinate complexes
(c) It does not explain the kinetic stabilities of coordination compounds
(d) It can distinguish between strong and weak ligands

104. The conditions favourable for the formation of SO_3 are:

$$2SO_2\,(g) + O_2\,(g) \rightleftharpoons 2SO_3\,(g)\ ;\ \Delta H^\circ = -198\ kJ$$

(a) Low temperature, high pressure (b) Any value of T and P
(c) Low temperature and low pressure (d) High temperature and high pressure

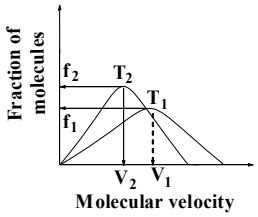
105. Pure ammonia is placed in a vessel at a temperature where its dissociation constant (α) is appreciable. At equilibrium, The true statement is $N_2 + 3H_2 \rightleftharpoons 2NH_3$

(a) K_p does not change with pressure
(b) α does not change with pressure
(c) Concentration of NH_3 does not change with pressure
(d) Concentration of hydrogen is less than that of nitrogen

106. The pH of a 1.0×10^{-3} M solution of weak acid HA is 4.0. The acid dissociation constant K_a is :

(a) 1.0×10^{-3} (b) 1.0×10^{-4} (c) 1.0×10^{-5} (d) 2.0×10^{-5}

107. Plot of Maxwell's distribution of velocities is given below :



Which of the following is correct about this plot ?

(a) $T_1 < T_2$ (b) $f_1 > f_2$ (c) $T_1 > T_2$ (d) $V_1 < V_2$

108. Residual entropy is the entropy of

(a) An isolated system (b) A system undergoing reversible reaction
(c) A system at equilibrium (d) A system at absolute zero of temperature

109. In the given reaction, (X) and (Y) will respectively be :

$$C_6H_5CHO + HCHO \xrightarrow[(ii)HOH/H^{\oplus}]{(i)conc.\ NaOH} (X) + (Y)$$

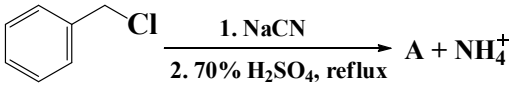
(a) C_6H_5COOH and CH_3OH (b) $C_6H_5CH_2OH$ and HCOOH
(c) Only C_6H_5COOH (d) Only CH_3OH

110. Pick all the gases from the list which dissolve in water to give an acidic solution

(i) Nitrogen **(ii)** Carbon dioxide
(iii) Sulphur dioxide **(iv)** Sulphur trioxide
(v) Ozone **(vi)** Hydrogen bromide

(a) (i), (iii), (iv), (vi) (b) (ii), (iii), (iv), (vi)
(c) (ii), (iii), (vi), (i) (d) (ii), (iv), (vi), (i)

111. What is the expected product, A of the following reaction sequence?



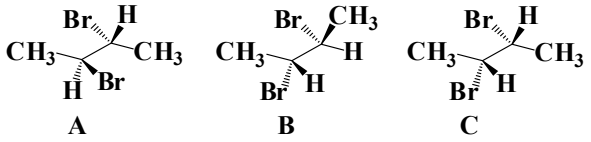
(a) $HCO_2CH_2C_6H_5$ (b) $C_6H_5CH_2OSO_3H$ (c) $C_6H_5CH_2COOH$ (d) $C_6H_5CHClCOOH$

112. The donation of lone pair of electrons of CO carbon into the vacant orbital of metal atom results in _____ bond.

(a) Sigma (b) pi (c) Back (d) Synergic

113. How many geometrical isomers are possible in $[Al(C_2O_4)_3]^{3-}$?
(a) 0 (b) 2 (c) 3 (d) 4

114. **Identify the enantiomers among the following compounds :**



A **B** **C**

(a) C and D (b) B and D (c) A and C (d) A and B

115. **Which of the following showed Jahn–Teller Distortion?**
(a) Co^{2+} (b) Mn^{2+} (c) Fe^{3+} (d) All of these

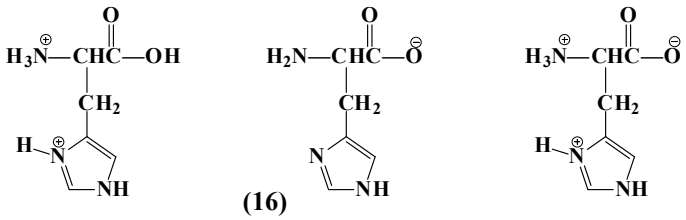
116. **Which of the following pair has the same electronic structure?**
(a) Ag, Sn (b) Mg, Na^+ (c) Ca, Ar (d) Ar, Cl^-

117. **$[CoL_6]^{3+}$ is red in colour whereas $[CoL_6]^{3+}$ is green. L and L respectively corresponds to:**
(a) NH_3 and H_2O (b) NH_3 and 1, 10–phenanthroline
(c) H_2O and 1, 10–phenanthroline (d) H_2O and NH_3

118. **50 mL of 0.1 M CH_3COOH is being titrated against 0.1 M NaOH. When 25 mL of NaOH has been added, the pH of the solution will be _____ $\times 10^{-2}$ (Nearest integer)**
(Given : pK_a (CH_3COOH) = 4.76
log 2 = 0.30 log 3 = 0.48 log 5 = 0.69 log 7 = 0.84log 2 = 0.30
(a) 475 (b) 476 (c) 477 (d) 478

119. **Which phosphorus is most reactive?**
(a) Red phosphorus (b) Violet phosphorus
(c) White phosphorus (d) Scarlit phosphorus

120. **Three molecular ionic states, P–R are possible for the amino acid histidine. Identify the correct choice of pH values, respectively for the observation of the ionic states P–R:**



(a) P at pH 1; Q at pH 12; R at pH 7 (b) P at pH 7; Q at pH 1; R at pH 12
(c) P at pH 12; Q at pH 7; R at pH 1 (d) P at pH 12; Q at pH 1; R at pH 7

121. In the reaction given below :

$$R\text{–}Cl \xrightarrow[\text{(ii) } LiAlH_4]{\text{(i) KCN}} \text{Product A}$$

$$R\text{–}Cl \xrightarrow[\text{(ii) } LiAlH_4]{\text{(i) AgCN}} \text{Product B}$$

The compound A and B are :

(a) Metamers (b) Functional isomers
(c) Chain isomers (d) Position isomers

122. Type of hybridisation in diborane is :
(a) sp^2 (b) sp^3 (c) sp (d) sp^3d

123. Match the following

List – I	**List – II**
A. Phosphorescene	**1.** A schematic representation of the various types of radiative and non–radiative transitions that can occur in molecules
B. Intersystem crossing	**2.** Spontaneous emission of radiation arising from transitions between energy states of same multiplicity
C. Jablonski diagram	**3.** Non–radiative transition between energy states of different multiplicity
D. Fluorescence	**4.** Spontaneous emission of radiation arising from transitions between energy states of different multiplicities

Choose the correct option
(a) A–4, B–3, C–1, D–2 (b) A–4, B–3, C–2, D–1
(c) A–3, B–1, C–2, D–4 (d) A–1, B–2, C–3, D–4

124. The molar conductivities of KOAc and HCl at infinite dilution in water at 25^oC are 90.0 and 426.2 S cm^2 mol^{-1}, respectively. To calculate the molar conductivity of HOAc at infinite dilution, the additional molar conductivity value of which one of the following electrolytes will be required?
(a) NaCl (b) KCl (c) KNO_3 (d) NaOH

125. In its electronic spectrum, $[V(H_2O)_6]^{3+}$ exhibits two absorption bands, one at 17,800 (ν_1) and the second at 25,700 (ν_2) cm^{-1}.The correct assignment of these bands, respectively, is:

(a) $\nu_1 = {}^3T_{1g}(F) \rightarrow {}^3T_{2g}(F)$, $\nu_2 = {}^3T_{1g}(F) \rightarrow {}^3T_{1g}(P)$

(b) $\nu_1 = {}^3T_{1g}(F) \rightarrow {}^3T_{1g}(P)$, $\nu_2 = {}^3T_{1g}(F) \rightarrow {}^3T_{2g}(P)$

(c) $\nu_1 = {}^3A_{2g} \rightarrow {}^3T_{1g}(F)$, $\nu_2 = {}^3A_{2g} \rightarrow {}^3T_{2g}(F)$

(d) $\nu_1 = {}^3A_{2g} \rightarrow {}^3T_{2g}(F)$

ANSWER KEY

1 (b)	11 (c)	21 (b)	31 (c)	41 (a)	51 (b)	61 (a)	71 (d)	81 (c)	91 (b)	101(b)	111(d)	121(b)
2 (c)	12 (c)	22 (c)	32 (d)	42 (a)	52 (d)	62 (d)	72 (a)	82 (a)	92 (c)	102(a)	112(a)	122(b)
3 (c)	13 (d)	23 (b)	33 (a)	43 (d)	53 (a)	63 (b)	73 (d)	83 (a)	93 (a)	103(d)	113(a)	123(a)
4 (b)	14 (d)	24 (d)	34 (c)	44 (d)	54 (c)	64 (b)	74 (c)	84 (d)	94 (b)	104(a)	114(a)	124(b)
5 (a)	15 (b)	25 (a)	35 (a)	45 (b)	55 (d)	65 (d)	75 (d)	85 (a)	95 (d)	105(a)	115(a)	125(a)
6 (a)	16 (b)	26 (c)	36 (d)	46 (a)	56 (d)	66 (a)	76 (a)	86 (c)	96 (d)	106(c)	116(d)	
7 (c)	17 (d)	27 (a)	37 (c)	47 (c)	57 (a)	67 (c)	77 (c)	87 (a)	97 (c)	107(d)	117(a)	
8 (b)	18 (d)	28 (a)	38 (b)	48 (b)	58 (d)	68 (b)	78 (b)	88 (b)	98 (c)	108(d)	118(b)	
9 (a)	19 (d)	29 (d)	39 (b)	49 (b)	59 (a)	69 (a)	79 (c)	89 (d)	99 (c)	109(b)	119(c)	
10 (a)	20 (c)	30 (b)	40 (b)	50 (b)	60 (d)	70 (c)	80 (b)	90 (a)	100(c)	110(b)	120(a)	

Solution

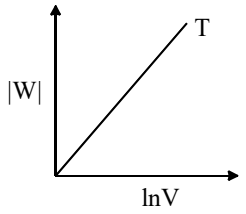
1. **(b)** $W = -2.303\ nRT \log \frac{V_2}{V_1}$

or

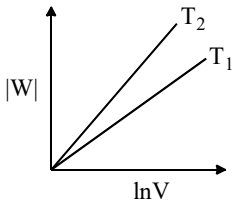
$W = -nRT \ln \frac{V_2}{V_1}$

$|W| = nRT \ln V$

$y = m\ x$

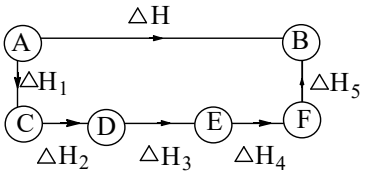


more the value of T, more will be the slope.



$T_2 > T_1$

Hess law → If states that the total enthalpy charge during the complete course of a chemical reaction is independent of the sequence at steps taken.



$$\Delta H = \Delta H_1 + \Delta H_2 + \Delta H_3 + \Delta H_4 + \Delta H_5$$

2. **(b)** Required equation $A \rightarrow 2B$

I. $A \rightarrow C$ $\quad \Delta_r H = q_1$_____(1)

II. $C \rightarrow D$ $\quad \Delta_r H = q_2$_____(2)

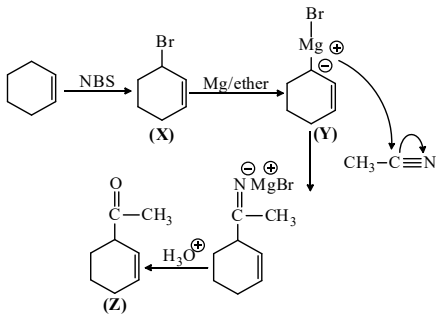
III. $\frac{1}{2} D \rightarrow B$ $\quad \Delta_r H = q_3$_____(3)

Equ.(1) + equ. (2) + 2× eq (3). We get

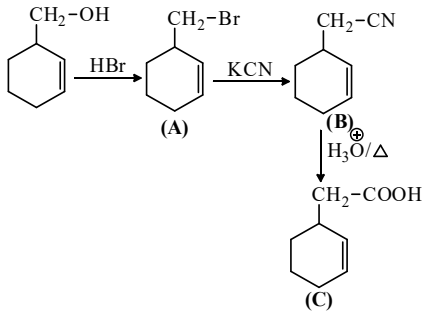
$A \rightarrow 2B$

$\Delta_r H = q_1 + q_2 + 2q_3$

3. **(b)**



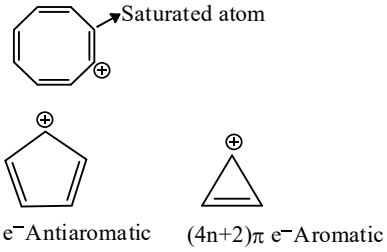
4. **(b)**



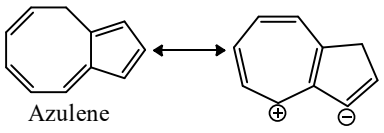
5. **(a)** Electronic transitions are studied by UV spectrometer.

6. **(a)** **<u>Homo aromatic</u>** → System in which a stabilized cyclic conjugated system is form by possessing one saturated atom.

Ex.:



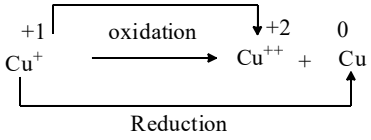
7. **(a)** Azulene is aromatic and high dipole moment.



8. **(b)** **<u>Xanthoprotic test</u>** → It is used to detect the presence of aromatic amino acids

(tyrosine, tryptophan and phenylalanime) in a protein solution.
It gives yellow colour nitro derivations on heating with conjugation HNO_3

9. **(a)** **Diproportionation reaction** → It is a reaction in which, the some element is simultaneously oxidized and reduced.



10. **(a)** **<u>Electrochemical series order</u>** →
Li > K > Ba > Sr > Ca > Na > Mg > Al > Mn > Zn > Cr > Fe > Cd > Co > Ni > Sn > Pb > H_2 > Cu > Hg > Ag > Pt > Au
Oxides of strong reducing agents (Li , K, Ba, Sr, Ca------) can't be reduced by carbon to give the respective metals.

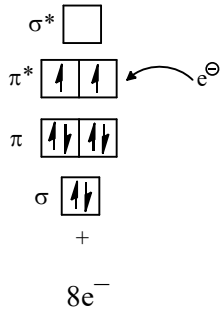
11. **(b)** Tritium emits β particle ($_1B^o$)
$_1H^3 \rightarrow {}_2He^3 + {}_1\beta^o$

12. **(c)** Surface tension is the tension of the surface film of a liquid caused by the attraction of the particles in the surface layer by the bulk of the liquid, which tends to minimize surface area. When temperature increases, molecules gets energy and tendency to have minimum surface area is decreases. Thus surface tension decreases.

13. **(d)** Vaccum is a measure of emptiness

14. **(d)**

15. **(b)** $O_2 = 16\ e^-$



When O_2 changes to O_2^-, electron goes to π * orbital.

16. **(b)** $6\ LiH + 8BF_3 \rightarrow 6\ LiBF_4 + B_2H_6$
(X)

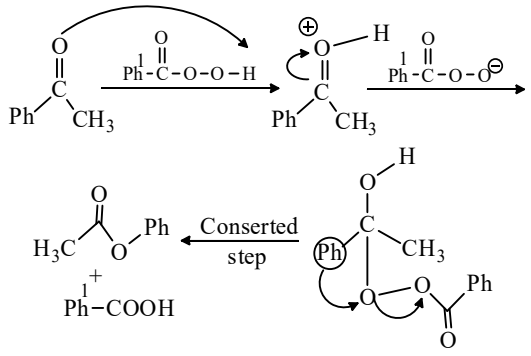
17. **(d)**

18. **(d)** Specific resistance $\ell = \frac{RA}{l}$
(Resistivity)
Unit → ohm × $\frac{cm^2}{cm}$
Unit → ohm-cm or simens^{-1} cm

19. **(a)** n = 3
ℓ = 1 → p-subshell
3p → maximum 6 electrons can be filled

20. **(c)** **Baeyer villager oxidation**
- Ketone convert into ester
- Reagent → per acid, H_2O_2, m-CPBA, $-\overset{O}{\overset{\|}{C}}-O-OH$, caro's acid

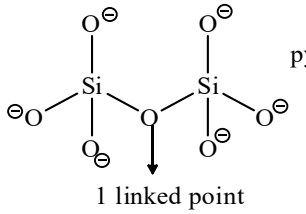
Mechanism →



21. **(b)** Total 4 colligative property
(1) Depression of freezing point
(2) Elevation of boiling point
(3) Osmotic pressure
(4) Relative vapouring in vapour pressure

22. **(c)** Silica get in contact with water vapour is an example of adsorption.

23. **(b)**



pyrosilicate

1 linked point

24. **(d)** Hydration energy $\propto \frac{\text{Charge}}{\text{size}}$

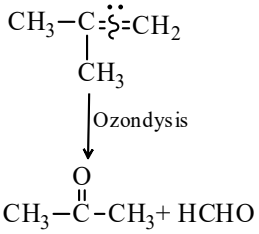
Size $Be^{2+} < Mg^{+2} < Ca^{+2} < Sr^{+2} < Ba^{++}$

Hydration energy $Be^{+2} > Mg^{+2} < Ca^{+2} > Sr^{+2} > Ba^{++}$

25. **(a)**

26. **(c)** In organometallic compound carbon atom is directly attached to the metal
Ex. R–Mg–X, R_2CuLi, R–Li, R_2Zn
Hence, magnesium bromide is not an organometallic compound.

27. **(a)**



$CH_3-C-CH_3 + HCHO$

28. **(a)** T = 27 + 273 = 300 kg,

$M_{H_2} = 2 \times 10^{-3}$ kg/mol

Most probable velocity $V_{mp} = \sqrt{\frac{2RT}{M}}$

$$V_{mp} = \sqrt{2 \times \frac{25}{3} \times \frac{100}{2 \times 10^{-3}}}$$

$$\left\{\because R = \frac{25}{3}\right\}$$

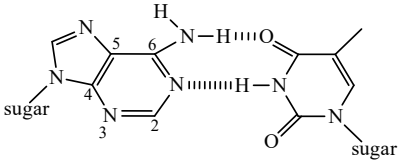
$$= \sqrt{25 \times 10^5}$$

$$= \sqrt{250 \times 10^4}$$

$$= 15.8 \times 10^2 \text{ m/sec}$$

V_{mp} = 15.8 × 10^4 cm/sec

29. **(d)** N(1) → Hydrogen bond acceptor
C(6) NH_2 → Hydrogen bond acceptor



Adenine
Thymine

30. **(a)** Osmotic pressure $\pi = CRT \times i$

	$CaCl_2$	KCl	Glucose	Urea
i	3	2	1	1

Highest osmotic pressure

31. **(c)** Zone refining is used for the purification of metals like Si, Ge, Ga which are used in semiconductors.

32. **(d)**

33. **(a)** Galvanic cell

	Anode	**Cathods**
1.	Oxidation occur	Reduction occur
2.	Negative	Positive

Note → EMF measured by voltmeter

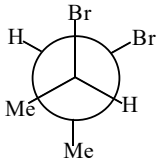
For normal hydrogen electron $E^\circ = 0$

34. **(c)**

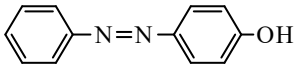
Gauche interaction	Me/Me	Me/Br	Br/Br
Values (kJ/mol)	3.3	0.8	3.0

Since $\frac{Me}{Br}$ interaction value is 0.8 kJ/mol, it means there is minimum repulsion in $\frac{Me}{Br}$, hence anti to each other.

Since $\frac{Me}{Me}$ and $\frac{Br}{Br}$ interaction values are higher, it means there are much more repulsion, hence gauche to each other.

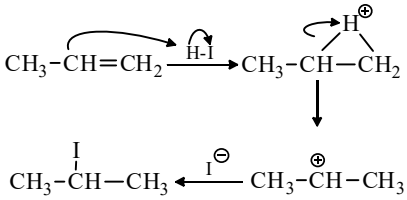


35. **(a)** p-hydroxy azo benzene (orange dye)



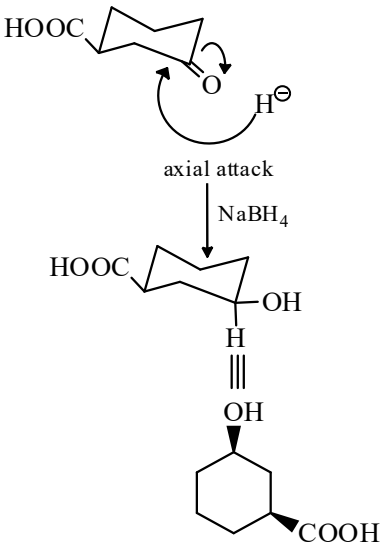
36. **(d)** $CH_3-CH=CH_2 + HI \longrightarrow CH_3-\overset{I}{\underset{|}{C}}H-CH_3$

Mechanism

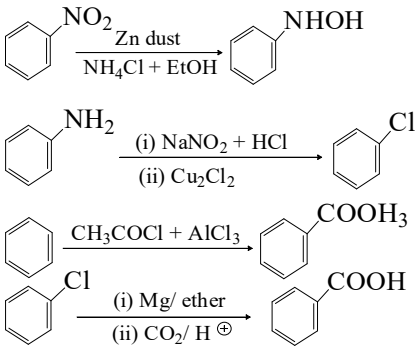


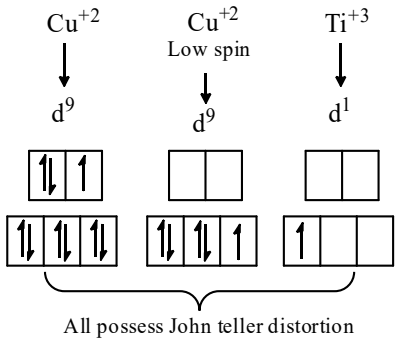
37. **(c)** Aluminum is not degraded in nature because it forms an oxide layer in its surface.

38. **(b)**

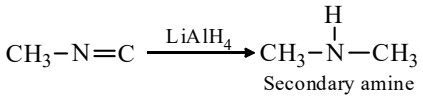


39. **(c)**





40. **(b)** option is correct



41. **(a)** **NaOH** $\rightarrow$ Strong electrolyte $\rightarrow$ 100% ionize

CH_3COOH $\rightarrow$ Weak electrolyte $\rightarrow$ Approx 5% ionize

Hence in the solution number of $H^{\ominus}$ ions is greater than $H^{\oplus}$ ions. Thus solution will be basic.

42. **(a)** $m_1v_1nf_1 = m_2v_2nf_2$

$0.025 \times 3 \times V_1 = 0.030 \times 2 \times 25$

$V_1 = 20$ mL

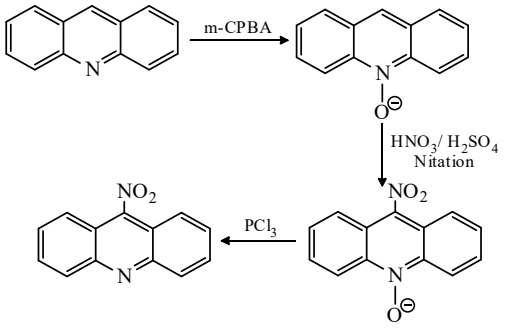
43. **(d)** Adsorption H-bonding > Polar > Non-polar

$NH_3 > CO_2 > CH_4 > H_2$

44. **(d)**

45. **(b)** Phenol gets slowly oxidized to a pink colored compound p"benzoquinone.

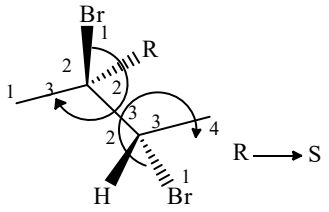
46. **(a)** options is correct

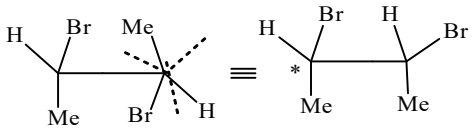


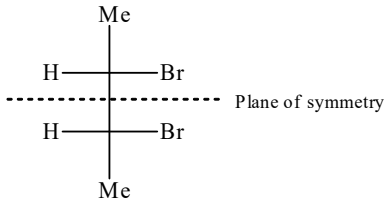
47. **(c)** **Chirality** → Word chirality is used as a term to describe a molecule whose enonomer are non-super imposable on their mirror image.

48. **(b)**

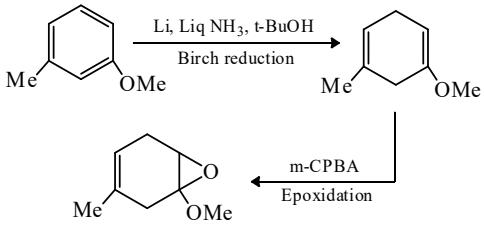
49. **(b)** Meso compounds have 2 asymmetric center and plane of symmetry.



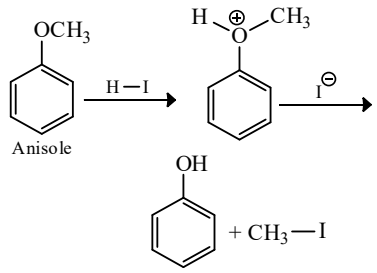




50. **(a) option is correct**



51. **(b)**



52. **(d)** **Iodoform test** → $-\overset{O}{\overset{\|}{C}}-CH_3$ and $-\underset{OH}{\underset{|}{CH}}-CH_3$ group give iodoform test and form white ppt.

(a) $H_3C-\boxed{\underset{OH}{\underset{|}{CH}}-CH_3}$ Gives iodo from test

(b) $CH_3-H_2C-\boxed{\underset{OH}{\underset{|}{CH}}-CH_3}$ Gives iodo from test

(c) $CH_3-CH_2-H_2C-\boxed{\overset{O}{\overset{\|}{C}}-CH_3}$ Gives iodo from test

(d) $H_3C-H_2C-\overset{O}{\overset{\|}{C}}-CH_2-CH_3$ not give iodofrom test

53. **(a)**

54. **(c)** Gas adsorbing on charcoal is an example of physisorption.

Characteristics of physisorption

(1) Vander waals forces

(2) Multilayered

(3) Not specific

(4) Low temperature
(5) Low heat of adsorption
(6) No activation energy required
(7) Reversible

55. (d)

56. (d)

57. (a) Electrolysis of dilute sulphuric acid

Anode $\rightarrow 2H_2O \rightarrow 4H^{\oplus} + O_2 + 4e^-$

Cathode $\rightarrow 4H^{\oplus} + 4e^- \rightarrow 2H_2$

58. (d) $\because$ 22400 mL O_2 = 1 mol O_2

$$\therefore 5600 \text{ mL } O_2 = \frac{5600}{22400} \text{ mol } O_2$$

$$= \frac{1}{4} \text{ mol } O_2$$

1 mol of O_2 produces 4 moles of e^- and 1 mol of silver requires 1 moles of e^-

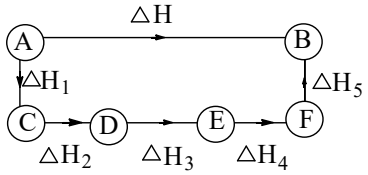
$$\frac{W_{Ag^+}}{M_{Ag}} \times 1 = \frac{W_{O_2}}{M_{O_2}} \times 4$$

$$\frac{W\ Ag^+}{100} = \frac{1}{4} \times 4$$

$$W_{Ag^+} = 108 \text{ g}$$

59. (b) **Activation energy** $\rightarrow$ The minimum amount of energy that is required to activate atoms or molecules to a condition in which they can undergo chemical transformation.

60. (d) Hess law '! If states that the total enthalpy charge during the complete course of a chemical reaction is independent of the sequence at steps taken.

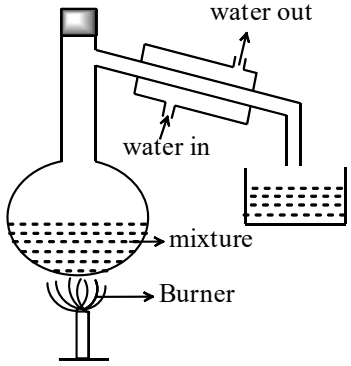


$$\boxed{\Delta H = \Delta H_1 + \Delta H_2 + \Delta H_3 + \Delta H_4 + \Delta H_5}$$

Hence Hess law depend upon initial and final conditions.

61. (a) Acid + Base $\rightarrow$ Water + Salt

62. (d) **Steam distillation** $\rightarrow$



Boiling point of o-nitro phenol = 216°C
Boiling point of p-nitro phenol = 279°C
When mixture of o-nitro phenol and p-nitro phenol is heated in the flask,

o-nitro phenol evaporates first and condensate and finally separated.

63. **(b)**

Ions	Mn^{3+}	Cr^{+3}	V^{3+}
d electrons	d^4	d^3	d^2
No. of unpairedelectrons	4	3	2

64. **(b)** In the presence of organic matter and light, $AgNO_3$ decomposes to metallic silver (black) which produces a black stain on skin.

65. **(d)** Binding capacity $\propto$ pressure of O_2 of Haemoglobin

$$\propto \frac{1}{\text{pressure of } CO_2}$$

$$\propto \text{pH value}$$

$$\propto \frac{1}{\text{Acidity}}$$

Hence release of O_2 from oxyhaemoglobin is favored by law pH and high pressure of CO_2.

66. **(a)** **f-block elements**

1) Electronic spectra of lanthanide show sharp bond

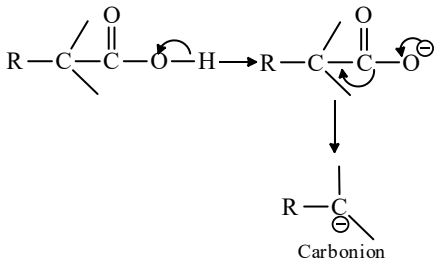
2) On going left to right in f-block elements, size decreases.

3) Co-ordination no. upto 12

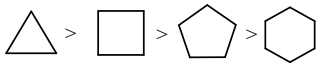
4) High melting point and boiling point

5) Variable oxidation states

67. **(c)** Smaller the ring, higher the Y.S. character, higher stability of carbon ion

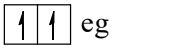


%S character



Acidity $\rightarrow$ I > II > III >IV

68. **(b)** $Fe^{+3} \rightarrow d^5$



$CFSE = -0.4 \times (t_{2g})^n + 0.6 \times (eg)^n$

$= -0.4 \times 3 + 0.6 \times 2$

$= -1.2 + 1.2$

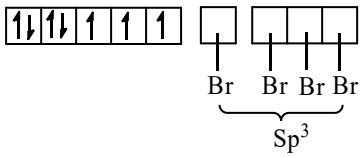
$CFSE = 0$

69. **(a)** Unpaired $e^- \rightarrow$ Paramagnetic

Paired $e^- \rightarrow$ Diamagnetic

$[CoBr_4]^{2-}$

$Co^{+2} \rightarrow 3d^7$ $4s^o$ $4p^o$

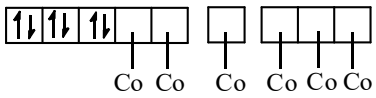


Unpaired $e^- = 3$

Hence paramagnetic

$Mo(Co)_6$

$Mo \rightarrow 3d^4$ $4s^o$ $4p^o$



Unpaired $e^- = 0$

Hence diamagnetic

$[Pt(en)Cl_2]$

Pt^{+2}

4d and 5d complexes always low spin and diamagnetic.

70. (c) **Buffer solution** $\rightarrow$ A buffer is a solution that can resist pH change upon the addition of an acidic or basic components.

71. (d)

72. (a) Mercury is liquid metal because it has a completely filled s-orbital and almost behaves like a noble gas.

73. (d) $A = A_o\left(\frac{1}{2}\right)^n$

A_o = Initial concentration

$n = \frac{400}{100}$ $A \rightarrow$ conc. after 't'

time

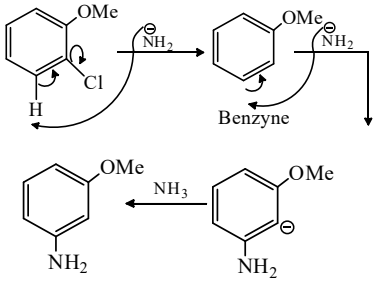
$n = 4$ $n \rightarrow$ number of half lifes

$A = A_o\left(\frac{1}{2}\right)^4$

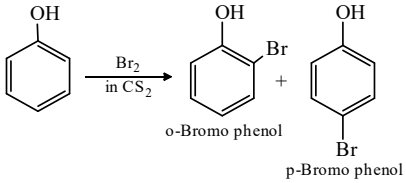
$A = \frac{A_o}{16}$

Hence $1/16^{th}$ concentration of radioactive substance remains.

74. (c)



75. (d)



76. (d) $CH \equiv CH \xrightarrow{H_2O} HC=CH$ (H, OH) $\xrightarrow{\text{Tautomerism}} CH_3\text{-}CH=O$

Acetaldehyde

77. (c) $aA + bB \rightarrow cC + dD$

$$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$$

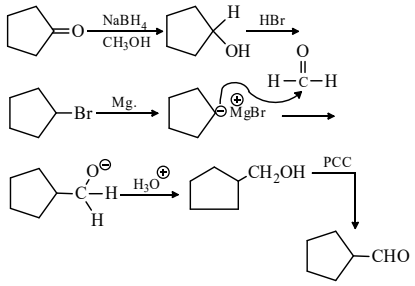
$naA + nbB \rightarrow ncC + ndD$

$$K_c^1 = \frac{[C]^{nc}[D]^{nd}}{[A]^{na}[B]^{nb}}$$

$$K_c^1 = \left\{\frac{[C]^c[D]^d}{[A]^a[B]^b}\right\}^n$$

$K_c^1 = K^n$

78. **(c)**



79. **(c)**

80. **(b)** $\Delta S = \frac{dq}{T}$

$$= \frac{1.435 \times 10^3 \text{ cal.mol}^{-1}}{273 \text{ K}}$$

$$\Delta S = 5.26 \text{ cal.mol}^{-1} \text{ K}^{-1}$$

81. **(c)** **<u>Condensation polymer</u>** $\rightarrow$ The process in which a larger structure can form by the step – growth by joing small monomers by the release of small molecules in known as condensation polymer.

$COOH–CH_2–CH_2–CH_2–COOH + NH_2–(CH_2)_6–NH_2$

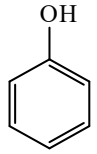
$\downarrow$

$$-\overset{O}{\overset{\|}{C}}-(CH_2)_4-\overset{O}{\overset{\|}{C}}-NH-(CH_2)_6-NH- + H_2O$$

Condensation polymers form by step-growth polymerization, it means molecular weight of polymers rises through out the reaction.

82. **(a)** Be not have any empty orbital to accept electrons from EDTA. So be not form complex with EDTA.

83. **(a)**



+ HCHO

$\rightarrow$ Phenol formaldehyde resin

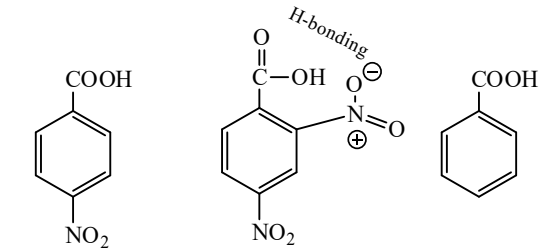
Eg.: Novolac and Bakelite

84. **(d)**

85. **(a)**

86. **(c)**

87. **(a)** Benzoic acid are acidic in nature when EWG are attached, then acidity increases.



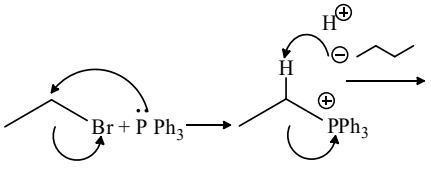
(I) p-nitra benzoic acid **(II)** o-nitra benzoic acid **(III)** benzoic acid

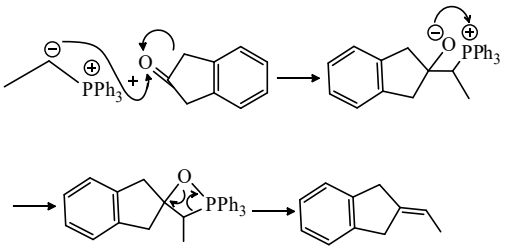
Acidity I > II > III

$$\text{pKa} \propto \frac{1}{\text{Acidity}}$$

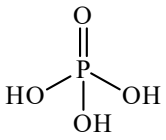
pKa values I < II < III

88. **(b)**

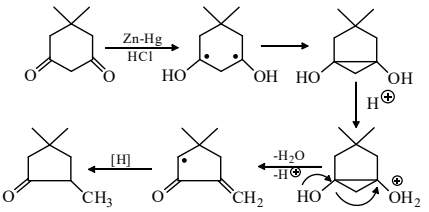


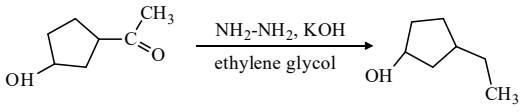


89. **(d)** Phosphoric acid in a triprotic acid



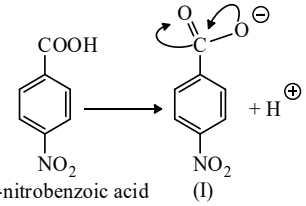
90. **(b)**





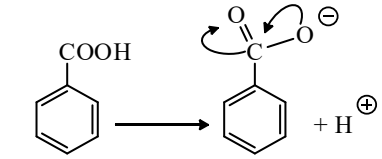
91. **(b)** For this conversion we will use wolff kishnar reduction.
If we use clemmensen reagent.

92. **(c)**



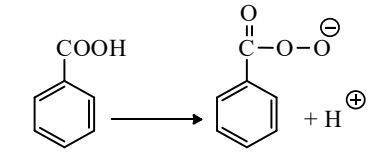
p-nitrobenzoic acid (I)

Negative charge is more stabilized due to resonance, hence more stable and more acidic.



Benzoic acid (II)

Negative charge is stabilized due to resonance but less stable than I, in the absence at EWG-NO_2.

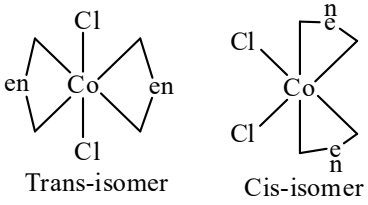


Perbenzoic acid (III)

Negative charge is not participate in resonance, hence least stable and least acidic.

Acidity p-nitro benzoic acid > Benzoic acid > Peroxy benzoic acid

93. **(a)** $[CoCl_2(en)_2]$ shows geometrical isomerism



Trans-isomer Cis-isomer

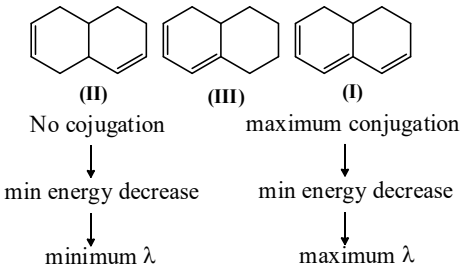
94. **(b)** Boiling point $\propto$ H – bonding
$\propto$ Molar mass of molecule

Molar mass $C_2H_5COOH > CH_3COOH > HCOOH$

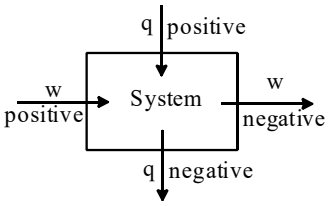
Boiling point $C_2H_5COOH > CH_3COOH > HCOOH$

95. **(d)** Resonance/ conjugation increase $\rightarrow$ Energy of molecule decrease $\rightarrow$ wavelength increase

$$\boxed{\lambda E = \frac{hc}{\lambda}}$$



96. **(d)**



97. **(c)** Molecules are held together in a crystal by Vander waal's attraction.

98. **(c)** Proof of cyclic structure of glucose

1) Not give schiff's test of aldehyde.

2) Not form addition product with $NaHSO_3$

3) Not react with Grignard reagent

4) Glucose penta acetate not react with NH_2OH

5) Not absorb the bond in IR spectrum.

99. **(c)**

100. **(c)** Polyphosphates are applicable as water softening agents because they form soluble complexes with cationic species of hard water.

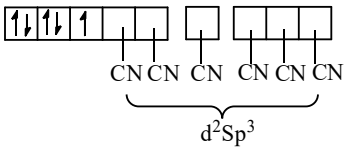
101. **(b)** When HCl gas is passed in saturated solution of NaCl, the concentration of $Cl^{\ominus}$ ion increases so reaction will move in backward direction and precipitation of NaCl will start.

$\mathbf{NaCl \rightleftharpoons Na^{\oplus} + Cl^{\ominus}}$

$\mathbf{HCl \rightleftharpoons H^{\oplus} + Cl^{\ominus}}$ common ion effect

102. **(a)** $[Fe(CN)_6]^{3-}$

$Fe^{+3} \rightarrow \quad 3d^5 \quad 4s^o \quad 4p^o$



Unpaired $e^- = 1$

Hence paramagnetic

103. **(d)** **Valence bond theory** $\rightarrow$ This theory is given by Linins pooling important points of this is given following

1) Ligands donate the electrons to the central atom and for co-ordinate bond.

2) Metal atom or ion under the influence of ligands can use its (n"1)d, ns, sp and nd orbital's for hybridization

3)

CN	Hybridization	Geometry
4	sp^3	Tetrahedral
4	dsp^2	Square planer
5	sp^3d	Trigonal bipyramidal
6	sp^3d^2/ d^2sp^3	Octahedral

4) If in the complex
Unpaired e^- present $\rightarrow$ Paramagnetic
Unpaired e^- not present $\rightarrow$ Diamagnetic

5) **If weak ligand attach** $\rightarrow$ e^- filled according to Hund's rule
If strong ligand attach $\rightarrow$ e^- filled opposite to Hund's rule

6) **If (n – 1)d orbital involve** $\rightarrow$ Inner orbital complex and
orbital $\rightarrow$ outer orbital complex

Limitations of VBT

1) It involves a number of assumptions

2) It does not distinguish between weak and strong ligand.

3) It does not explain the colour exhibited by co-ordination

104. **(a)** Le chaterlier's principle $\rightarrow$

1) **Effect of concentration** = Concentration equilibrium shift towards less number of moles.

2) **Effect of pressure =** Pressure increase equilibrium shift towards less number of moles.

3) **Effect of temperature =** If reaction is endothermic increases forward direction
If reaction is exothermic increases backward direction

4) **Addition of inert material**

a) At cons. volume $\rightarrow$ No effect seen

b) **At cons. press** $\rightarrow$ Equilibrium shift towards more no. of moles

$$2SO_2 + O_2 \rightleftharpoons 2SO_3 \qquad \Delta H^o = -198kJ$$

$\Rightarrow$ Reaction is exothermic. Hence low temperature is favoured for the formation of SO_3.

$\Rightarrow$ High pressure is good for the formation of SO_3.

105. **(a)** K_p does not change with pressure

106. **(c)**

$$\begin{array}{ccccc} HA & \rightleftharpoons & H^{\oplus} & + & A^{\ominus} \\ C & & O & & O \\ C - C\alpha & & C\alpha & & C\alpha \end{array}$$

$$K_a = \frac{C\propto, C\propto}{C - C\propto} = \frac{\cancel{C}\propto, C\propto}{\cancel{C}[1-\propto]}$$

$\because 1 - \propto = 1$

$K_a = C\propto^2$ _____(i)

$\because pH = 4$

$[H^{\oplus}] = 10^{-4}$

$$\propto = \frac{10^{-4}}{10^{-3}} = 10^{-1}$$

From equation (i)

$K_a = 1 \times 10^{-3} \times (10^{-1})^2$

$K_a = 10^{-5}$

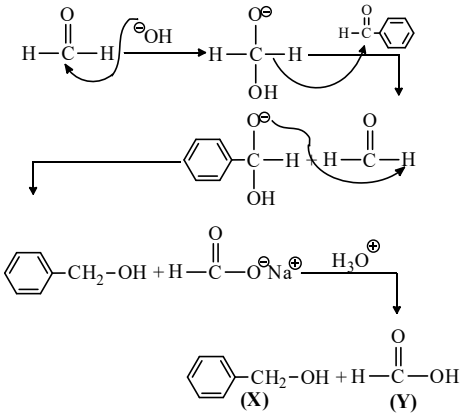
107. **(c)**

108. **(d)** Residual entropy in the entropy of a system at absolute zero temperature.

109. (b) **Cross cannizzaro reaction →**

$C_6H_5CHO + HCHO \rightarrow C_6H_5\text{-}CH_2\text{-}OH + HCOOH$

Mechanism



110. (b) $CO_2 + H_2O \rightarrow H_2CO_3$

Carbonic acid

(Acidic)

$SO_2 + H_2O \rightarrow H_2SO_3$

Sulfurous acid

(Acidic)

$SO_3 + H_2O \rightarrow H_2SO_4$

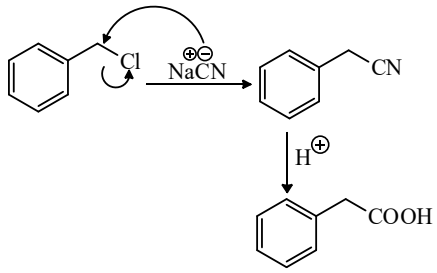
Sulfuric acid

(Acidic)

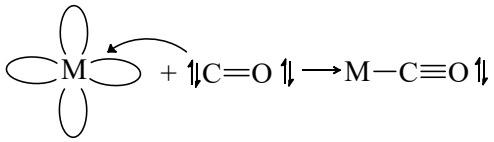
$HBr + H_2O \rightarrow H_3O^{\oplus} + Br^{\ominus}$

Acidic solution

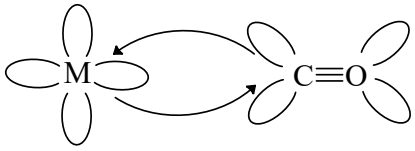
111. (c)



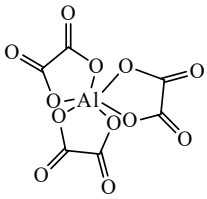
112. (a) When lone pair of e^- of so donate to cavort orbital of metal, ó bond forms.



When metal donate it's electrons to CO then ð bond forms. Which is called back bonding.



113. (a) No any geometrical isomer is possible



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

114. ()

115. (a) Symmetrical electronic configuration → No John-Teller distortion occur (t_{2g} and eg half filled or full filled)

Example: $t_{2g}^3eg > t_{2g}^3eg^2 > t_{2g}^6eg^2$ etc.

Unsymmetrical electronic configuration → John-Teller distortion occur (t_{2g} and eg partially filled)

Example: $t_{2g}^{2}eg > t_{2g}^{3}eg^{1} > t_{2g}^{6}eg^{3}$ etc.

$Cr^{+3}(d^3)$ $Cr^{+4}(d^2)$ $Pe^{+3}(d^5)$ $Ni^{+2}(d^{10})$

_ _ _ _ A - A A A

$Co^{+3} \rightarrow d^6$ ↿⇂ ↿⇂ ⇅ ↿ ↿ JTD ✓

$Mn^{+2} \rightarrow d^5$ ↿⇂ ↿⇂ ↿ ↿ ↿ JTD ✗

$Fe^{3+} \rightarrow d^5$ ↿⇂ ↿⇂ ↿ ↿ ↿ JTD ✗

116. (d) $Ar_{18} \rightarrow [Ne]\ 3s^2\ 3p^6$

$Cl^{-} \rightarrow [Ne]\ 3s^2\ 3p^6$

117. (a)

118. (b) 50 ml 0.1M CH_3COOH

$$[C] = \frac{n}{V} \times 1000$$

$$\text{Moles of } CH_3COOH\ n = \frac{[C] \times V}{1000}$$

$$= \frac{0.1 \times 50}{1000} = \frac{5}{1000} = 5 \text{ mili moles}$$

25 ml 0.1 m NaOH

Moles of NaOH

$$= \frac{0.1 \times 25}{1000} = \frac{2.5}{1000} = 2.5 \text{ mili moles}$$

$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$				
Milimoles	5	2.5	0	0
Used/ formed	2.5	2.5	2.5	2.5
Finally	2.5	0	2.5	2.5
		↓		↓
		Weak acid		Salt (WASB)

$$pH = pKa + \log_{10} \frac{[Salt]}{[Acid]}$$

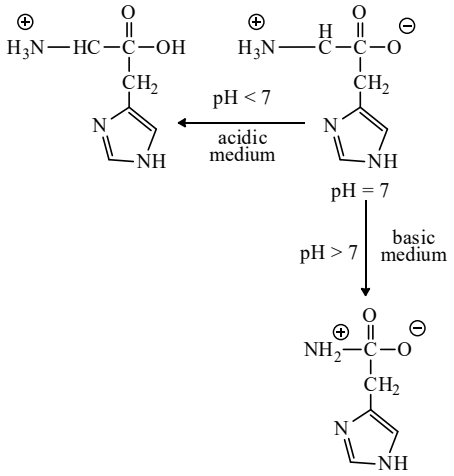
$$= 4.76 + \log_{10} \frac{\cancel{2.5}}{\cancel{2.5}}$$

pH = 4.76

pH = 476 × 10^{-2}

119. (c) White phosphorus is not reactive amongst all phosphorous

120. (a) option is correct



121. (b) $R{-}Cl \xrightarrow{KCN} R{-}CN \xrightarrow{LiAlH_4} R{-}CH_2{-}NH_2$

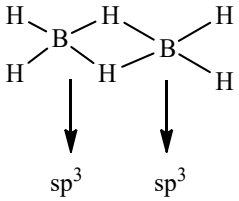
Product 'A'

$R-Cl \xrightarrow{AgCN} R-NC \xrightarrow{LiAlH_4} R-NH-CH_3$

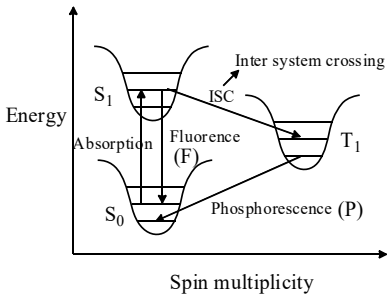
Product 'B'

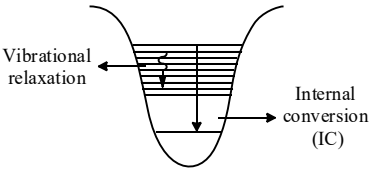
Product 'A' and product 'B' are functional group isomer.

122. (b)



123. (a) Jablonski diagram





Time taken P > F > ISC > IC > Absorption is fastest

	Phosphoresence	**Fluorescene**
1.	Change in spin $T_1 \rightarrow S_0$	Not change in spin $S_1 \rightarrow S_0$
2.	Spin angular momentum is not conserved $(\Delta S \neq 0)$	Conserved $(\Delta S = 0)$
3.	Take longer time	Take shorter time
4.	Forbidden by selection rule	Allowed by selection rule

Note → Radiative process → Phosphorescence, Fluorescence

Non-radiative → IC, ISC

124. (b) $\Lambda^{\infty}_{KOAc} = \lambda^{\infty}_{K^{\oplus}} + \lambda^{\infty}_{OAc^{\ominus}} = 90\ Scm^2\ mol^{-1}$

$\Lambda^{\infty}_{HCl} = \lambda^{\infty}_{H^{\oplus}} + \lambda^{\infty}_{Cl^{\ominus}} = 426.2\ Scm^2\ mol^{-1}$

To find out molar conductivity of HOAc molar conductivity of KCl is required.

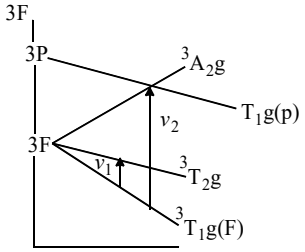
125. (a) $[V(H_2O)_6]^{3+}$

$V^{3+} \rightarrow d^2$

$L = 2 + 1 = 3 \rightarrow F$

$S = ½ + ½ = 1$

$m = 25 + 1 = 2 \times 1 + 1 = 3$



$v_1 = {}^3T_1g(F) \rightarrow {}^3T_2g(F) = 17800\ cm^{-1}$

$v_2 = {}^3T_1g(F) \rightarrow {}^3T_1g(F) = 25700\ cm^{-1}$