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PRACTICE PAPER

Time : 3 Hours **Max. Marks :** 720

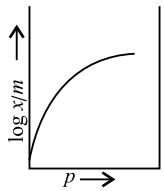
CHEMISTRY

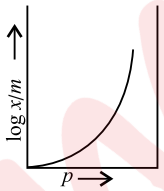
SECTION-A

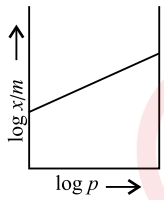
51. Which of the following is the most stable state when two atoms come closer to each other to form a molecule?

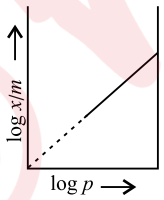
(a) (i), when the bond is formed, the energy is minimum.
(b) (ii), when the atoms touch each other, the energy is zero.
(c) (iii), when the atoms are isolated, the energy is minimum.
(d) (ii), when the attractive forces are more than repulsive forces.

52. Which of the following curves is in accordance with Freundlich adsorption isotherm?

(a) 

(b) 

(c) 

(d) 

53. The best method to purify impure acetone is

(a) $CH_3COCH_3 + HCl \longrightarrow CH_3-\underset{\underset{Cl}{|}}{\overset{\overset{OH}{|}}{C}}-CH_3 \xrightarrow{heat} CH_3COCH_3$

(b) $CH_3COCH_3 + NaHSO_3 \longrightarrow CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{OH}{|}}{C}}-SO_3Na \xrightarrow{Na_2CO_3} CH_3COCH_3$

(c) $CH_3COCH_3 + HCN \longrightarrow CH_3-\underset{\underset{CN}{|}}{\overset{\overset{OH}{|}}{C}}-CH_3 \xrightarrow{HOH} CH_3COCH_3$

(d) $CH_3COCH_3 + H_2SO_4 \longrightarrow CH_3-\underset{\underset{HSO_4}{|}}{\overset{\overset{OH}{|}}{C}}-CH_3 \xrightarrow{heat} CH_3COCH_3$

54. Which of the following is a false statement?
(a) Free radicals, carbonium ions or carbanions are reaction intermediates.
(b) Reaction between methane and chlorine in presence of sunlight proceeds *via* free radical.
(c) The electronegative atom in the carbon chain produces $+I$ effect.
(d) Homolytic fission of C – C bonds gives free radicals.

55. Match the column I with column II and mark the appropriate choice.

Column I		Column II	
(A)	Impure metal to volatile complex	(i)	Blistered copper
(B)	$2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$	(ii)	Mond process
(C)	Purification of mercury	(iii)	van Arkel process
(D)	Purification of zirconium	(iv)	Liquation

(a) (A) → (iv), (B) → (iii), (C) → (i), (D) → (ii)
(b) (A) → (ii), (B) → (i), (C) → (iv), (D) → (iii)
(c) (A) → (i), (B) → (ii), (C) → (iv), (D) → (iii)
(d) (A) → (iii), (B) → (iv), (C) → (i), (D) → (ii)

56. Which of the following diols would cleave into two fragments with HIO_4?
(a) 1,3-Hexanediol (b) 2,4-Hexanediol
(c) 1,6-Hexanediol (d) 3,4-Hexanediol

57. Artificial sweetener which is stable under cold conditions only is
(a) saccharin (b) sucralose
(c) aspartame (d) alitame.

58. (I) $H_2O_2 + O_3 \longrightarrow H_2O + 2O_2$
(II) $H_2O_2 + Ag_2O \longrightarrow 2Ag + H_2O + O_2$
Role of hydrogen peroxide in the above reactions is respectively
(a) oxidising in (I) and reducing in (II)
(b) reducing in (I) and oxidising in (II)
(c) reducing in (I) and (II)
(d) oxidising in (I) and (II).

59. Which set of quantum numbers is possible for the last electron of Mg^+ ion?
(a) $n = 3, l = 2, m = 0, s = +1/2$
(b) $n = 2, l = 3, m = 0, s = +1/2$
(c) $n = 1, l = 0, m = 0, s = +1/2$
(d) $n = 3, l = 0, m = 0, s = +1/2$

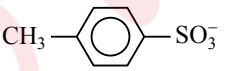
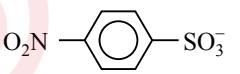
60. Which of the following will have a *meso*-isomer?
(a) 2-Chlorobutane (b) 2-Hydroxypropanoic acid
(c) 2,3-Dichloropentane (d) 2,3-Dichlorobutane

61. Which of the following reactions is said to be entropy driven?
(a) Endothermic reaction with positive entropy change and high temperature
(b) Endothermic reaction with negative entropy change and low temperature
(c) Exothermic reaction with positive entropy change and high temperature
(d) Exothermic reaction with negative entropy change and low temperature

62. Which of the following does not liberate O_2 on heating?
(a) MgO (b) $NaNO_3$ (c) Pb_3O_4 (d) $KClO_3$

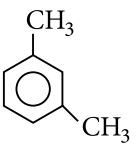
63. If 10^{21} molecules are removed from 200 mg of CO_2, the number of moles of CO_2 left is
(a) 2.88×10^{-3} (b) 28.8×10^{-3}
(c) 0.288×10^{-3} (d) 1.66×10^{-2}

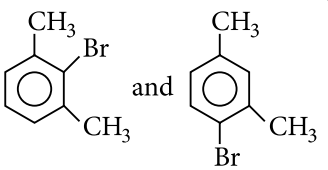
64. Leaving tendency of the following groups in decreasing order is

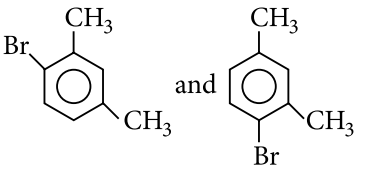
I. Cl^- II. 
III. OH^- IV. 

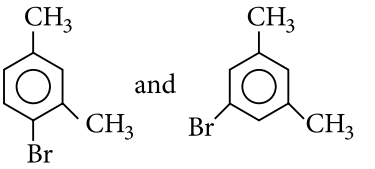
(a) IV > II > I > III (b) I > II > III > IV
(c) II > IV > I > III (d) I > IV > II > III

65. What products are formed when the following compound is treated with Br_2 in the presence of $FeBr_3$?



(a) 

(b) 

(c) 

(d) None of these

66. The ions O^{2-}, F^-, Na^+, Mg^{2+} and Al^{3+} are isoelectronic. Their ionic radii show
(a) a decrease from O^{2-} to F^- and then increase from Na^+ to Al^{3+}
(b) a significant increase from O^{2-} to Al^{3+}
(c) a significant decrease from O^{2-} to Al^{3+}
(d) an increase from O^{2-} to F^- and then decrease from Na^+ to Al^{3+}.

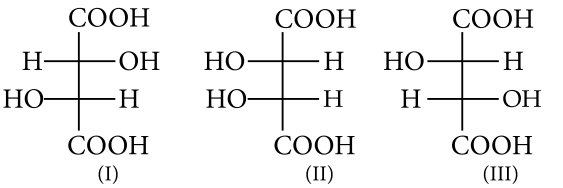
67. Acidity of diprotic acids in aqueous solutions increases in the order
(a) $H_2S < H_2Se < H_2Te$ (b) $H_2Se < H_2S < H_2Te$
(c) $H_2Te < H_2S < H_2Se$ (d) $H_2Se < H_2Te < H_2S$

68. The correct order of increasing basicity of the given conjugate bases ($R = CH_3$) is
(a) $RCOO^- < HC \equiv C^- < NH_2^- < R^-$
(b) $RCOO^- < HC \equiv C^- < R^- < NH_2^-$
(c) $R^- < HC \equiv C^- < RCOO^- < NH_2^-$
(d) $RCOO^- < NH_2^- < HC \equiv C^- < R^-$

69. The pH of 0.004 M hydrazine solution is 9.7. Its ionisation constant (K_b) is
(a) 7.79×10^{-8} (b) 4.49×10^{-9}
(c) 1.67×10^{-10} (d) 6.25×10^{-7}

70. The vapour density of a mixture containing NO_2 and N_2O_4 is 38.3 at 300 K. The number of moles of NO_2 in 100 g of the mixture is approximately
(a) 0.44 (b) 4.4
(c) 33.4 (d) 3.34

71. Pair of enantiomers from the following compounds are



(I) (II) (III)

(a) I and II (b) II and III
(c) I and III (d) both (a) and (b).

72. In a face centred cubic arrangement of *A* and *B* atoms, *A* atoms are at the corners of the unit cell and *B* atoms at the face centres. One of the *A* atoms is missing from one corner in the unit cell. The simplest formula of the compound is
(a) A_7B_3 (b) AB_3 (c) A_7B_{24} (d) $A_{7/8}B_5$

73. Among the following mixtures, dipole-dipole as the major interaction is present in
(a) benzene and ethanol
(b) acetonitrile and acetone
(c) KCl and water
(d) benzene and carbon tetrachloride.

74. One mole of a complex compound $Co(NH_3)_5Cl_3$ gives 3 moles of ions when dissolved in water. One mole of the same complex reacts with two moles of $AgNO_3$ solution to form two moles of AgCl. The structure of complex is
(a) $[Co(NH_3)_5Cl]Cl_2$ (b) $[Co(NH_3)_3Cl_3].2NH_3$
(c) $[Co(NH_3)_4Cl_2]Cl.NH_3$ (d) none of these.

75. The energy absorbed by each molecule (A_2) of a substance is 4.4×10^{-19} J and bond energy per molecule is 4.0×10^{-19} J. The kinetic energy of the molecule per atom will be
(a) 2.2×10^{-19} J (b) 2.0×10^{-19} J
(c) 4.0×10^{-20} J (d) 2.0×10^{-20} J

76. An alkane C_7H_{16} is produced by the reaction of lithium di(3-pentyl)cuprate with ethyl bromide. The name of the product is
(a) 3-methylhexane (b) 2-ethylpentane
(c) 3-ethylpentane (d) *n*-heptane.

77. Thermal decomposition method is used to purify
(a) Ni (b) Cr (c) Sn (d) Pb.

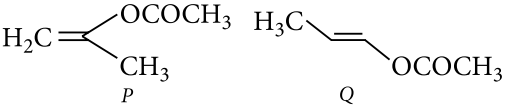
78. Which of the following synthesis gives 3-methyl -1-hexanol?
(a) 2-Bromohexane $\xrightarrow[C_2H_5OC_2H_5]{Mg}$ $\xrightarrow[(ii)\ H_3O^+]{(i)\ H_2C=O}$
(b) 2-Bromopentane $\xrightarrow[C_2H_5OC_2H_5]{Mg}$ $\xrightarrow[(ii)\ H_3O^+]{(i)\ \text{epoxide}}$
(c) 3-Bromopentane $\xrightarrow[C_2H_5OC_2H_5]{Mg}$ $\xrightarrow[(ii)\ H_3O^+]{(i)\ CH_3CH=O}$
(d) 1-Bromobutane $\xrightarrow[C_2H_5OC_2H_5]{Mg}$ $\xrightarrow[(ii)\ H_3O^+]{(i)\ CH_3COCH_3}$

79. Which of the following are isoelectronic and isostructural?
NO_3^-, CO_3^{2-}, ClO_3^-, SO_3
(a) NO_3^-, ClO_3^- (b) CO_3^{2-}, NO_3^-
(c) CO_3^{2-}, SO_3 (d) Both (b) and (c)

80. The enthalpy of neutralisation of NH_4OH and CH_3COOH is -10.5 kcal mol^{-1} and enthalpy of neutralisation of CH_3COOH with strong base is -12.5 kcal mol^{-1}. The enthalpy of ionisation of NH_4OH will be
(a) 4.0 kcal mol^{-1} (b) 3.0 kcal mol^{-1}
(c) 2.0 kcal mol^{-1} (d) 3.2 kcal mol^{-1}

81. Which of the following is not the characteristic of interhalogen compounds?
(a) They are more reactive than halogens.
(b) They are quite unstable but none of them is explosive.
(c) They are covalent in nature.
(d) They have low boiling points and are highly volatile.

82. The product of acid hydrolysis of *P* and *Q* can be distinguished by



P *Q*

(a) Lucas reagent (b) 2,4-DNP
(c) Fehling's solution (d) $NaHSO_3$

83. Which of the following orders is true regarding the basic nature of NH2 group?
(a) *o*-Toluidine > Aniline > *o*-Nitroaniline
(b) *o*-Toluidine < Aniline > *o*-Nitroaniline
(c) *o*-Toluidine < Aniline < *o*-Nitroaniline
(d) *o*-Toluidine > Aniline < *o*-Nitroaniline

84. Schottky defect in crystals is observed when
(a) unequal number of cations and anions are missing from the lattice
(b) equal number of cations and anions are missing from the lattice
(c) anion leaves its normal site and occupies an interstitial site
(d) density of the crystal is increased.

85. The indicator that is obtained by coupling the diazonium salt of sulphanilic acid with *N*,*N*-dimethylaniline is
(a) phenanthroline (b) methyl orange
(c) methyl red (d) phenolphthalein.

SECTION-B

Attempt any 10 questions out of 15.

86. Aqueous ammonia is used as a precipitating reagent for Al^{3+} ions as $Al(OH)_3$ rather than aqueous NaOH, because
(a) NH_4^+ is a weak base
(b) NaOH is a very strong base
(c) NaOH forms $[Al(OH)_4]^-$ ions
(d) NaOH forms $[Al(OH)_2]^+$ ions.

87. The electronic configuration of actinoids cannot be assigned with degree of certainty because of
(a) small energy difference between 5*f* and 6*d* levels
(b) overlapping of inner orbitals
(c) free movement of electrons over all the orbitals
(d) none of the above.

88. If a solution containing components *A* and *B* follows Raoult's law then
(a) *A*—*B* attraction force is greater than *A*—*A* and *B*—*B*
(b) *A*—*B* attraction force is less than *A*—*A* and *B*—*B*
(c) *A*—*B* attraction force remains same as *A*—*A* and *B*—*B*
(d) volume of solution is different from sum of volumes of solute and solvent.

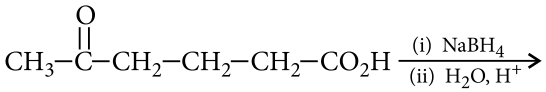
89. Fructose gives the silver mirror test because it
(a) contains an aldehyde group
(b) contains a keto group
(c) undergoes rearrangement under the alkaline conditions of the reagent to form a mixture of glucose and mannose
(d) none of these.

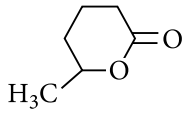
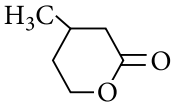
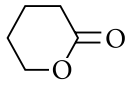
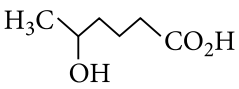
90. What happens when the temperature of a solution is increased from 25°C to 65°C?
(a) The rate of the reaction remains unchanged and the rate constant *k* decreases.

(b) The rate of the reaction increases and rate constant k decreases.
(c) The rate of the reaction decreases and so does the rate constant k.
(d) The rate of the reaction increases and so does the rate constant k.

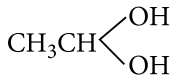
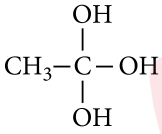
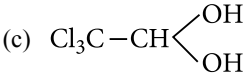
91. When $LiNO_3$ is heated, it gives oxide, Li_2O, whereas other alkali metal nitrates decompose to give corresponding
(a) nitrite (b) peroxide
(c) both nitrite and oxide (d) none of these.

92. End product of the following conversion is



(a) 
(b) 
(c) 
(d) 

93. A compound containing two –OH groups attached with one carbon atom is unstable but which one of the following is stable?

(a) 
(b) 
(c) 
(d) None of these

94. Which one of the following statements is not true?
(a) pH of drinking water should be between 5.5 – 9.5.
(b) Concentration of DO below 6 ppm is good for the growth of fish.
(c) Clean water would have a BOD value of less than 5 ppm.
(d) Oxides of sulphur, nitrogen and carbon are the most widespread air pollutants.

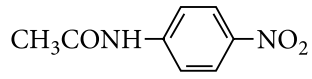
95. Beckmann rearrangement is involved in the synthesis of which of the following polymers?
(a) PAN (b) Nylon 6,10
(c) Nylon-6 (d) Melamine

96. Propanal on treatment with dilute sodium hydroxide forms
(a) $CH_3CH_2CH_2CH_2CH_2CHO$
(b) $CH_3CH_2CH(OH)CH_2CH_2CHO$
(c) $CH_3CH_2CH(OH)CH(CH_3)CHO$
(d) CH_3CH_2COONa

97. An explosion takes place when conc. H_2SO_4 is added to $KMnO_4$. Which of the following is formed?
(a) Mn_2O_7 (b) MnO_2
(c) $MnSO_4$ (d) Mn_2O_3

98. Which one of the following shows highest magnetic moment?
(a) V^{3+} (b) Cr^{3+} (c) Fe^{3+} (d) Co^{3+}

99. $R - OH + HX \rightarrow RX + H_2O$
In the above reaction, the reactivity of alcohols is
(a) tertiary > secondary > primary
(b) tertiary < secondary < primary
(c) tertiary > primary > secondary
(d) secondary > primary > tertiary

100. Which of the following is the least reactive compound towards nucleophilic acyl substitution?
(a) CH_3COCl
(b) $CH_3CONHCH_3$
(c) $CH_3CONHC_6H_5$
(d) 

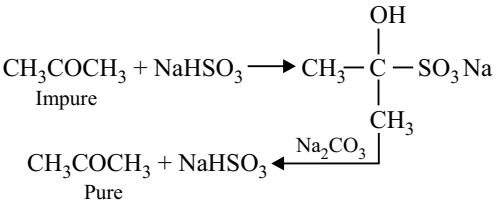
Explanations

CHEMISTRY

51. (a) : Energy is minimum when a bond is formed.

52. (c)

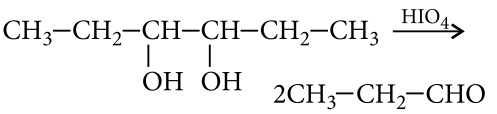
53. (b) :



54. (c) : The electronegative atom in the carbon chain produces $-I$ effect.

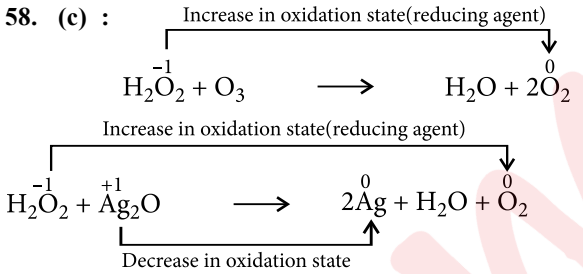
55. (b)

56. (d) :



57. (c) : Aspartame is stable under cold conditions but unstable at cooking temperature.

58. (c) :



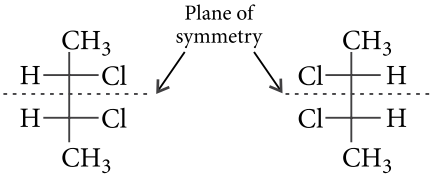
H_2O_2 acts as reducing agent in all those reactions in which O_2 is evolved.

59. (d) : Last electron of Mg^+ is $3s^1$.

Mg : $1s^2 2s^2 2p^6 3s^2$; Mg^+ : $1s^2 2s^2 2p^6 3s^1$

$\therefore$ For an e^- in 3*s*-orbital, the quantum numbers would be : $n = 3$, $l = 0$, $m = 0$, $s = +1/2$.

60. (d) : 2,3-dichlorobutane contains a plane of symmetry *i.e.*, the upper half of the molecule is the mirror image of the lower half. The rotation of one half of the molecule will therefore exactly counter balance the rotation of other half, causing the molecule to be optically inactive. Such an internally compensated molecule is said to be a *meso*-form.



61. (a) : For endothermic reaction, ΔH = +ve. For reaction to be spontaneous, ΔS must be positive and also $T\Delta S$ must be greater than ΔH in magnitude. The reaction is then said to be entropy driven.

62. (a) : $2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2$

$2Pb_3O_4 \xrightarrow{\Delta} 6PbO + O_2$

$2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2$

MgO being high melting oxide does not decompose on heating to liberate O_2.

63. (a) : 200 mg CO_2 = 0.2 g $= \frac{0.2}{44}$ mol $= 0.00454$ mol

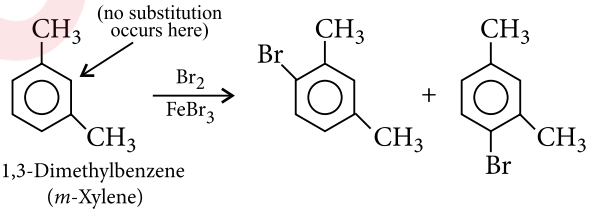
$= 4.54 \times 10^{-3}$ mol

10^{21} molecules of $CO_2 = \frac{10^{21}}{6.02 \times 10^{23}} = 1.66 \times 10^{-3}$ mol

$\therefore$ No. of moles left = $(4.54 - 1.66) \times 10^{-3} = 2.88 \times 10^{-3}$

64. (a) : As the negative charge of leaving group can be delocalised into the phenyl ring and if additionally attached group on the ring has $-I$ effect it will further delocalise the negative charge then such group has higher leaving tendency. Thus the leaving group activity order is so.

65. (b) : $-CH_3$ group is *o,p*-directing. Because of crowding, no substitution occurs at the carbon atom between the two $-CH_3$ groups in *m*-xylene, even though two $-CH_3$ groups activate that position.



66. (c) : Ionic radii of isoelectronic ions decrease with increase of nuclear charge thus, it shows a decrease from O^{2-} to Al^{3+}.

67. (a) : As the atomic size increases down the group, the bond length increases and the bond strength decreases and the cleavage of *E*–H (*E* = S, Se, Te)bond becomes easier thus, more will be the acidity. Hence, the correct order is : $H_2S < H_2Se < H_2Te$.

68. (a) : The order of basicity can be explained on the basis of the acidity of the acids of the given conjugate bases. Stronger the acid, weaker is the conjugate base. Since *R*COOH is the strongest acid amongst all, $RCOO^-$ is the weakest base. Due to *sp* hybridised carbon, acetylene is also acidic and hence, a weak base but stronger than $RCOO^-$. As sp^3 carbon is less electronegative than sp^3 nitrogen, R^- is more basic than NH_2^-.

So, the correct order is $RCOO^- < HC \equiv C^- < NH_2^- < R^-$.

69. (d) : For weak bases :

$[OH^-] = \sqrt{K_b \times C}$

pH = 9.7 thus, pOH = 14 – 9.7 = 4.3

$-\log[OH^-] = 4.3$

$\Rightarrow$ $[OH^-] = 5 \times 10^{-5}$

$5 \times 10^{-5} = \sqrt{K_b \times 0.004}$

or $K_b \times 0.004 = 25 \times 10^{-10}$

$\Rightarrow \quad K_b = \dfrac{25}{4\times10^{-3}} \times 10^{-10} = 6.25 \times 10^{-7}$

70. (a) : Molecular weight of the mixture $= 38.3 \times 2 = 76.6$

Let mass of NO_2 in the mixture = x g

then mass of $N_2O_4 = (100 - x)$ g

Number of moles of $NO_2 = x/46$

Number of moles of $N_2O_4 = \dfrac{100-x}{92}$

(Molecular weight of $NO_2 = 46$, Molecular weight of $N_2O_4 = 92$)

$$\frac{\text{Weight}}{\text{Number of moles}} = \text{Molecular weight}$$

$$\frac{x+(100-x)}{\frac{x}{46}+\frac{(100-x)}{92}} = 76.6 \Rightarrow \frac{x}{46}+\frac{(100-x)}{92} = \frac{100}{76.6}$$

$x = 20.1$

Number of moles of $NO_2 = \dfrac{20.1}{46} = 0.437 \approx 0.44$

71. (c) : Structures I and III are non-superimposable mirror images of each other. Hence, they are pair of enantiomers.

72. (c) : One atom of (A) is missing from one corner.

No. of atoms A in unit cell $= 7 \times \dfrac{1}{8} = \dfrac{7}{8}$

No. of atoms B in unit cell $= 6 \times \dfrac{1}{2} = 3$

$A : B = \dfrac{7}{8} : 3$

So, simplest formula is A_7B_{24}.

73. (b) : Dipole-dipole interactions occur among the polar molecules having permanent dipoles. The polarity of the molecules depends upon the electronegativities of the atoms present in the molecule and the geometry of the molecule.

Molecules	**Interactions**
Benzene and ethanol	Dispersion forces
Acetonitrile and acetone	Dipole-dipole
KCl and water	Ion-dipole
Benzene and CCl_4	Dispersion forces

74. (a) : Since the complex gives two moles of AgCl, there must be two ionisable chlorine atoms. Hence, compound should be $[Co(NH_3)_5Cl]Cl_2$.

$[Co(NH_3)_5Cl]Cl_2 + 2AgNO_3 \longrightarrow [Co(NH_3)_5Cl](NO_3)_2 + 2AgCl\downarrow$

$[Co(NH_3)_5Cl]Cl_2 \rightleftharpoons \underbrace{[Co(NH_3)_5Cl]^{2+} + 2Cl^-}_{\text{Three ions}}$

75. (d) : Energy absorbed by each molecule $= 4.4 \times 10^{-19}$ J

Energy required to break the bond $= 4.0 \times 10^{-19}$ J

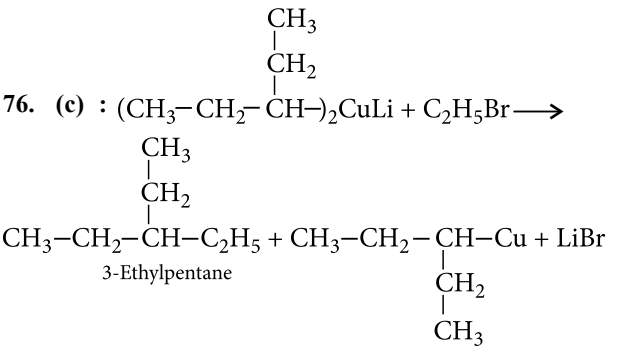
Remaining energy gets converted to kinetic energy

$= (4.4 \times 10^{-19} - 4.0 \times 10^{-19})$ J

$= 0.4 \times 10^{-19}$ J per molecule

$\therefore$ Kinetic energy per atom $= 0.2 \times 10^{-19}$ J $= 2 \times 10^{-20}$ J

76. (c) :

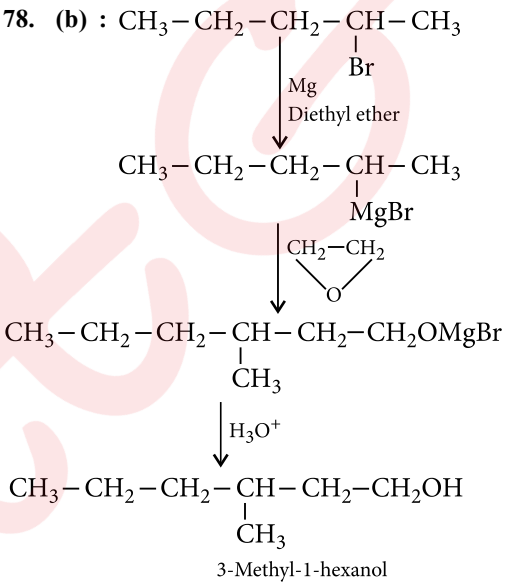


3-Ethylpentane

77. (a) : Ni combines with CO at 323 K to form $Ni(CO)_4$ which decomposes thermally at 423 K to give pure Ni metal.

$Ni(CO)_4 \xrightarrow{423\ K} Ni + 4CO\uparrow$

78. (b) :



3-Methyl-1-hexanol

79. (b) : Total number of electrons in $NO_3^- = (7 + 3 \times 8 + 1) = 32$

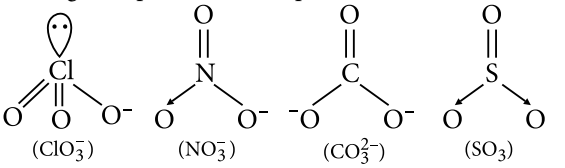
Total number of electrons in $CO_3^{2-} = (6 + 3 \times 8 + 2) = 32$

Total number of electrons in $ClO_3^- = (17 + 3 \times 8 + 1) = 42$

Total number of electrons in $SO_3 = (16 + 3 \times 8) = 40$

Therefore, NO_3^- and CO_3^{2-} are isoelectronic.

Structures of given species can be represented as :



(ClO_3^-) (NO_3^-) (CO_3^{2-}) (SO_3)

Thus, NO_3^- and CO_3^{2-} are isostructural and isoelectronic.

80. (c) : ΔH_{neut} for a strong acid with a strong base $= -13.7$ kcal equiv^{-1} $= -13.7$ kcal mol^{-1}

(For monovalent acids and bases)

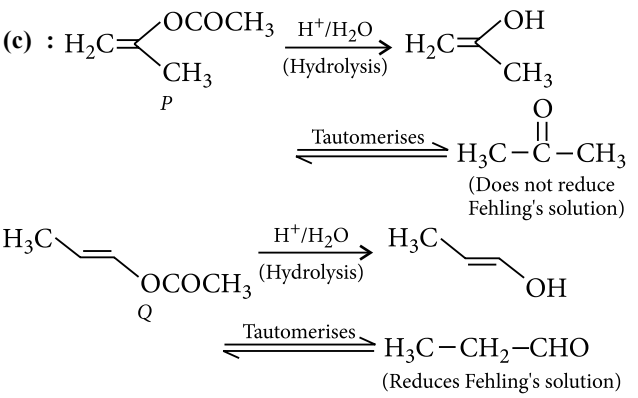
$\Delta H_{ion}(CH_3COOH) = -12.5 - (-13.7) = +1.2$ kcal mol^{-1}

$\Delta H_{ion}(NH_4OH) = -10.5 - (-13.7) - \Delta H_{ion}(CH_3COOH)$

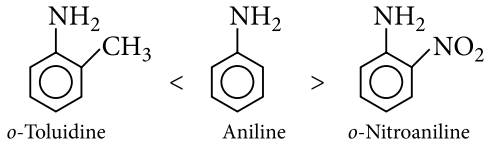
$= 13.7 - 10.5 - 1.2 = 2$ kcal mol^{-1}

81. (d) : Some interhalogens are solids and are not volatile.

82. (c) :

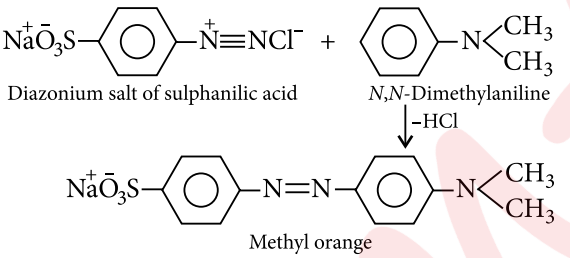


83. (b) : *Ortho* substituted anilines are weaker bases than anilines regardless of the nature of the substituent whether electron releasing or electron withdrawing. This is called *ortho* effect and is probably due to a combination of steric and electronic factors.



84. (b) : In Schottky defect, equal number of cations and anions are missing from the lattice.

85. (b) :



86. (c) : $Al(OH)_3$ formed with NaOH dissolves in excess of NaOH to form aluminate ion.

$$AlCl_3 + 3NaOH \longrightarrow Al(OH)_3\downarrow + 3NaCl$$

$$Al(OH)_3 + OH^- \longrightarrow \underset{\text{Soluble}}{[Al(OH)_4]^-}$$

87. (a) : For the first four actinide elements, Th, Pa, U and Np, the difference in energy between 5*f* and 6*d*-orbitals is small. Thus, in these elements (and their ions) electrons may occupy the 5*f* or the 6*d* levels or sometimes both. Later in the actinide series the 5*f*-orbitals become appreciably lower in energy. Thus, from Pu onwards the 5*f*-shell fills in a regular way.

88. (c) : Raoult's law is valid for ideal solutions only. A solution containing components of *A* and *B* behaves as an ideal solution when *A*—*B* attraction force remains same as *A*—*A* and *B*—*B*.

89. (c) : Under alkaline conditions of the reagent, fructose gets converted into a mixture of glucose and mannose (Lobry de Bruyn - van Ekenstein rearrangement) both of which contain the –CHO group and hence, reduce Tollens' reagent to give silver mirror test.

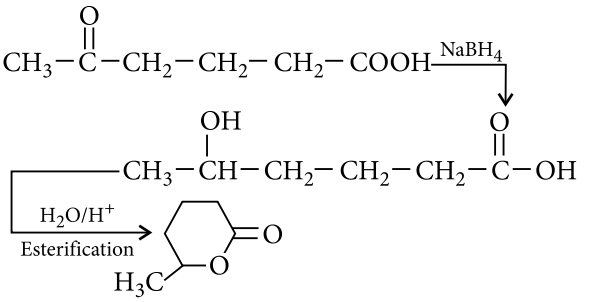
90. (d) : With the increase of temperature, rate of reaction increases and thus rate constant also increases because rate ∝ rate constant.

91. (a) : When $LiNO_3$ is heated it gives oxide, NO_2 and O_2 while other nitrates of alkali metals give oxygen and nitrites.

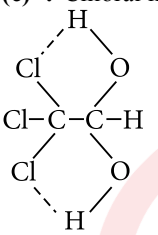
$4LiNO_3 \rightarrow 2Li_2O + 4NO_2 + O_2$

$2MNO_3 \rightarrow 2MNO_2 + O_2$ (All Alkali metals except Li)

92. (a) :

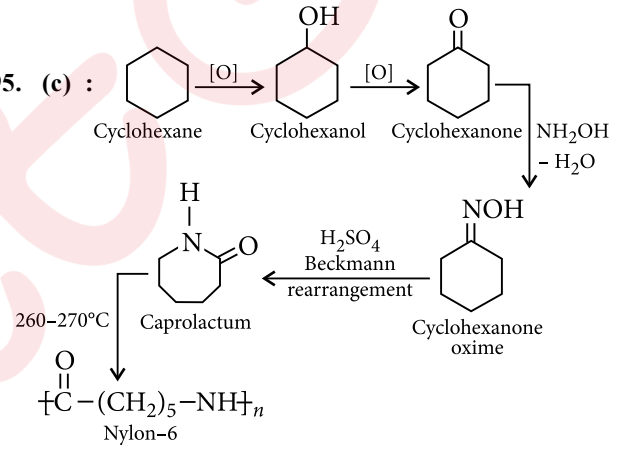


93. (c) : Chloral hydrate is stable due to hydrogen bonding.

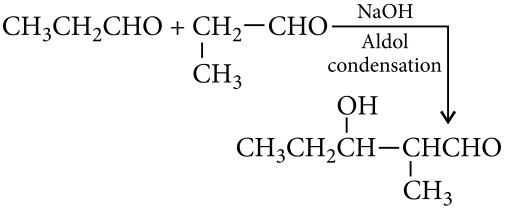


94. (b) : Fishes die in water bodies having low level of dissolved oxygen (DO).

95. (c) :



96. (c) :



97. (a) : $\underset{\text{(Conc.)}}{2KMnO_4 + H_2SO_4} \longrightarrow K_2SO_4 + \underset{\text{(Explosive)}}{Mn_2O_7} + H_2O$

98. (c) : Greater the number of unpaired electrons more will be the magnetic moment.

Ion	V^{3+}	Cr^{3+}	Fe^{3+}	Co^{3+}
Outer electronic configuration	$3d^2$	$3d^3$	$3d^5$	$3d^6$
No. of unpaired *d*-electrons	2	3	5	4

99. (a) : Reactions of alcohols involving cleavage of C – OH bond follow the reactivity order :
Tertiary > secondary > primary, according to the stability of carbocation intermediate.

100. (b) : More basic the leaving group, less reactive is the acyl derivative. Now basicity of the leaving groups decreases in the order : $CH_3NH^- > C_6H_5NH^- > p\text{-}NO_2 — C_6H_4 — NH^- > Cl^-$, therefore, $CH_3CONHCH_3$ is the least reactive acyl derivative.