JEE MAIN - 2016

CHEMISTRY

ANSWER KEY AND EXPLANATIONS

Q61. Sol. (D)

(A) Ice formed by heavy water sinks in normal water due to higher density of D2O than normal water.

(B) $6CO_2 + 6H_2O \xrightarrow[\text{chlorophyll}]{\text{hv}} C_6H_{12}O_6 + 6O_2$

(C) Water can show amphiprotic nature and hence water can act both as an acid a base.

(D) There is extensive intermolecular hydrogen bonding in the condensed phase instead of intramolecular H -bonding.

Q62. Sol. (D)

Parameters Maximum prescribed conc. in drinking water

Iron	0.2 ppm
Fluoride	1.5 ppm
Lead	50 ppb
Nitrate	50 ppm

Hence the concentration of nitrate in a given water sample exceeds from the upper limit as given above.

Q63. Sol. (A)

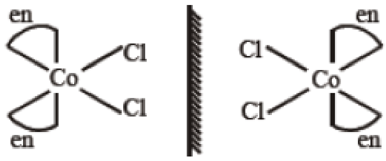
Galvanization is the process of applying a protective zinc coating of steel or iron, to prevent rusting.

Q64. Sol. (C)

1) Complex $\left[\mathrm{Co}\left(\mathrm{NH}_3\right)_4\mathrm{Cl}_2\right]\mathrm{Cl}$ have two G.I. which are optically inactive due to presence of plane of symmetry.

2) Complex $\left[\mathrm{Co}\left(\mathrm{NH}_3\right)_4\mathrm{Cl}_3\right]$ also have two optically inactive geometrical isomers due to presence of plane of symmetry.

3) Complex $\mathrm{cis}\left[\mathrm{Co}\left(\mathrm{en}\right)_2\mathrm{Cl}_2\right]\mathrm{Cl}$ is optically active due to formation of non-superimposable mirror image.



4) $\mathrm{trans}\left[\mathrm{Co}\left(\mathrm{en}\right)_2\mathrm{Cl}_2\right]\mathrm{Cl}$ Complex $\mathrm{trans}\left[\mathrm{Co}\left(\mathrm{en}\right)_2\mathrm{Cl}_2\right]\mathrm{Cl}$ is optically inactive.

Q65. Sol. (D)

Initial moles and final moles are equal

$$(n_T)_i = (n_T)_f$$

$$\frac{P_iV}{RT_1} + \frac{P_iV}{RT_1} = \frac{P_fV}{RT_1} + \frac{P_fV}{RT_2}$$

$$2\frac{P_i}{T_i} = \frac{P_f}{T_1} + \frac{P_f}{T_2}$$

$$P_f = \frac{2P_iT_2}{T_1 + T_2}$$

Q66. Sol. (A)

$$C_{(s)} + \frac{1}{2}O_{2(g)} \rightarrow CO_{(g)}\ ;\ \Delta H_r = \Delta H_f(CO)$$
$$\Delta H_f = \Delta H_c(C) - \Delta H_c(CO)$$
$$= -393.5 + 283.5$$
$$= -110KJ$$

Q67. Sol. (C)

Volume of N_2 in air $= 375 \times 0.8 = 300\,ml$

Volume of O_2 in air $= 375 \times 0.2 = 75\,ml$

$$C_xH_y \quad + \left(x + \frac{y}{4}\right)O_2 \longrightarrow \quad xCO_2(g) + \frac{Y}{2}H_2O(\ell)$$

15ml	$15\left(x + \frac{y}{4}\right)$		
0	0	$15x$	–

After combustion total volume

$$330 = V_{N_2} + V_{co_2}$$
$$330 = 300 + 15x$$
$$x = 2$$

Volume of O_2 used

$$15\left(x + \frac{y}{4}\right) = 75$$
$$x + \frac{y}{4} = 5$$
$$y = 12$$

So hydrocarbon is $= C_2H_{12}$

none of the option matches it therefore it is a BONUS.

Alternatively

$$C_xH_y \quad + \left(x+\frac{y}{4}\right)O_2 \longrightarrow \quad xCO_2 + \quad \frac{Y}{2}H_2O(\ell)$$

$$15 \qquad 15\left(x+\frac{y}{4}\right)$$

$$0 \qquad 0 \qquad 15x \qquad -$$

Volume of O_2 used

$$15\left(x+\frac{y}{4}\right)=75$$

$$x+\frac{y}{4}=5$$

If further information (i.e., $330\,ml$) is neglected, **option (3)** only satisfy the above equation.

Q68. Sol. (C)

$$H_2O_{2(aq)} \rightarrow H_2O_{(aq)} + \frac{1}{2}O_2(g)$$

$$k=\frac{1}{t}\ln\left(\frac{a_0}{a_t}\right)$$

$$=\frac{1}{50}\ln\left(\frac{0.5}{0.125}\right)$$

$$=\frac{1}{50}\ell n4\,min^{-1}$$

$$\frac{\text{Rate of disappearance of } H_2O_2}{1}=\frac{\text{Rate of appearance of } O_2}{\frac{1}{2}}$$

$$(\text{Rate})_{O_2}=\frac{1}{2}\times(\text{Rate})_{H_2O_2} <$$

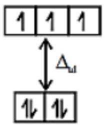
$$=\frac{1}{2}k[H_2O_2]$$

$$=\frac{1}{2}\times\frac{1}{50}\times\ell n4\times0.05$$

$$=6.93\times10^{-4}\,M\,min^{-1}$$

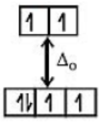
Q69. Sol. (C)

In option (1) : $[CoCl_4]^{2-}$, $Co^{2+}(3d^7)$ with W.F.L.,



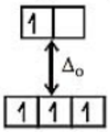
= 3-unpaired electrons.

& $[Fe(H_2O)_6]^{2+}$, $Fe^{2+}(3d^6)$ with W.F.L.,



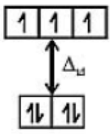
= 4-unpaired electrons.

In option (2) : $[Cr(H_2O_6)]^{2+}$, $Cr^{2+}(3d^4)$ with W.F.L.,



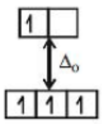
= 4-unpaired electrons.

& $[CoCl_4]^{2-}$, $Co^{2+}(3d^7)$ with W.F.L.,



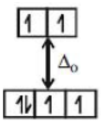
= 3-unpaired electrons.

In option (3) : $[Cr(H_2O_6)]^{2+}$, $Cr^{2+}(3d^4)$ with W.F.L.,



= 4-unpaired electrons.

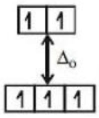
& $[Fe(H_2O)_6]^{2+}$, $Fe^{2+}(3d^6)$ with W.F.L.,



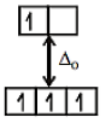
= 4-unpaired electrons.

Here both complexes have same unpaired electrons i.e. $= 4$

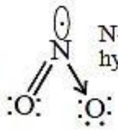
In option (4) : $\left[Mn\left(H_2O_6\right)\right]^{2+}$, $Mn^{2+}\left(3d^5\right)$ with

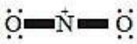
WFL,  = 5-unpaired electrons.

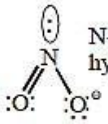
& $\left[Cr\left(H_2O\right)_6\right]^{2+}$, $Cr^{2+}\left(3d^4\right)$ with W.F.L.,

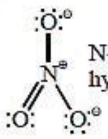
 = 4-unpaired electrons.

Q70. Sol. (B)

Option (1) 
NO_2
N-atom has sp^2 hybridised state

Option (2) 
NO_2^+
N-atom has sp hybridised state

Option (3) 
NO_2^-
N-atom has sp^2 hybridised state

Option (4) 
NO_3^-
N-atom has sp^2 hybridised state

Q71. Sol. (D)

Among 20 naturally occurring amino acids "Cysteine" has ' –SH ' or thiol functional group.

$$\Rightarrow \text{General formula of amino acid} \rightarrow \underset{\displaystyle NH_2}{\overset{}{R{-}\underset{|}{C}H{-}COOH}}$$

$\Rightarrow$ Value of R = $-CH_2-SH$ in cysteine.

Q72. Sol. (B)

Acid	Formula	Formal oxidation state of phosphorous
Pyrophosphorous acid	$H_4P_2O_5$	+3
Pyrophosphoric acid	$H_4P_2O_7$	+5
Orthophosphoric acid	$H_4P_2O_3$	+3
Hypophosphoiric acid	$H_4P_2O_6$	+4

Both pyrophosphorous and orthophosphorous acids have +3 formal oxidation state

Q73. Sol. (A)

Distillation under reduced pressure. Glycerol (B.P. 290°C) is separated from spent lye in the soap industry by distillation under reduced pressure, as for simple distillation very high temperature is required which might decompose the component.

Q74. Sol. (D)

Froth floatation method is mainly applicable for sulphide ores.

(1) Malachite ore: $Cu(OH)_2.CuCO_3$

(2) Magnetite ore: Fe_3O_4

(3) Siderite ore: $FeCO_3$

(4) Galena ore: PbS (Sulphide Ore)

Q75. Sol. (A)

Due to poor shielding of $d-$ electrons in Sc, Z_{eff} of Sc becomes more so that ionisation energy of Sc is more than Na, K and Rb.

Q76. Sol. (A)

4 moles of NaOH and one mole of Br_2 is required during production of on mole of amine during Hoffmann's bromamide degradation reaction.

$$R-\overset{\overset{\displaystyle O}{\|}}{C}-NH_2 + Br_2 + 4NaOH \rightarrow R-NH_2 + K_2CO_3 + 2NaBr + 2H_2O$$

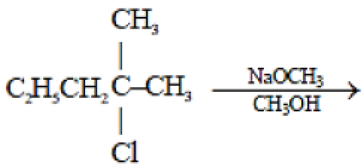
Q77. Sol. (C)

CrO_2 is metallic as well as ferromagnetic

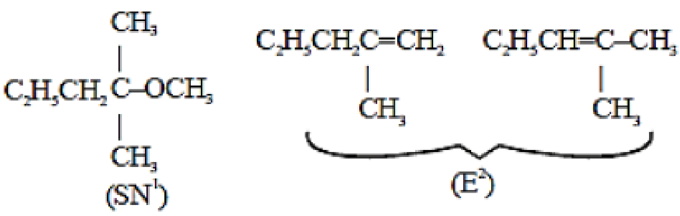
Q78. Sol. (A)

Low density polythene: It is obtained by the polymerisation of ethene under high pressure of $1000-2000\,\text{atm}$. at a temp. of 350 K to 570 K in the pressure of traces of dioxygen or a peroxide initiator (cont). Low density polythene is chemically inert and poor conductor of electricity. It is used for manufacture squeeze bottles. toys and flexible pipes.

Q79. Sol. (B)



Possible mechanism which takes place is E_2 & SN_1 mechanism. Hence possible products are.



Q80. Sol. (A)

As electron of charge 'e' is passed through 'V' volt, kinetic energy of electron becomes = 'eV'

$$\text{As wavelength of } e^- \text{ wave}(\lambda) = \frac{h}{\sqrt{2m.K.E.}}$$

$$\lambda = \frac{h}{\sqrt{2meV}}$$

$$\therefore \frac{h}{\lambda} = \sqrt{2meV}$$

Q81. Sol. (D)

Assuming temperature to be $100^{o}\,C$ Relative lowering of vapour pressure

Equatation $\dfrac{P^{0}-P^{s}}{P^{0}} = X_{\text{solute}} = \dfrac{n}{n+N}$

Modified forms of equitation is $\dfrac{P^{0}-P_{s}}{P_{s}} = \dfrac{n}{N}$

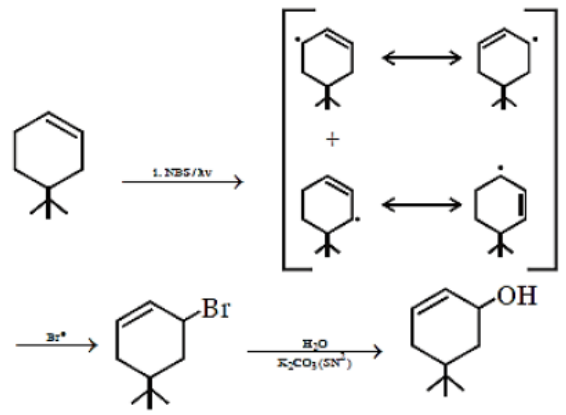
$P^{0} = 760\,\text{torr}$

$P_{s} = ?$

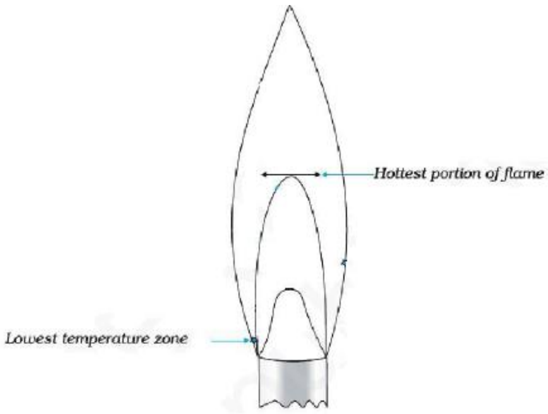
$$\frac{760-P_{s}}{P_{s}} = \frac{18/180}{178.2/18}$$

$P_{s} = 752.4\,\text{torr}$

Q82. Sol. (C)



Q83. Sol. (C)



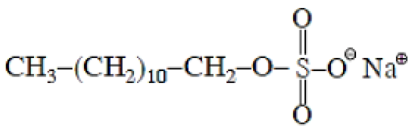
Q84. Sol. (B)

$$\underset{(conc.)}{Zn + 4HNO_3} \longrightarrow Zn(NO_3)_2 + 2H_2O + 2H_2O$$

$$\underset{(dil.)}{4Zn + 10HNO_3} \longrightarrow 4Zn(NO_3)_2 + N_2O + 5H_2O$$

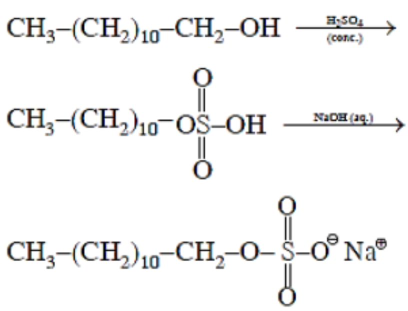
Q85. Sol. (C)

(1) Anionic detergent:



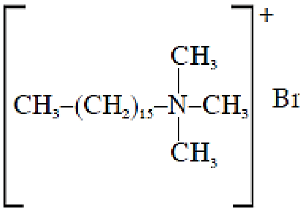
Sodium Lauryl sulfate is example of anionic detergent

These are sodium salts of sulphonated long chain alcohols or hydrocarbons.



Sodium lauryl sulphate (anionic detergent)

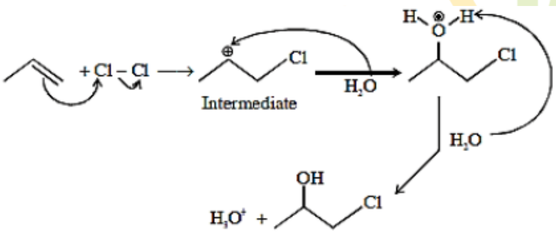
(2) Cationic detergent



Cetyle trimethyl ammonium bromide is an example of cationic detergent

(3) $C_{17}H_{35}CO_2Na$ **: Sodium sterarate (soap)**

Q86. Sol. (C)



Q87. Sol. (D)

According to Freundlich isotherm

$$\frac{x}{m} = k.p^{1/n}$$

$$\log \frac{x}{m} = \log k + \frac{1}{n} \log P$$

So intercept is $\log k$ and slope is $\frac{1}{n}$

Q88. Sol. (A)

The stability of the oxide of alkali metals depends upon the comparability of size of cation and anion. Therefore, the main oxide of alkali metals formed on excess of air are as follows:

Li Li_2O

Na Na_2O_2

K KO_2

Rb RbO_2

Cs CsO_2

Q89. Sol. (D)

$$A+B \rightleftharpoons C+D \quad K=100$$

$$Q=\frac{1\times1}{1\times1}=1$$

$\because Q<K$ so reaction moves in forward reaction

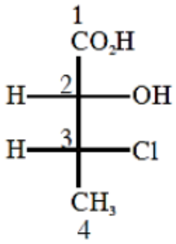
	A	+	B	$\rightleftharpoons$	C	+	D
Initial	1		1		10		10
At equ.	1−x		1−x		1+x		1+x

$$\frac{(1+x)^2}{(1-x)^2}=100 \Rightarrow \frac{1+x}{1-x}=10$$

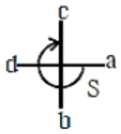
$$1+x=10-10x \Rightarrow x=\frac{9}{11}$$

$$\therefore [D]=1+x=1+\frac{9}{11}=1.818\text{M}$$

Q90. Sol. (C)



For 2^{nd} carbon



The priority order $a > b > c > d$

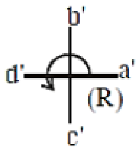
a = $-OH$

b - $-CH(Cl)-CH_3$

c = $-CO_2H$

d = $-H$

For 3^{rd} carbon



The priority order $a' > b' > c' > d'$

a' = $-Cl$

b' = $-CH(OH)-CO_2H$

c' = $-CH_3$

d' = $-H$