Joint Entrance Exam/JEE Mains 2016 Code – F

PART-A	CHEMISTRY

1.(3) de-Broglie wavelength, $\lambda = \frac{h}{P} \Rightarrow P = \frac{h}{\lambda}$ and $eV = \frac{1}{2}\frac{P^2}{m} \Rightarrow P = \sqrt{2meV} = \frac{h}{\lambda}$

2.(4) $CH_3-\underset{\underset{Cl}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_2-CH_2-CH_3 \xrightarrow[CH_3OH]{CH_3O^-Na^+} CH_3-\underset{\underset{OCH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_2-CH_2-CH_3 + CH_3-\overset{\overset{CH_3}{|}}{C}=CH-CH_2-CH_3$

(S_N1 product) (E1 and E2 product)

$+ \; CH_2=\overset{\overset{CH_3}{|}}{C}-CH_2-CH_2-CH_3$

3.(1) CrO_2 is metallic and ferromagnetic substance (fact).

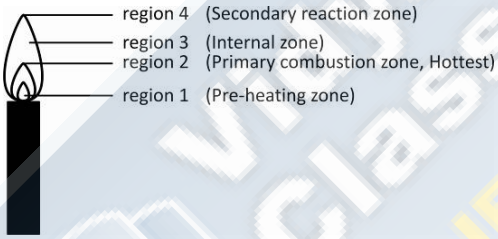
Read NCERT (XIIth) - Chapter-1/The Solid State-Page-28

4.(3) Low density polythene is chemically inert and tough but flexible and a poor conductor of electricity. Hence, it is used in the insulation of electricity carrying wires and manufacture of squeeze bottles, toys and flexible pipes.

5.(2) $\log\frac{x}{m} = \log k + \frac{1}{n}\log P$ (NCERT (XIIth-Chapter-5/Surface Chemistry-Page-125)

6.(3) $\left.\begin{array}{l} C + O_2 \rightarrow CO_2 \;\; [i] \\ CO + \frac{1}{2}O_2 \rightarrow CO_2 \;\; [ii] \end{array}\right\} \; C + \frac{1}{2}O_2 \rightarrow CO \Rightarrow \Delta_f H_{CO} = (\Delta H_{(i)} - \Delta H_{(ii)}) = -393.5 - (-283.5) = -110.0$

7.(1)



8.(1) $CH_3(CH_2)_{10}CH_2OH \xrightarrow{H_2SO_4} CH_3(CH_2)_{10}CH_2OSO_3H \xrightarrow{NaOH(aq)} CH_3(CH_2)_{10}CH_2OSO_3^-Na^+$

Sodium lauryl sulphate (Anionic detergent)

(Read NCERT-XIIth-Chapter 16-Chemistry in Every day life/Page-452)

9.(2) $n_{C_6H_{12}O_6} = \frac{18}{180} = 0.1, \; n_{n_{20}} = \frac{178.2}{18} = 9.9$

$\Rightarrow \quad \chi_{C_6H_{12}O_6} = \frac{0.1}{0.1+9.9} = \frac{0.1}{10} = 0.01, \; \text{Now} \; \frac{\Delta p}{P_A^\circ} = \chi_B \Rightarrow \frac{\Delta p}{760} = 0.01 \Rightarrow \Delta P = 7.6 \text{ torr}$

$\Rightarrow \; P_{sol^n} = P^\circ_{water} - \Delta P = 760 - 7.6 = 752.4 \text{ torr}$

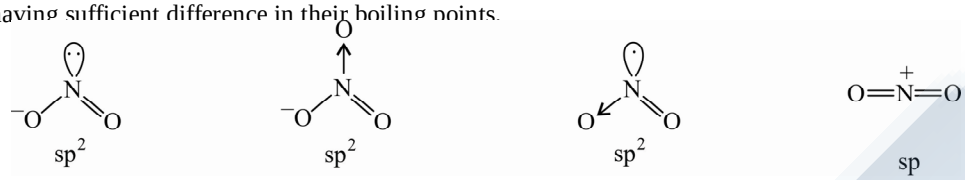
10.(3) Steam distillation is preferred for separation of substances which are steam volatile and are immiscible with water.

Fractional distillation is used if the difference in boiling points of two liquids is not much. This technique is used to separate different fractions of crude oil in petroleum industry.

Distillation under reduced pressure is used to purify liquids having very high boiling points and those, which decompose at or below their boiling points. Glycerol can be separated from spent-lye in soap industry by using this technique

Simple distillation ⇒ This technique is used to separate volatile liquids from nonvolatile impurities or liquids having sufficient difference in their boiling points.

11.(4)



12.(1) In fifty minutes the concentration of H_2O_2 decreases from 0.5 to 0.125 M.

It means two half lives must have passed

$\Rightarrow \quad 2t_{1/2} = 50$ minutes

$t_{1/2} = 25$ minutes

$\therefore \quad k = \left(\frac{0.693}{25}\right)\text{min}^{-1}$

Also $\frac{-d[H_2O_2]}{dt} = k[H_2O_2] = \frac{0.693}{25} \times (0.05)\text{mol min}^{-1}$

As per reaction

$$2H_2O_2 \longrightarrow 2H_2O + O_2$$

$$\frac{d[O_2]}{dt} = -\frac{1}{2}\left(\frac{d[H_2O_2]}{dt}\right) = \frac{1}{2} \times \frac{0.693}{25} \times 0.05 \text{ mol min}^{-1} = 6.93 \times 10^{-4} \text{ mol min}^{-1}$$

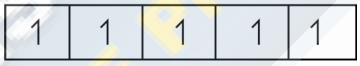
13.(1) $[Cr(H_2O)_6]^{2+} \Rightarrow Cr^{2+}$, $[Ar]\ 3d^4$

Four unpaired e⁻s

$[Fe(H_2O)_6]^{2+} \Rightarrow Fe^{2+}$, $[Ar]3d^6$

Four unpaired e⁻s

$[Mn(H_2O)_6]^{2+} \Rightarrow Mn^{2+}$, $[Ar]3d^5$



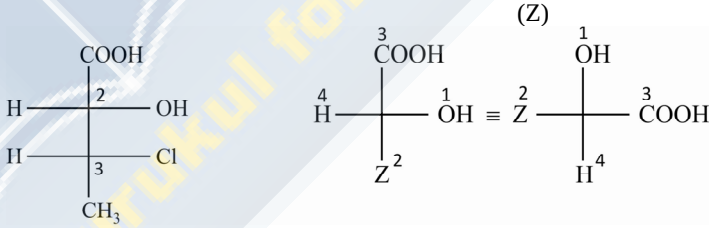
Five unpaired e⁻s

$[CoCl_4]^{2-} \Rightarrow Co^{2+}$, $[Ar]3d^7$

Three unpaired e⁻s

14.(1) Order of priority of substituent of C-2 is OH > CH(Cl)(CH_3) > COOH

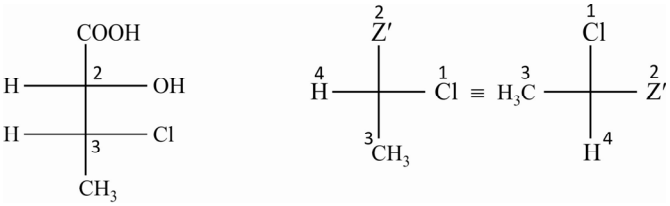
(Z)



Order of priority is in anti-clockwise direction hence, its configuration is S.

Order of priority of substituent of C-3 is Cl > CH(OH)COOH > CH_3

(Z′)



Order of priority is in clockwise direction hence, its configuration is R.

15.(2) Initially at equilibrium

$$\underset{1}{A} + \underset{1}{B} \rightleftharpoons \underset{1}{C} + \underset{1}{D} \quad K_{eq} = 100$$

$$\underset{(1-x)}{} \quad \underset{(1-x)}{} \quad \underset{1+x}{} \quad \underset{1+x}{} \quad Q = 1$$

$$K_{eq} = \frac{[C][D]}{[A][B]} = \frac{(1+x)(1+x)}{(1-x)(1-x)} = \frac{(1+x)^2}{(1-x)^2}$$

$$10 = \frac{1+x}{1-x}$$

On solving $x = \frac{9}{11}$

$[D] = 1.818$

16.(2) Sulphide ores are concentrated by forth floatation process

Galena $\rightarrow$ PbS Siderite $\rightarrow FeCO_3$ Malachite $\rightarrow CuCO_3 \cdot Cu(OH)_2$ Magnetite $\rightarrow Fe_3O_4$

17.(None) $C_xH_y(g) + \left(x + \frac{y}{4}\right)O_2(g) \longrightarrow xCO_2(g) + \frac{y}{2}H_2O(l)$

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

O_2 used = 20% of 375 = 75 ml

Inert part of air = 80% of 375 = 300 ml

Total volume of gases = CO_2 + Inert part of air = 330 ml

Vol of CO_2 = 30 ml

Two equations are x = 2, y = 12

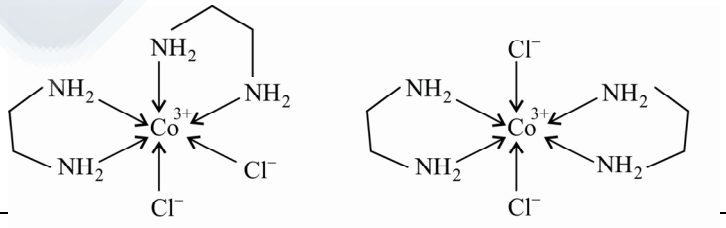
None of the option matches.

18.(4) H_3PO_3 is orthophosphorous acid : $HO-\underset{\underset{H}{|}}{\overset{\overset{O}{\|}}{P}}-OH$

$H_4P_2O_5$ is pyrophosphorous acid : $HO-\underset{\underset{H}{|}}{\overset{\overset{O}{\|}}{P}}-O-\underset{\underset{H}{|}}{\overset{\overset{O}{\|}}{P}}-OH$

Read NCERT (XIIth)-Chapter-7/p-Block Elements-Page-179

19.(1)

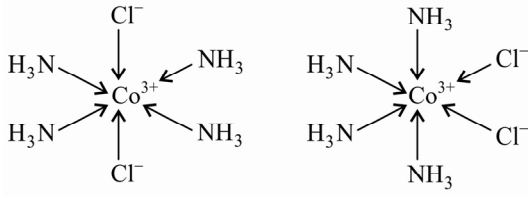


cis$[Co(en)_2Cl_2]Cl$ — Optically active

trans$[Co(en)_2Cl_2]Cl$ — Optically inactive due to plane of symmetry

$[Co(NH_3)_4Cl_2]Cl$ can exist in both *cis* and *trans* form and both are optically inactive.

Read NCERT (XIIth)-Chapter-9/Co-ordination Compounds-Page-259



trans *cis*

$[Co(NH_3)_3Cl_3]$ exist in *fac* and *Mer* forms and both are optically inactive.

20.(4) $Zn + \underset{\text{conc.}}{4HNO_3} \longrightarrow Zn(NO_3)_2 + 2H_2O + 2NO_2$

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

21.(2) Water shows only intermolecular H-bond in the condensed phase

22.(2) In drinking water maximum permissible concentration of

Lead about 50 ppb

Nitrate about 50 ppm

Iron about 0.2 ppm

Fluoride about < 1 ppm

High concentration of nitrate in drinking water can cause disease such as methemoglobinemia.

Read NCERT (XIth)-Chapter-14/Environmental Chemistry-Page-412

23.(3) Li mainly forms Li_2O Na mainly forms Na_2O_2 K mainly forms KO_2

24.(2) Cysteine is amino acid having thiol group

$$HS-CH_2-\underset{\displaystyle NH_2}{\underset{|}{CH}}-COOH$$

Read NCERT (XIIth)-Chapter-14/Biomolecules-Page-413

25. (3) Galvanization means applying a coating of zinc metal to prevent corrosion.

26.(3) $IE_{Na} = 496\ kJ/mol$; $IE_{Sc} = 633\ kJ/mol$

It is relatively difficult to remove on e^- from 4s orbital of Sc as compared to 3S of Na due to poor shielding of d-orbital.

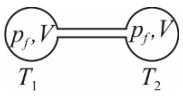
27.(3) $RCONH_2 + 4NaOH + Br_2 \longrightarrow RNH_2 + Na_2CO_3 + 2NaBr + 2H_2O$

Read NCERT (XIIth)-Chapter-13/Amines-Page-386

28.(2)

Number of mol of gases in each container $= \dfrac{p_iV}{RT_1}$

Total mol of gases in both containers $= 2\dfrac{p_iV}{RT_1}$

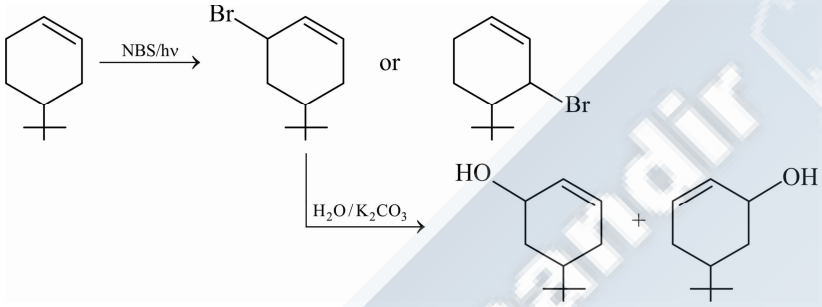


In left chamber $n_1 = \frac{p_f V}{RT_1}$ and In right chamber, $n_2 = \frac{p_f V}{RT_2}$

Total moles of gases should remain constant $\frac{2p_i V}{RT_1} = \frac{p_f V}{RT_1} + \frac{p_f V}{RT_2} \Rightarrow p_f = 2p_i\left(\frac{T_2}{T_1 + T_2}\right)$

29.(1) $CH_3 - CH = CH_2 \xrightarrow[\text{Electrophilic addition}]{HO^{-\delta} - Cl^{+\delta}} CH_3 - \underset{\text{Intermediate}}{\overset{+}{C}H} - CH_2 - Cl \xrightarrow{OH^-} CH_3 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_2 - Cl$

30.(1)



NBS is used for allylic bromination.