Solution

CHEMISTRY

JEE main - Chemistry

CHEMISTRY (Section-A)

1.

(c) 4

Explanation:

$\Sigma\Delta n$ = 10

or Σ(n - 1) = 10

or Σ4 = 10

$\therefore$ n = 5

Now, four lines from 5 to 1, 4 to 1, 3 to 1 and 2 to 1 will lead for Lyman series falling is regions.

2.

(c) A only

Explanation:

$B_2O_3 < Al_2O_3 < ln_2O_3 < Tl_2O$

3.

(c) 3×10^{-20}

Explanation:

Given $[H_2S]$ = 0.10 M

[HCI] = 0.20 M So, $[H^+]$ = 0.02 M

$H_2S \rightleftharpoons H^+ + HS^-, K_1 = 1.0 \times 10^{-7}$

$HS \rightleftharpoons H^+ + S^{2-}, K_2 = 1.2 \times 10^{-13}$

It means for,

$H_2S \rightleftharpoons 2H^+ + S^{2-}$

$K = K_1 \times K_2 = 10 \times 10^{-7} \times 1.2 \times 10^{-13}$

$= 1.2 \times 10^{-20}$

Now, $[S^{2-}] = \frac{K \times [H_2S]}{[H^+]^2}$ [according to the final equation]

$= \frac{1.2 \times 10^{-20} \times 0.1M}{(0.2M)^2}$

$= \frac{1.2 \times 10^{-20} \times 1 \times 10^{-1}M}{4 \times 10^{-2}M}$

$= 3 \times 10^{-20}M$

4.

(d) Option (iii)

Explanation:

In a closed system (e.g., the presence of reactants in a closed vessel made of conducting material i.e. copper) there is no exchange of matter, but exchange of energy is possible between system and the surroundings.

5.

(b) 4.8

Explanation:

4.8

6.

(b) Non redox change

Explanation:

$\underset{\frac{-1}{2}}{K}O_2 + H_2O + \underset{-2}{C}O_2 \longrightarrow \underset{0}{K}HCO_3 + O_2$

So, its a auto-redox reaction.

Also, its acid-base and hydrolysis reaction.

However, non-redox change doesn't happen here.

7. **(a)** PbO

Explanation:

PbO

8.

(d) R > S > Q > P

Explanation:

R is least stabilise alkene so, has a maximum value.

9. **(a)** One of the steps is endothermic in both the cases

Explanation:

In addition of HBr to an alkene, in the presence of peroxide, both the propagation steps are exothermic:

$HBr + HO^{\cdot} \rightarrow H_2O + Br^{\cdot}$

Propagation

CH_3 - CH = CH_2 + $Br^{\cdot}$ $\rightarrow$ CH_3 - $\dot{C}$H - CH_2Br ; $\Delta H < 0$

CH_3 - $\dot{C}$H - CH_2Br + HBr $\rightarrow$ CH_3 - CH_2 - CH_2Br + $Br^{\cdot}$; $\Delta H < 0$

In case of addition of HCl and HI, one of the propagation step is endothermic, reaction fail to occur.

10.

(c) $\frac{1}{76}$

Explanation:

$\frac{1}{76}$

11.

(c) unchanged

Explanation:

K_f depends only on nature of solvent, it does not depend on the concentration of solution.

$K_f = \frac{MRT_B^2}{1000\Delta H_f}$

12.

(b) $3E_3^\circ = E_2^\circ + 2E_1^\circ$

Explanation:

$3E_3^\circ = E_2^\circ + 2E_1^\circ$

13. **(a)** The order of a reaction is always equal to the sum of the stoichiometric coefficients of reactants in the balanced chemical equation for a reaction.

Explanation:

Order of reaction is an experimental value.

14.

(c) 1.0×10^{10}

Explanation:

From Nernst Equation we have

$E_{cell} = E^\circ_{cell} - \frac{2.303RT}{nF}\log_{10}K$

At equilibrium $E_{cell} = 0$

$0 = E^{\circ}_{cell} - \frac{2.303 \times 8.3140 \times 298}{2 \times 96500} \log K$

E°_{cell} = 0.295 V (given)

$0.295 = \frac{0.0591}{2} \log K$

$\log K = \frac{0.295 \times 2}{0.0591} = 10$

$\log K = 10 \Rightarrow K = \text{antilog } 10 \Rightarrow K = 1 \times 10^{10}$

15. **(a)** F_2

Explanation:

F_2

16.

(c) 6

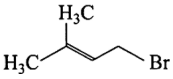
Explanation:

$K_2[PtCl_6] \longrightarrow 2K^+ + [PtCl_6]^{2-}$

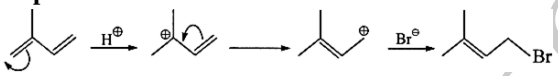
$\xrightarrow{AgNO_3}$ No ppt.

17.

(b)



Explanation:



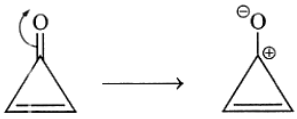
18. **(a)** i, iii

Explanation:

In alkyl aryl ethers, products are always phenol and an alkyl halide but never an aryl halide and alcohol whereas in the case of unsymmetrical ethers, if one of the alkyl groups is tertiary, the alkyl halide is formed from the tertiary alkyl group because the reaction occurs by S_N1 mechanism.

19. **(a)**

Explanation:



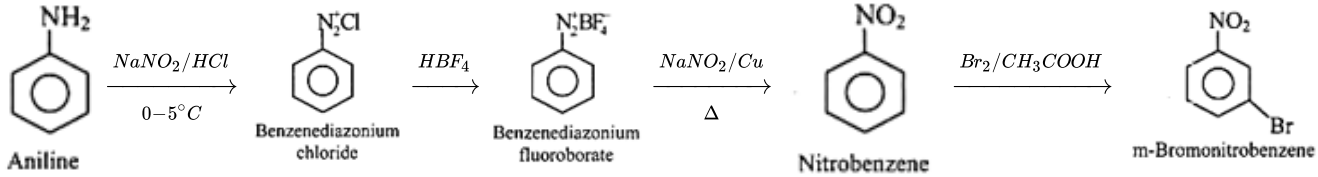
4n + 2 = 2

n = 0, Aromatic

Compound is aromatic in ionic form.

20. **(a)** $NaNO_2HCl/0{-}5^oC$, HBF_4, $NaNO_2/Cu/\Delta$, Br_2CH_3COOH

Explanation:



CHEMISTRY (Section-B)

21. 2

Explanation:

$AB_2 \rightleftharpoons \underset{s}{A^{2+}}(aq) + \underset{2s}{2B^-}(aq)$

$K_{sp} = 4s^3 = 3.2 \times 10^{-11}$

$\Rightarrow s^3 = 8 \times 10^{-12}$

$\Rightarrow s = 2 \times 10^{-4}$

22. 6.0

Explanation:

$2KMnO_4 + 5H_2C_2O_4 + 3H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 10CO_2 + 8H_2O$

Mn^{2+} has 5 unpaired electrons, therefore, the magnetic moment = $\sqrt{5\ (5\ +\ 2)} = \sqrt{35}$ BM

23. 15

Explanation:

$\underset{1\ \text{mol}}{\text{Na}} + H_2O \rightarrow \underset{1\ \text{mol}}{\text{NaOH}} + \frac{1}{2}H_2$

0.69 g of Na forms $= \frac{0.69}{23} = 0.03$ mol of NaOH

For complete neutralization of 0.03 mol of NaOH 0.03 mol = $(0.03 \times 36.5)g$ of HCl is required.

Density of HCl (d) = 73 g/L

$\therefore$ Volume of HCl required $= \frac{0.03 \times 36.5}{73}$ L

$= 1.5 \times 10^{-2}\ \text{L} = 15\ \text{mL}$

24. 8

Explanation:

Mg = $1s^2, 2s^2 2p^6, 3s^2, \underbrace{3p_x^0 3p_y^0 3p_z^0, 3d_{xy}^0 3d_{yz}^0 3d_{xz}^0 3d_{x^2-y^2}^0 3d_{z^2}^0}_{\text{(Eight orbitals)Vacant}}$

25. 718

Explanation:

$\Delta_f H^\circ_{KCl} = \Delta_{sub}\ H^\circ_{(K)} + \Delta_{ionization}\ H^\circ_{(K)} + \frac{1}{2}\Delta_{bond}\ H^\circ_{(Cl_2)} + \Delta_{electron\ gain}\ H^\circ_{(Cl)} + \Delta_{lattice}\ H^\circ_{(KCl)}$

$\Rightarrow$ -436.7 = 89.2 + 419.1 $+ \frac{1}{2}(243.0) + \{-348.6\} + \Delta_{lattice}\ H^\circ_{(KCl)}$

$\Rightarrow \Delta_{lattice} \cdot H^\circ_{(KCl)} = -717.8\ \text{kJ mol}^{-1} \simeq 718\ \text{kg mol}^{-1}$