

Solution

CHEMISTRY

JEE main - Chemistry

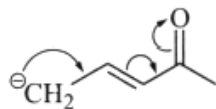
CHEMISTRY (Section-A)

1. (d) 24
Explanation:
Possible molar mass maybe 18, 20, 19, 20, 22, 21 respectively for $H^1H^1O^{16}$, $H^2H^2O^{16}$, $H^1H^2O^{16}$, $H^1H^2O^{18}$, $H^2H^2O^{18}$.
2. (c) Phosphorus
Explanation:
Phosphorus
3. (a) $6.07 \times 10^5 \text{ s}^{-1}$
Explanation:
 $NH_3 + H_2O \xrightleftharpoons[k_b]{k_f} NH_4^+ + OH^-$; $K_b = 3.4 \times 10^{10}$
 $NH_4^+ + H_2O \rightleftharpoons NH_4OH + H^+$; $K_a = 5.6 \times 10^{-10}$
 $K_{\text{base}NH_3} = \frac{K_f}{K_b}$
Also, $K_{\text{base}NH_3} = \frac{K_w}{K_{\text{acid}NH_4^+}}$ ($\because K_{\text{acid}} \times K_{\text{base}} = K_w$)
or $\frac{K_f}{3.4 \times 10^{10}} = \frac{10^{-14}}{5.6 \times 10^{-10}}$
or $K_f = 6.07 \times 10^5 \text{ sec}^{-1}$
4. (b) 172.28 kJ
Explanation:
172.28 kJ
5. (d) 1
Explanation:
The two conditions when colour of indicator will be visible are derived by
 $pH = pK_a + \log \frac{[In^-]}{[HIn]}$
i. $pH = 5 + \log 10 = 6$
ii. $pH = 5 + \log 0.1 = 4$
Thus, minimum change in pH i.e., $\Delta pH = (6 - 5)$ or $(5 - 4) = 1$
6. (c) 5
Explanation:
 $3Br_{2(aq)} + 6OH^-_{(aq)} \rightarrow 5Br^-_{(aq)} + BrO_3^-_{(aq)} + 3H_2O(l)$
7. (c) $PbSO_4$
Explanation:
When hydrogen peroxide react with PbS then they form $PbSO_4$.

8.

(d) X

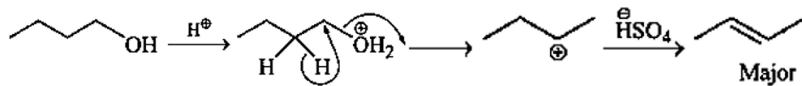
Explanation:



9.

(c) Trans-2-butene

Explanation:



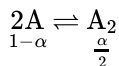
10.

(d) 80%

Explanation:

$$\Delta T = i \times K_f \times m$$

$$0.2 = i \times 1.86 \times \frac{0.7}{93} \times \frac{1000}{42} \Rightarrow i = 0.60$$



$$i = 1 - \alpha + \frac{\alpha}{2} \Rightarrow 1 - \frac{\alpha}{2} = 0.60 \Rightarrow \alpha = 0.80$$

11.

(c) > 76 cm of Hg

Explanation:

Water boils at a higher temperature than its boiling point if atmospheric pressure is more than 1 atm.

12.

(c) 1 M NaCl

Explanation:

The molecular conductivity and equivalent conductivity are the same for the solution of 1 M NaCl

$$\Lambda_M = \Lambda_E \times \text{valency factor};$$

For NaCl, valency factor = 1

For other ions, $\Lambda_M > \Lambda_E$ as the valency factor is more than 1.

13.

(b) 2

Explanation:

$$t_{\frac{1}{2}} \propto (P_0)^{1-n}$$

$$\frac{\left(t_{\frac{1}{2}}\right)_1}{\left(t_{\frac{1}{2}}\right)_2} = \frac{(P_0)^{1-n}}{(P_0)_2^{1-n}} \Rightarrow \left(\frac{4}{2}\right) = \left(\frac{50}{100}\right)^{1-n}$$

$$\Rightarrow 2 = \left(\frac{1}{2}\right)^{1-n} \Rightarrow 2 = (2)^{n-1}$$

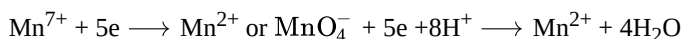
$$\Rightarrow n - 1 = 1 \Rightarrow n = 2$$

14.

(b) MnO_4^-

Explanation:

E_{RP}° of $\text{MnO}_4^-/\text{Mn}^{2+}$ is highest and thus MnO_4^- is easily reduced and is the strongest oxidising agent.

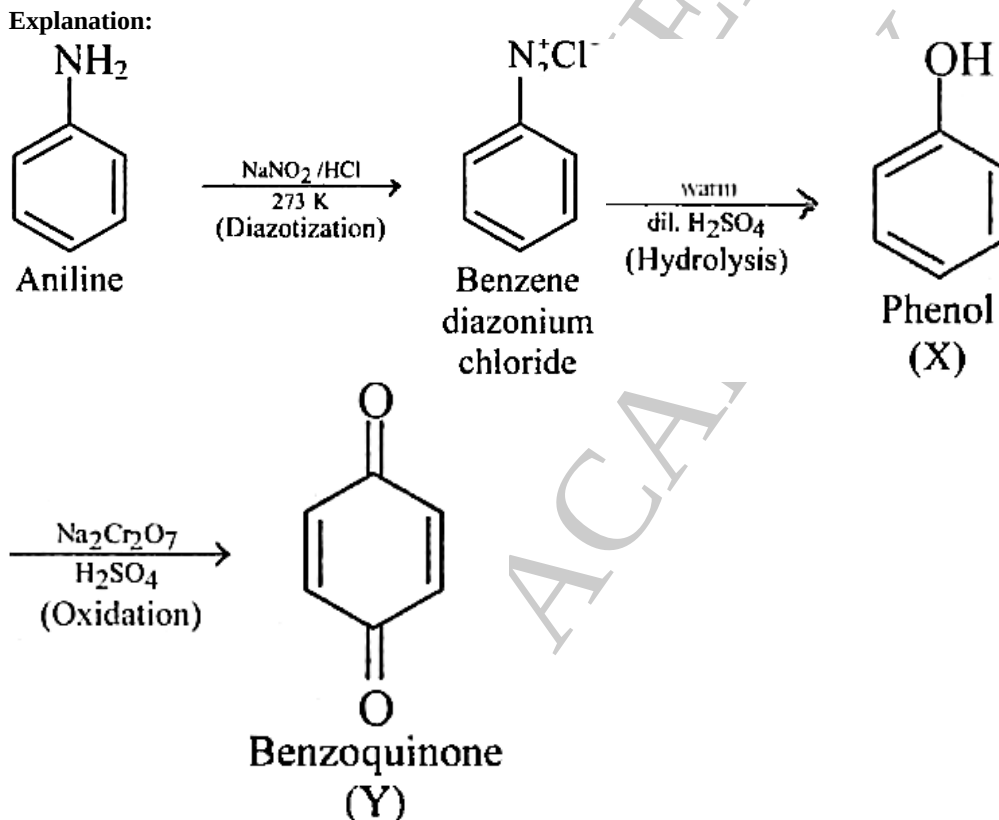


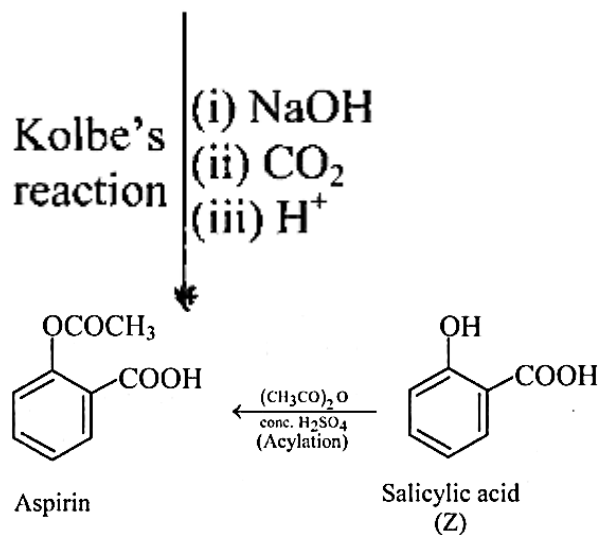
15. (d) Smaller size of fluorine atom
Explanation:
The electron gain enthalpy order for halogens is $\text{Cl} > \text{F} > \text{Br} > \text{I}$
Due to the small size of fluorine, the extra electron to be added feels more electron-electron repulsion. Therefore fluorine has less value for electron affinity than chlorine.

16. (a) Grignard's reagent
Explanation:
 $\text{R}-\text{MgX}$ has $\text{M}-\text{C}\sigma$ -bond.

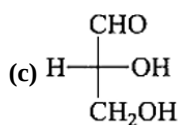
17. (a) $\text{R}-\text{Cl} + \text{NaI} \xrightarrow{\Delta}$
Explanation:
The halogen-exchange reaction is a method of preparing alkyl iodides from either alkyl bromides or alkyl chlorides.

18. (d) Phenol, Benzoquinone, Salicylic acid
Explanation:

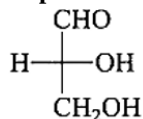




19.



Explanation:



20.

(c) (C) > (B) > (A) > (D)

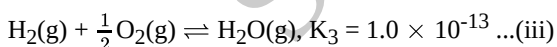
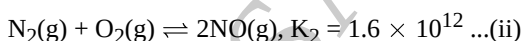
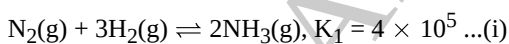
Explanation:

The basic strength of amines depends upon the availability of lone pair of electrons. Aliphatic amines are more basic than aromatic amines.

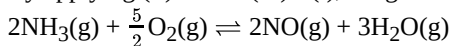
CHEMISTRY (Section-B)

21.4

Explanation:



By applying (ii) + 3 × (iii) - (i), we get

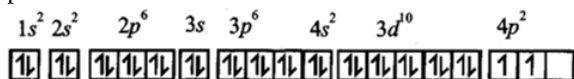


$$K_{\text{eq}} = \frac{k_2 \times k_3^3}{k_1} = \frac{1.6 \times 10^{12} \times (10^{-13})^3}{4 \times 10^5}$$

$$= \frac{1.6}{4} \times 10^{-32} = 4 \times 10^{-33}$$

22.7.0

Explanation:

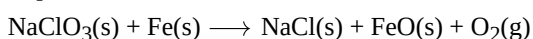


$m = 0 \quad 0 \quad -1 \ 0 \ 1 \quad 0 \ -1 \ 0 \ 1 \quad 0 \quad -2 \ -1 \ 0 \ 1 \ 2$

Completely filled orbital (x) with $m_l = 0$ are 7.

23.2130

Explanation:



Moles of NaClO₃ = Moles of O₂

$$\text{Moles of O}_2 = \frac{PV}{RT} = \frac{1 \times 492}{0.082 \times 300} = 20 \text{ mol}$$

$$\text{Mass of NaClO}_3 = 20 \times 106.5 = 2130 \text{ g}$$

24. 5

Explanation:



25. 25

Explanation:

$$\Delta G^\circ = -nFE^\circ = \Delta H^\circ - T\Delta S^\circ$$

$$\Delta S^\circ = \frac{\Delta H^\circ + nFE^\circ}{T}$$

$$= \frac{(-825.2 \times 10^3) + (2 \times 96487 \times 4.315)}{298}$$

$$= 25.11 \text{ JK}^{-1} \text{ mol}^{-1} \approx 25 \text{ JK}^{-1} \text{ mol}^{-1}$$

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