Vidyamandir Classes
Gurukul for IITJEE Preparation
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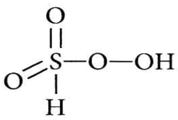
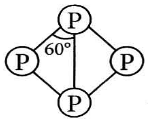
MOCK TEST PAPER # 5

SOLUTION

CHEMISTRY (CLASS-XII)

12. (i)  (ii) 

14. (i)

Number of moles of heptane $= \dfrac{26.0\ \text{g}}{100\ \text{g mol}^{-1}}$
$= 0.26$ mol

No. of moles of octane $= \dfrac{35.0\ \text{g}}{114\ \text{g mol}^{-1}} = 0.31$ mol

$p_{(\text{heptane})} = 0.456 \times 105.2\ \text{kPa} = 47.97\ \text{kPa}$

$p_{(\text{octane})} = 0.544 \times 46.8\ \text{kPa} = 25.46\ \text{kPa}$

$P_{\text{Total}} = 47.97 + 25.46 = 73.43\ \text{kPa}$

15. Reaction during discharging,

At anode : $Cd_{(s)} + 2OH^-_{(aq)} \rightarrow Cd(OH)_{2(s)} + 2e^-$

At cathode :

$NiO_{2(s)} + 2H_2O_{(l)} + 2e^- \rightarrow Ni(OH)_{2(s)} + 2OH^-_{(aq)}$

$Cd_{(s)} + NiO_{2(s)} + 2H_2O_{(l)} \rightarrow Cd(OH)_{2(s)} + Ni(OH)_{2(s)}$

When charging takes place, reactions are reversed.

16. (ii) $\pi = iCRT$

or, $0.70 = i \times 0.0103 \times 0.082 \times (27 + 273)$

or, $i = \dfrac{0.70}{0.0103 \times 0.082 \times 300} = 2.76$

Since $i > 1$, solute molecules are dissociated in the solution.

17. (i) According to Ellingham diagram, at temperature below 710 K,
$\Delta G°(C, CO_2) < \Delta G°(C, CO)$ hence CO_2 is better reducing agent.
At temperature above 710 K,
$\Delta G°(C, CO_2) > \Delta G°(C, CO)$ hence CO is better reducing agent.

(ii) $2FeS + 3O_2 \longrightarrow 2FeO + 2SO_2$

$FeO + SiO_2 \longrightarrow \underset{\text{(Slag)}}{FeSiO_3}$

(iii) $\underset{\text{Impure}}{Ti} + 2I_2 \longrightarrow TiI_4,\ TiI_4 \xrightarrow{1800\ K} \underset{\text{Pure}}{Ti} + 2I_2$

18. (ii) $CuCl_2 \longrightarrow Cu^{2+} + 2Cl^-$

At cathode, $Cu^{2+} + 2e^- \longrightarrow Cu_{(s)}$

At anode, two reactions are possible

$2Cl^- \longrightarrow Cl_{2(g)} + 2e^-;\quad E° = 1.36\ V$

$H_2O \longrightarrow 2H^+ + \frac{1}{2}O_2 + 2e^-;$
$E° = 1.23\ V$

19. $[FeF_6]^{3-}$: Number of unpaired electrons = 5

Magnetic moment $= \sqrt{5(5+2)} = 5.92$ B.M.

$[Fe(H_2O)_6]^{2+}$: Number of unpaired electrons = 4

Magnetic moment $= \sqrt{4(4+2)} = 4.9$ B.M.

$[Fe(CN)_6]^{4-}$:

Diamagnetic and its magnetic moment is zero.

20. (i)

$CH_3-C(CH_3)(Br)-CH_3 \xrightarrow{aq.\ KOH} CH_3-C(CH_3)(OH)-CH_3$

(A) 2-Bromo-2-methylpropane → 2-Methylpropan-2-ol

$CH_3CH_2CH(Br)-CH_3 \xrightarrow{aq.\ KOH} CH_3CH_2CH(OH)-CH_3$

(B) 2-Bromobutane (Optically active) → Butan-2-ol

25. (A) $CH_3-C(=O)-O-CH_2-CH_2-CH_2-CH_3$

(B) CH_3CH_2OH

(C) $CH_3CH_2CH_2CH_2OH$

(D) CH_3CHO

(E) $CH_3-CH=CH-CHO$

26. (i) (a) The reaction is of zero order.

(b) Slope of the straight line graph gives rate constant.

$$-k = \frac{d[R]}{dt}$$

According to first order kinetic equation,

$$k = \frac{2.303}{t}\log\left(\frac{p_{SO_2Cl_2\,(\text{initial})}}{p_{SO_2Cl_2\,(\text{after reaction})}}\right)$$

$$= \frac{2.303}{100}\log\left(\frac{0.4}{0.1}\right) = 1.38 \times 10^{-2}\ s^{-1}$$

OR

(i) For a first order reaction,

$$t = \frac{2.303}{k}\log\frac{[R]_0}{[R]_t}$$

$t = 577.7\ s \approx 578\ s$

(ii) (a) For a first order reaction,

$$k = \frac{2.303}{t} \log \frac{[R]_0}{[R]_t}$$

$k = 0.015\ \text{min}^{-1}$

(b) When $[R]_t = 0.1\ [R]_0$, $t = ?$

$$k = \frac{2.303}{t_1} \log \frac{[R]_0}{0.1\ [R]_0} = \frac{2.303}{t_1} \log 10$$

$t_1 = 153.53$ min

$\therefore$ After 153.53 min, 10% of the original material remains unreacted.

(c) Also,

$$k = \frac{2.303}{t_2} \log \frac{0.8\ [R]_0}{0.64\ [R]_0} = \frac{2.303}{t_2} \log \frac{10}{8}$$

$t_2 = 15$ min

27. **OR**

(i) $4NH_{3(g)} + 5O_{2(g)} \xrightarrow[500K,\ 9bar]{Pt} 4NO_{(g)} + 6H_2O_{(g)}$

$2NO_{(g)} + O_{2(g)} \rightleftharpoons 2NO_{2(g)}$

$3NO_{2(g)} + H_2O_{(l)} \longrightarrow 2HNO_{3(aq)} + NO_{(g)}$

(ii) (a) $I_2 + 10HNO_3 \longrightarrow 2HIO_3 + 10NO_2 + 4H_2O$

(b) $C + 4HNO_3 \longrightarrow CO_2 + 2H_2O + 4NO_2$

(c) $S_8 + 48HNO_{3(conc.)} \longrightarrow 8H_2SO_4 + 48NO_2 + 16H_2O$

(d) $P_4 + 20HNO_{3(conc.)} \longrightarrow 4H_3PO_4 + 20NO_2 + 4H_2O$

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