Unit Test-2

Hints & Solutions

Solution Paper-1

1. [A,B,C]

$V_{strength} = 56$;

$\therefore M = \frac{28}{11.2} = 2.5$

$\therefore$ 1 contain 2.5 moles of H_2O_2

or $2.5 \times 34 = 85$ g H_2O_2

wt. of 1 litre solutin = 265 g ($\because$ d = 265 g/L)

$\therefore w_{H_2O} = 180$g or moles of $H_2O = 10$

$x_{H_2O_2} = \frac{2.5}{2.5+10} = 0.2$

$\% \frac{w}{v} = \frac{2.5\times 34}{1000} \times 100 = 8.5$

$m = \frac{2.4}{180} \times 1000 = 13.88$

2. [B,C,D]

$3Sn^{2+} + 14H^+ + CrO_7^{2-} \rightarrow 3Sn^{3+} + 2Cr^{3+} + 7H_2O$

3. [B,C]

$n_{O_2} = \frac{16}{32} = 0.5\ N_A$ no. of molecules of $O_2 = 0.5\ N_A$

$n_{O_3} = \frac{16}{48} = 0.33$ atoms $= 0.5 \times 2N_A$

$O_3 = 0.33\ N_A = 0.99$ no. of molecules of N_A atom

4. [A,B,C]

$CS_2 + 3Cl_2 \rightarrow CCl_4 + S_2Cl_2$

$\frac{1}{74}$ $\quad$ $\frac{2}{71\times 3}$

$\frac{1}{74}$ $\quad$ $\frac{2}{213}$

before = 0.0135 $\quad$ 0.0093

reaction $\quad$ (Limiting reagent)

0.0135 – .0093 $\quad$ 0.0093 × 154

0.0042 × 74 $\quad$ = 1.45 gm CCl_4 formed

5. [A, D]

Mass of 1 mole CO_2 = 44 gm

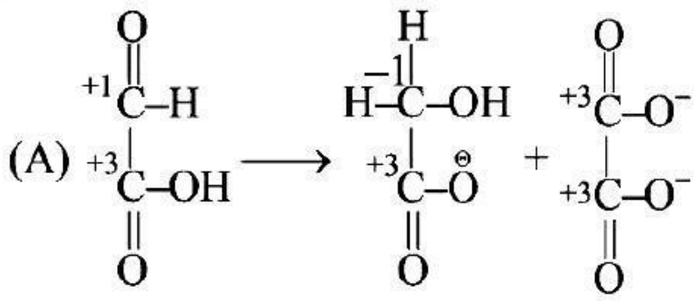
$1\text{ gm} = \frac{1}{1.67\times 10^{-24}}$ u

$= \frac{100}{167} \times 10^{24\times 44}$ u

$= \frac{4400}{167} \times 10^{24}$ u

$= 2.65 \times 10^{25}$ u

6. [A,B,C,D]

(A) 

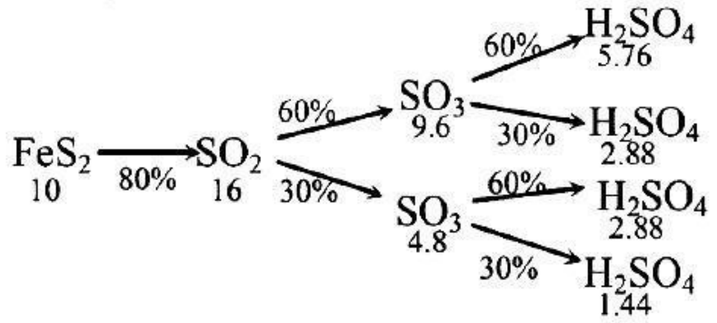
(B) $\overset{2}{P_2}H_4 \longrightarrow \overset{-3}{P}H_3 + \overset{-1/2}{P_4}H_2$

(C) $\overset{0}{P_4} + NaOH \longrightarrow NaH_2\overset{+1}{P}O_2 + \overset{-3}{P}H_3$

(D) $Ca\overset{0}{O}Cl_2 \longrightarrow \overset{-1}{Ca}Cl_2 + Ca(\overset{+5}{C\ell}O_3)_2$

7. [A,B,C]

1.2 kg $FeS_2 \Rightarrow$ 10 moles



$\therefore H_2SO_4$ can be between 1.44 mole to 5.76 mole

8. [4]

Initial moles of NH_3 = 0.38 moles

Moles of NH_3 remaining after completation

$= (0.38 - 0.025x)$

$\frac{\text{Moles of } NH_3 \text{ in water}}{\text{Moles of } NH_3 \text{ in } CHCl_3} = 24$

$\therefore$ Moles of NH_3 in $CHCl_3$

$$= \frac{\text{Moles of } NH_3 \text{ in water}}{24} = 0.0112$$

$\therefore$ $0.38 - 0.025\,x = 0.0112 \times 24 + 0.0112$

$= 0.0112 \times 25$

$\therefore$ $0.025\,x = 0.38 - 0.0112 \times 25$

$= 0.38 - 0.28 = 0.1$

or $x = \frac{0.1}{0.025} = 4$

9. [5]

No. of m equ. Of Na_2CO_3 in 80 ml of resulting solution $= \frac{42.4}{53} \times 30 - 0.4 \times 50$

$= 4$

No. of m equ of Na_2CO_3 in 10 ml of above solution $= 0.5$

No. of m equ in 50 ml of diluted solution $= 0.05$

So 0.05 = Normality of 40 times diluted A × V

$\Rightarrow 0.05 = \frac{0.4}{40} \times V \Rightarrow V = 5$ mL

10. [2]

$$2 \times \frac{0.7}{106 + 18x} = 5 \times 19.8 \times \frac{1}{10} \times \frac{1}{1000}$$

On solving , we get

$x = 2$

11. [3]

$N_2H_4 \rightarrow Y + 10e^-$

$2X + 4 = 0$

$X = -2$

$\because$ two nitrogen atoms losses = $10\ e^-$

$\therefore$ 1 nitrogen atoms losses = $5e^-$

$N^{-2} \rightarrow N^{+3}$

12. [8]

$$27 = \frac{12}{x} \times 18$$

$$x = \frac{12 \times 18}{27} = 8$$

13. [B]

Theory based

14. [A]

Theory based

15. [B]

Theory based

16. [C]

Theory based

17. [B]

Theory based

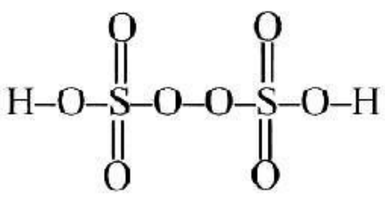
18. [C]

Theory based

Solution Paper-2

1. [C]

Structure of $H_2S_2O_8$ is



It contains peroxide linkage for which oxidation number of these two O-atoms will be –1 each

$\therefore$ $2 \times (+1) + 2x + 6 \times (-2) + 2 \times (-1) = 0$

or $2 + 2x - 12 - 2 = 0$ or $x = +6$

2. [D]

$MnO_4^- + 8H^+ + 5e^- \rightarrow \overset{2+}{Mn} + 4\,H_2O] \times 2$

$C_2O_4^{2-} \rightarrow 2CO_2 + 2e^-] \times 5$

$2\ MnO_4^- + 5\,C_2O_4^{2-} + 16H^+ \rightarrow$

$2\ \overset{2+}{Mn} + 10\ CO_2 + 8\ H_2O$

Thus, the coefficient of oxalate ion $C_2O_4^{2-}$ is 5.

3. [D]

Only in reaction (d), the O.N. of the elements undergo a change

$$\overset{+1-2}{Cu_2S} + 2\overset{+2}{FeO} \rightarrow 2\overset{0}{Cu} + 2\overset{0}{Fe} + \overset{+4}{SO_2}$$

i.e. O.N. of Cu decreases from +1 to 0 and that of Fe decreases from +2 to 0 while that of S increases from –2 to +4. Therefore, it is a redox reaction.

4. [C]

Blackness appears in lead paintings due to its slow and gradual conversion to PbS. H_2O_2 oxidises black lead sulphate to white lead sulphate.

5. [C]

Sodium hexameta phosphate

6. [C]

$Ca(OH)_2$ removes soluble bicarbonates in the form of insoluble $CaCO_3$.

7. [C]

Factual.

8. [A,B,D]

$M_1V_1 + M_2V_2 = MV$

$$1 \times 100 + \frac{10 \times 98 \times 0.1}{98} \times 100 = M \times 200$$

$M = 1$

$$M = \frac{1 \times 98 \times 200}{1000} = W$$

$W = 19.6$

9. [A,C]

$$\left.\begin{matrix} NaCl \\ + \\ CaCl_2 \end{matrix}\right\} 4.44 \text{ gm}$$

$$\underset{111gm}{CaCl_2} \longrightarrow CaCO_3 \rightarrow \underset{56gm}{CaO}$$

$\because$ 56 gm CaO req. = 111 gm $CaCl_2$

$$\therefore \text{ 1.12 gm of CaO req.} = \frac{111}{56} \times 1.12 = 2.22 \text{ gm}$$

$$\% \, CaCl_2 = \frac{2.22}{4.44} \times 100 = 2.22 \text{ gm}$$

$= 50\,\%$

10. [B, C]

$CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5 + H_2O$

72 gm $\quad 2.77 \times 10^{25} \times 1.67 \times 10^{-24}$

$$\frac{72}{60} = 2.77 \times 1.67 \times 10$$

$$1.2 = \frac{2.77 \times 16.7}{46} = 1.005$$

alcohol is limiting reagent

acetic acid is excess reagent

11. [A, C]

$CaCO_3 \rightarrow CaO + CO_2$

100 gm

$\therefore$ 100 gm $\rightarrow$ = 56 gm

$$\therefore \text{ 90 gm} \rightarrow = \frac{56}{100} \times 90$$

= 50.40 gm

or 0.9 gm molecule

12. [A,C]

Xe	67.2	$\frac{67.2}{131} = 0.512$	1
O	32.8	$\frac{32.8}{16} = 2.05$	4

XeO_4 or Xe_2O_8

13. [C, D]

Since the molecular mass of N_2 & CO is 28 and N_2O & CO_2 is 44 so both have no. of molecules in one gram = $\frac{44}{N_A}$ & $\frac{28}{N_A}$

14. [A,B,C]

$$M = \frac{10 \times wt\%xd}{mol.wt.}$$

$$M = \frac{d}{\left(\frac{m^1}{1000} + \frac{1}{m}\right)}$$

Only ppm can not be calculate

15. [A]

Meq. Of KIO_3 = Meq. of KI $2I^{5+} + 10e \rightarrow I_2^0$

$M \times 5 \times 50 = 10 \times 0.1 \times 1$ $2I^- \rightarrow I_2^0 + 2e$

$\therefore M = 4 \times 10^{-3}$

16. [A]

Meq. of ascorbic acid in 50 mL solution mixture with HCl

= Meq. of KIO_3 $\quad (I^{5+} + 6e \rightarrow I^-)$

$= 4 \times 10^{-3} \times 6 \times 1 = 0.024$

Meq. of ascorbic acid in 500 mL

= 0.24 meq. in 250 ml

mixture of original solution

$\therefore\ N \times 1000 = 0.96$

or $N = 9.6 \times 10^{-4}$

$$\therefore\ M = \frac{9.6 \times 10^{-4}}{2} = 4.8 \times 10^{-4}$$

Strength $= 4.8 \times 10^{-4} \times 176 = 0.0845$ g/litre

17. [B]

Meq. of $CuSO_4$ in 100 mL $= 100 \times 0.02 = 2$

$$\therefore\ w_{CuSO_4} = \frac{2 \times 249.6}{1000} = 0.499 \text{ g}$$

$$\therefore\ w_{Cu} = \frac{0.499 \times 63.6}{249.6} = 0.127 \text{ g}$$

$$\therefore\ \%\text{ of Cu} = \frac{0.127}{2.5} \times 100 = 5.08$$

18. [B]

$$\text{Eq. } I_2 = \text{Eq. of } CuSO_4 = \frac{10 \times 0.02}{1000} = 2 \times 10^{-4}$$

$$\therefore\ \frac{w}{254/2} = 2 \times 10^{-4}$$

$$\therefore\ w_{I_2} = 0.0254 \text{ g}$$