Mole Concept & Stoichiometry

Section E

52) $0.9\ ml = 0.9\ g\ H_2O$

density = 1 g/mL

$2 + 8 = 10\ e^-$

no. of e^- = ?

no. of molecule = $\frac{0.9}{18} \times N_A$

no. of e^- = $\frac{0.9}{18} \times N_A \times 10$

$= 0.5\ N_A$

(57) $Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$

Specific gravity = 1.3

$\Rightarrow$ density = 1.3 g/mL

$$\frac{\text{density of a substance}}{\text{density of water}}$$

$Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$

98 $\quad 50 \times 1.3\ g$

$\downarrow 40\%$

$\frac{40}{100} \times 50 \times 1.3\ g$

$= 26$

$n = \frac{26}{98} = \frac{13}{49}$

$n_{H_2SO_4} = \frac{26}{98}$

1 mole → 22.4 L

$\frac{13}{n_g}$ → $\frac{13}{n_g} \times 22.4$

$= 5.94$ L

$\simeq$ 6 L

(58)

$Zn + 2NaOH \rightarrow Na_2ZnO_2 + H_2$

$\frac{6.53\,g}{65.43} = 0.1$ mole; H_2: 0.1

$CuO + H_2 \rightarrow Cu + H_2O$

0.1 0.1

63.5
16
79.5

mass of $CuO = 79.5 \times 0.1$

$= 7.95$

$\simeq 8$

(59)

$HCOOH + H_2SO_4 \rightarrow H_2O + CO$

x — Dehydrating agent — x x

$\begin{matrix} COOH \\ | \\ COOH \end{matrix} + H_2SO_4 \rightarrow H_2O + CO + CO_2$

1 — 1 1 1

$KOH + CO_2 \rightarrow K_2CO_3 + H_2O$

Base — 1 acid — Salt — water

total moles of gases $= x + 2$

$$1 = \frac{1}{6}(x+2) \Rightarrow \boxed{x = 4}$$

$$\boxed{4:1}$$

reduction in vol

(60)

$$C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$$
$$x\,L \qquad\qquad 3x\,L$$

$$2C_4H_{10} + 13O_2 \longrightarrow 8CO_2 + 10H_2O$$
$$(3-x)\,L \qquad\qquad 4(3-x)\,L$$

$$3x + 4(3-x) = 10$$

$$3x + 12 - 4x = 10$$

$$\boxed{x = 2}$$

(2)

$$1\ e^- = 9.1 \times 10^{-31}\ kg$$

$$9.1 \times 10^{-31}\ kg \rightarrow 1\ e^-$$

$$1\ kg \longrightarrow \frac{1}{9.1 \times 10^{-31}} \text{ electrons}$$

$$\text{No. of moles of } e^- = \frac{1}{9.1 \times 10^{-31} \times 6.023 \times 10^{23}}$$

$$= \frac{10^8}{9.1 \times 6.023}$$

Integer Answer

(2) $H_2SO_4 + CuCO_3 \rightarrow CuSO_4 + H_2CO_3$

0.5 M 0.5

$n = M \times V$

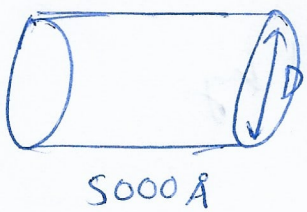
$= 0.5 \times V = \frac{0.5}{123.5}$

63.5
12
4

$V = \frac{1}{123.5} L$

$V(mL) = \frac{1000}{123.5} mL = 8.097\ mL$

(3) $1\ \text{Å} = 10^{-10}\ m = 10^{-8}\ cm$



$\text{Volume} = \pi r^2 h = \pi \times \left(\frac{150}{2} \times 10^{-8}\right)^2 \times 5000 \times 10^{-10}\ cm^3$

mass = vol x density

$0.75\ cm^3/g$ $0.75\ cm^3 \rightarrow 1g$

$\text{mass of one particle} = \frac{\pi \times \left(\frac{150 \times 10^{-8}}{2}\right)^2 \times 5000 \times 10^{-8}}{0.75}\ g$

$\frac{cm^3}{cm^3/g} = g$

$\text{molar mass} = \text{[illegible]} \times N_A$

cm^3 cm^3/g

$= 7.09 \times 10^7\ g.$

Q60)

$$\underset{x}{HCOOH} + H_2SO_4 \rightarrow H_2O + \underset{x}{CO}$$

$$\begin{matrix} COOH \\ | \\ COOH \end{matrix} + H_2SO_4 \rightarrow H_2O + \underset{1}{CO} + \underset{1}{CO_2}$$

1

$$\frac{1}{x+2} = \frac{1}{6} \Rightarrow x + 2 = 6$$

$$x = 4$$