Year 11 Chemistry **_SOLUTIONS_**

Chemical Calculations Assignment 3

Practical Applications

1.
   (a) *There is no single right answer for this metacognitive question, but it must be clear and possible*.
   (b) Water.

2.
   (a)
      (i) Concentration
      (ii) $C_1 = C_2$
      $\therefore \frac{n_1}{V_1} = \frac{n_2}{V_2}$
   (b)
      (i) Volume
      (ii) $V_1 = V_2$
      $\therefore \frac{n_1}{C_1} = \frac{n_2}{C_2}$
   (c)
      (i) Moles
      (ii) $n_1 = n_2$
      $\therefore C_1V_1 = C_2V_2$
   (d)
      (i) Volume
      (ii) $V_1 = V_2$
      $\therefore \frac{n_1}{C_1} = \frac{n_2}{C_2}$

3. $C_1 = C_2$
   $\therefore \frac{n_1}{V_1} = \frac{n_2}{V_2}$
   $\therefore n_2 = \frac{n_1}{V_1} \times V_2 = \frac{0.034}{250} \times 20 = 0.0027 \text{ mol}$

4. $n_1 = n_2$
   $\therefore C_1V_1 = C_2V_2$
   $\therefore C_2 = \frac{C_1V_1}{V_2} = \frac{0.10 \times 300}{300 + 50} = 0.086 \text{ mol L}^{-1}$

5.
   (a) $M_{Cu} = 63.55 \text{ g mol}^{-1}$
   $n_{Cu} = \frac{m_{Cu}}{M_{Cu}} = \frac{1.0}{63.55} = 0.016 \text{ mol}$

(b) Mole ratio $\frac{n_{HNO_3}}{n_{Cu}} = \frac{4}{1}$

$\therefore n_{HNO_3} = \frac{4}{1} \times n_{Cu} = 4 \times 0.016 = 0.063 \text{ mol}$

(c) $C = 2.0 \text{ mol L}^{-1}$ $n = 0.063 \text{ mol}$ $V = ?$

$C = \frac{n}{V}$

$\therefore V = \frac{n}{C} = \frac{0.063}{2.0} = 0.031 \text{ L}$

6. $M_{MgO} = 40.31 \text{ g mol}^{-1}$

$n_{MgO} = \frac{m_{MgO}}{M_{MgO}} = \frac{0.044}{40.31} = 0.0011 \text{ mol}$

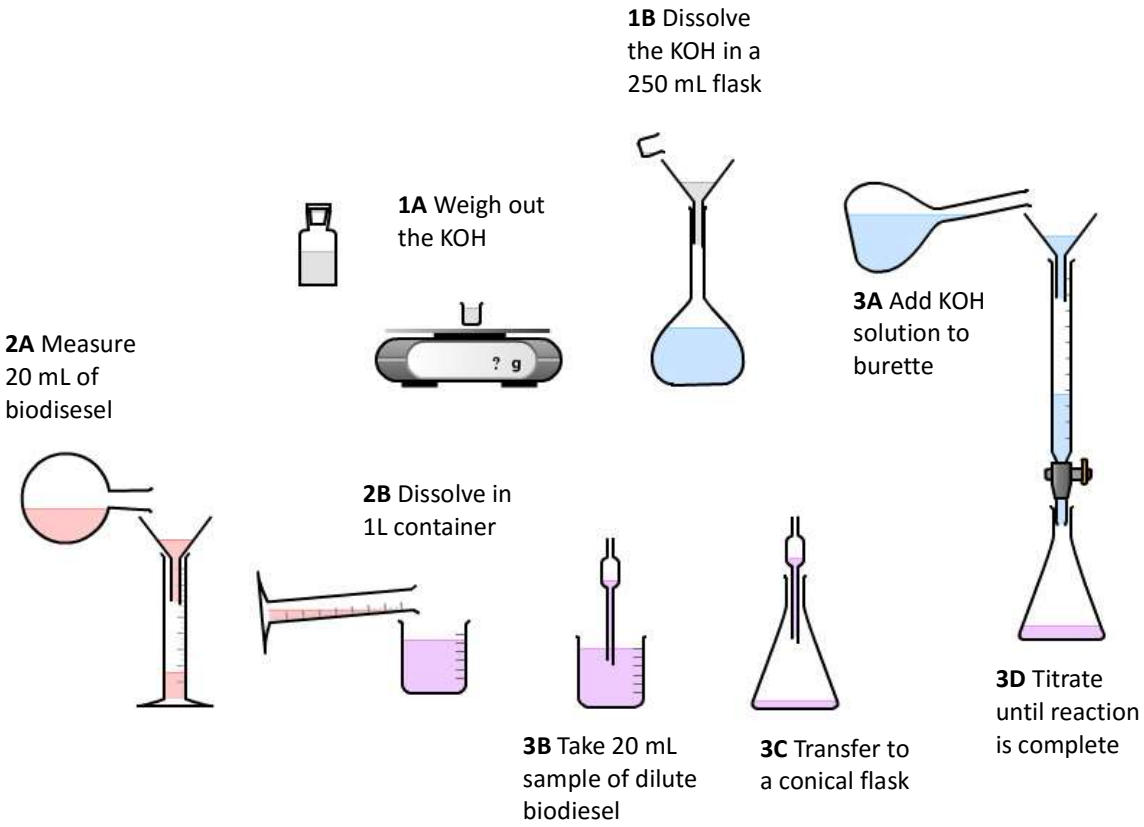
Mole ratio $\frac{n_{HCl}}{n_{MgO}} = \frac{2}{1}$

$\therefore n_{HCl} = \frac{2}{1} \times n_{MgO} = 2 \times 0.0011 = 0.0022 \text{ mol}$

$C_{HCl} = \frac{n_{HCl}}{V_{HCl}} = \frac{0.0022}{0.020} = 0.11 \text{ mol L}^{-1}$

7.

(a)



(b) $n = CV = 0.010 \times 0.250 = 0.0025 \text{ mol}$

$M_{MgO} = 56.108 \text{ g mol}^{-1}$

$m = nM = 0.0025 \times 56.108 = 0.14 \text{ g}$

(c) 4.2 mL = 0.0042 L

$n = CV = 0.010 \times 0.0042 = 4.2 \times 10^{-5}$ mol

(d) Mole ratio $\frac{n(H^+)}{n(KOH)} = \frac{1}{1}$

$\therefore n(H^+) = \frac{1}{1} \times n(KOH) = 4.2 \times 10^{-5}$ mol

(e) $C = \frac{n}{V} = \frac{4.2 \times 10^{-5}}{0.020}$ = 0.0021 mol L^{-1}

(f) $n_1 = n_2$

$\therefore C_1V_1 = C_2V_2$

$\therefore C_1 = \frac{C_2V_2}{V_1} = \frac{0.0021 \times 1000}{20}$ = 0.11 mol L^{-1}