Titration Calculation Practice Solutions

1.

(a) $n = C \times V = 0.300 \times 0.1000 = 0.0300$ mol

(b)

(i) $n = C \times V = 0.10 \times 0.00835 = 8.4 \times 10^{-4}$ mol

(ii) 0.0017 mol

(iii) $0.0017 \times 5 = 8.4 \times 10^{-3}$ mol

(c) $0.0300 - 8.4 \times 10^{-3} = 0.022$ mol

(d) $n_{CaCO_3} = \frac{1}{2} n_{HCl} = \frac{1}{2} \times 0.022 = 0.011$ mol

$M_{CaCO_3} = 100.09$

$m = n \times M = 0.011 \times 100.09 = 1.1$ g

(e) $\frac{1.1}{1.13} \times 100 = 96$ %w/w

2.

(a) $n = C \times V = 0.300 \times 0.0500 = 0.0150$ mol

(b) $n = C \times V = 2.00 \times 0.01775 = 0.0355$ mol

(c) $n_{Cr_2O_7^{2-}} = \frac{1}{6} n_{Fe^{2+}} = \frac{1}{6} \times 0.0355 = 0.00592$ mol

(d) $0.0150 - 0.00592 = 0.00908$ mol

(e) $n_{H_2} = 3 n_{Cr_2O_7^{2-}} = 3 \times 0.00908 = 0.0273$ mol

(f) $C = \frac{n}{V} = \frac{0.0273}{1.0 \times 10^2} = 2.73 \times 10^{-4}$ mol L^{-1}

$\times 2.016 = 5.49 \times 10^{-4}$ g L^{-1}

$\div 10 = 5.49 \times 10^{-5}$ %w/v

3.

(a) $n = C \times V = 0.500 \times 0.04080 = 0.0204$ mol

(b) 0.0204 mol

(c) $n_{Ca(OCl)_2} = \frac{1}{2} n_{OCl^-} = \frac{1}{2} \times 0.0204 = 0.0102$ mol

$M_{Ca(OCl)_2} = 142.98$

$m = n \times M = 0.0102 \times 142.98 = 1.46$ g

(d) Mass in one pellet $= \frac{1}{2} \times 1.46 = 0.729$ g

$\frac{0.729}{1.00} \times 100 = 72.9$ %w/w

4.

(a) $n = C \times V = 0.1170 \times 0.03146 = 0.003681$ mol

(b) $n_{HNO_3} = 2 \times n_{Na_2CO_3} = 2 \times 0.003681 = 0.007362$ mol

(c) $C = \frac{n}{V} = \frac{0.007362}{0.02000} = 0.3681$ mol L^{-1} in the dilute solution

$\times 25 = 9.202$ mol L^{-1} in the commercial solution

(d) $M_{HNO_3} = 63.018$

$9.202 \times 63.018 = 579.9$ g L^{-1}

$\div 10 = 57.99$ %w/v

5.

(a) $n = C \times V = 0.00490 \times 0.02000 = 9.80 \times 10^{-5}$ mol

(b) $n = C \times V = 0.0233 \times 0.01455 = 3.39 \times 10^{-4}$ mol

(c) $n_{MnO_4^-} = \frac{1}{5} \times n_{Cu^{2+}} = \frac{1}{5} \times 3.39 \times 10^{-4} = 6.78 \times 10^{-5}$ mol reacted in Step 2

(d) $9.80 \times 10^{-5} - 6.78 \times 10^{-5} = 3.02 \times 10^{-5}$ mol in original solution

$n_{H_2C_2O_4} = \frac{5}{2} \times n_{MnO_4^-} = \frac{5}{2} \times 3.02 \times 10^{-5} = 7.55 \times 10^{-5}$ mol of oxalic acid

(e) $M_{H_2C_2O_4} = 90.036$

$m = n \times M = 7.55 \times 10^{-5} \times 90.036 = 0.00698$ g in 50.00 mL

$C = \frac{m}{V} = \frac{0.00698}{50.00} = 1.36 \times 10^{-4}$ g mL^{-1}

$\times 10^6 = 136$ μg mL^{-1}

6.

(a) $n = C \times V = 1.0 \times 0.0500 = 0.050$ mol

(b)

(i) $n = C \times V = 0.50 \times 0.03879 = 0.019$ mol

(ii) $n_{NaOH} = 2 \times n_{H_2SO_4} = 2 \times 0.019 = 0.039$ mol

(iii) $0.050 - 0.039 = 0.011$ mol

(c) $M_{C_6H_8O_6} = 176.124$

$m = n \times M = 0.011 \times 176.124 = 2.0$ g total in five tablets

Total mass of five tablets = $0.500 \times 5 = 2.50$

$\frac{2.0}{2.5} \times 100 = 79$ %w/w