Set 15

1. a) $c(CuSO_4) = \dfrac{0.223}{0.125}$
   $= 1.78 \text{ mol L}^{-1}$

   b) $c(NaC\ell) = \dfrac{1.17}{2.05}$
   $= 0.571 \text{ mol L}^{-1}$

   c) $c(AgNO_3) = \dfrac{0.0335}{0.250}$
   $= 0.134 \text{ mol L}^{-1}$

2. a) $n(KNO_3) = 2.55 \times 0.105$
   $= 0.268 \text{ mol}$

   b) $n(Na_2CO_3) = 0.112 \times 2.50$
   $= 0.280 \text{ mol}$

   c) $n(KMnO_4) = 0.230 \times 0.660$
   $= 0.152 \text{ mol}$

3. a) $n(KC\ell) = 1.26 \times 0.630$
   $= 0.794 \text{ mol}$
   $m(KC\ell) = 0.794 \times 74.55$
   $= 59.2 \text{ g}$

   b) $n(Na_2CO_3) = 0.265 \times 0.250$
   $= 6.625 \times 10^{-2} \text{ mol}$
   $m(Na_2CO_3.10H_2O) = (6.625 \times 10^{-2}) \times 286.15$
   $= 19.0 \text{ g}$

   c) $n(C_2H_2O_4) = 0.420 \times 1.05$
   $= 0.441 \text{ mol}$
   $m(C_2H_2O_4.2H_2O) = 0.441 \times 126.07$
   $= 55.6 \text{ g}$

4. a) $n(C\ell^{-1}) = 2\, n(BaCl_2)$
   $= 2 \times 0.200 \times 0.0250$
   $= 1.00 \times 10^{-2} \text{ mol}$

   b) $n(SO_4^{2-}) = n(Na_2SO_4)$
   $= 2.56 \times 0.550$
   $= 1.41 \text{ mol}$

   c) $n(NO_3^-) = 2n(Pb(NO_3)_2)$
   $= 2 \times (2.02 \times 10^{-3}) \times 2.20$
   $= 8.89 \times 10^{-3} \text{ mol}$

5. a) $n(K_2CO_3) = \dfrac{10.0}{138.21}$
   $= 7.23 \times 10^{-2} \text{ mol}$

$$[K_2CO_3] = \frac{7.23x10^{-2}}{0.220}$$
$$= 0.329 \text{ mol L}^{-1}$$

$[K^+] = 2 [KCl]$
$= 2 \times 0.329$
$= 0.658 \text{ mol L}^{-1}$

$[CO_3^{2-}] = [K_2CO_3]$
$= 0.329 \text{ mol L}^{-1}$

6. $c_1V_1 = c_2V_2$

$0.250 \times 0.250 = 14.0 \times V_2$

$$V_2 = \frac{0.250x0.250}{14.0}$$
$$= 4.46 \times 10^{-3} \text{ L}$$

7. $n(NH_4^+) = 2\, n((NH_4SO_4)$
$= 2 \times 0.360 \times 0.250$
$= 0.180 \text{ mol}$

$n(NH_4^+) = n(NH_4NO_3)$
$= 0.675 \times 1.20$
$= 0.810 \text{ mol}$

$n(NH_4^+ \text{ total}) = 0.180 + 0.810$
$= 0.990 \text{ mol}$

$$[NH_4^+] = \frac{0.990}{0.360+0.675}$$
$$= 0.956 \text{ mol L}^{-1}$$

8. $0.500 \times 0.0250 = 0.120 \times V_2$

$$V_2 = \frac{0.500x0.025}{0.120}$$
$$= 0.104 \text{ L}$$

9. $150 \times 1.10 = 0.210 \times V_2$

$$V_2 = \frac{150x1.10}{0.210}$$
$$= 786 \text{ mL}$$

$V(\text{added}) = 786 - 150$
$= 636 \text{ mL}$

10.   a) $n(Na_2CO_3) = \dfrac{25.6}{105.99}$
$= 0.242 \text{ mol}$

$$[Na_2CO_3] = \frac{0.242}{0.200}$$
$$= 1.21 \text{ mol L}^{-1}$$

b) $n(Na^+) = 2\, n(Na_2CO_3)$
$= 2 \times 1.21 \times 0.0200$
$= 4.84 \times 10^{-2} \text{ mol}$

$$[Na^+] = \frac{4.84x10^{-2}}{0.100}$$
$$= 0.484 \text{ mol L}^{-1}$$