Friday quiz 2 - overall equations and ionic equations.

1) Write the balanced overall and ionic equations of the following. Give states.
   a. Hydrochloric acid (HCl) solution reacts with calcium carbonate powder to produce a calcium chloride aqueous solution, carbon dioxide gas and liquid water.

      Overall equation $2HCl(aq) + CaCO_3(s) \rightarrow CO_2(g) + CaCl_2(aq) + H_2O(l)$
      Ionic equation $2H^+(aq) + CaCO_3(s) \rightarrow CO_2(g) + Ca^{2+} + H_2O(l)$

   b. An aqueous solution of barium nitrate ($Ba(OH)_2$ is placed in an aqueous solution of hydrochloric acid (HCl) to produce an aqueous solution of barium chloride and liquid water.

      Overall equation $Ba(NO_3)_2(aq) + 2HCl(aq) \rightarrow 2H_2O(l) + BaCl_2(aq)$
      Ionic equation $2OH^-(aq) + 2H^+(aq) \rightarrow 2H_2O(l)$

   c. An aqueous solution of hydrochloric acid (HCl) reacts with a solid piece of zinc metal to produce hydrogen gas and an aqueous solution of zinc chloride.

      Overall equation $2HCl(aq) + Zn(s) \rightarrow ZnCl_2(aq) + H_2(g)$
      Ionic equation $2H^+(aq) + Zn(s) \rightarrow Zn^{2+}(aq) + H_2(g)$

   d. Sodium oxide (Na_2O) solution is mixed with an aqueous solution of nitric acid to produce liquid water and an aqueous solution of sodium nitrate.

      Overall equation $Na_2O(aq) + 2HNO_3(aq) \rightarrow 2NaNO_3(aq) + H_2O(l)$
      Ionic equation $O^{-2}(aq) + 2H^+(aq) \rightarrow H_2O(l)$

   e. Copper(II) hydroxide powder is added to an aqueous solution of sulphuric acid (H_2SO_4) to produce water and aqueous solution of copper(II) sulphate.

      Overall equation $Cu(OH)_2(s) + H_2SO_4(aq) \rightarrow H_2O(l) + CuSO_4(aq)$
      Ionic equation $Cu(OH)_2(s) + 2H^+(aq) \rightarrow 2H_2O(l) + Cu^{2+}(aq)$

   f. Hydrochloric acid (HCl) solution is mixed with an aqueous solution of sodium sulphite (Na_2SO_3) to produce sulphur dioxide gas, liquid water and an aqueous solution of sodium chloride.

      Overall equation $2HCl(aq) + Na_2SO_3(aq) \rightarrow SO_2(g) + H_2O(l) + 2NaCl(aq)$
      Ionic equation $2H^+(aq) + SO_3^{-2}(aq) \rightarrow SO_2(g) + H_2O(l)$

   g. Copper(II) sulphide powder is placed in aqueous solution of HCl to produce solid copper chloride and hydrogen sulphide gas (H_2S).

      Overall equation $CuS(s) + 2HCl(aq) \rightarrow CuCl_2(s) + H_2S(g)$
      Ionic equation $CuS(s) + 2H^+(aq) + 2Cl^-(aq) \rightarrow CuCl_2(s) + H_2S(g)$

2) Write the balanced ionic equation for the reaction that occurs when the two aqueous solutions of $CuSO_4$ and K_2S are mixed to form a precipitate.

$Cu^{2+}(aq) + S^{2-}(aq) \rightarrow CuS(s)$

3) Write the balanced overall and ionic equation for the reaction between aqueous solutions of K_2CO_3 and HNO_3. Include states.

a. Overall *$K_2CO_3(aq) + 2HNO_3(aq) \rightarrow H_2O(l) + CO_2(g) + 2KNO_3(aq)$*

b. Ionic *$CO_3^{2-}(aq) + 2H^+(aq) \rightarrow CO_2(g) + H_2O(l)$*

4) Write the balanced overall and ionic equations for the reaction between aqueous solutions of $AgNO_3$ and $MgCrO_4$ to form an insoluble, coloured, substance. Include states.
Although the charge of CrO_4^{2-} is not given students should be able to obtain this using the formula of $MgCrO_4$ and the charge on the Mg ion given in the table below.
Knowledge of how to write ionic formulae was required

Overall - $2AgNO_3(aq) + MgCrO_4 \rightarrow Ag_2CrO_4(s) + Mg(NO_3)_2(aq)$
Ionic – $Ag^+(aq) + CrO_4^{2-}(aq) \rightarrow AgCrO_4(s)$

Valency of Some Simple and Polyatomic Ions

Valency	Simple (+ve) ions	Simple (-ve) ions	Polyatomic ions
1	Copper(I), Cu^+ Hydrogen, H^+ Potassium, K^+ Silver, Ag^+ Sodium, Na^+	Hydride, H^- Chloride, Cl^- Bromide, Br^- Iodide, I^-	Ammonium, NH_4^+ Hydrogencarbonate, HCO_3^- Hydroxide, OH^- Nitrate, NO_3^-
2	Calcium, Ca^{2+} Copper(II), Cu^{2+} Iron(II), Fe^{2+} Lead(II), Pb^{2+} Magnesium, Mg^{2+} Zinc, Zn^{2+}	Oxide, O^{2-} Sulfide, S^{2-}	Carbonate, CO_3^{2-} Sulfate, SO_4^{2-}
3	Aluminium, Al^{3+} Iron(III), Fe^{3+}	Nitride, N^{3-}	Phosphate, PO_4^{3-}