1.4 Assignment

1) *Determine the # of atoms of each type present in the following reactants.*

Reactants	# of each atom
PbS + 2 PbO	Pb = 3
	S = 1
	O = 2
2 NH_4NO_3 + H_2S	N = 4
	H = 10
	O = 6
	S = 1
$Fe(NO_3)_3$ + 3 LiOH	Fe = 1
	N = 3
	O = 12
	Li = 3
	H = 3
$Ca_3(PO_4)_2$ + 3 H_2SO_4	Ca = 3
	P = 2
	O = 20
	H = 6
	S = 3

2) Balance the following chemical equations by inspection ;

a) ___K_2O + ___H_2O -------> 2 KOH

b) 6 KOH + 2 H_3PO_4 -------> 2 K_3PO_4 + 6 H_2O OR $3KOH + H_3PO_4 \rightarrow K_3PO_4 + 3H_2O$

c) ___$CaCl_2$ + 2 HNO_3 -------> ___$Ca(NO_3)_2$ + 2 HCl

d) ___$FeCl_3$ + 3 KOH -------> 3 KCl + ___$Fe(OH)_3$

e) 4 .NaClO + ___H_2S -------> 4 NaCl + ___H_2SO_4

f) 3 Ag_2S + 8 HNO_3 -------> 6 $AgNO_3$ + 2 NO + 3 S + 4 H_2O

g) ___I_2 + 2 $Na_2S_2O_3$ -------> ___ $Na_2S_4O_6$ + 2 NaI

h) ___Fe + 2 $CuNO_3$ -------> ___$Fe(NO_3)_2$ + 2 Cu

i) ___$MgCl_2$ + 2 NH_4NO_3 -------> ___$Mg(NO_3)_2$ + 2 NH_4Cl

j) 2 Al + 3 H_2SO_4 -------> ___$Al_2(SO_4)_3$ + 3 H_2

3) **Write the total and net ionic equations for the following using the procedure above.**

a) ___Zn (s) + 2 HCl (aq) -----> ___ $ZnCl_2$ (aq) + ___H_2 (aq)

$Zn_{(s)} + 2H^+_{(aq)} + 2Cl^-_{(aq)} \rightarrow Zn^{2+}_{(aq)} + 2Cl^-_{(aq)} + 2H^+_{(aq)}$

$Zn_{(s)} \rightarrow Zn^{2+}_{(aq)}$

b) ___$FeCl_3$ (aq) + 3 $AgNO_3$ (aq) ------> 3 AgCl (s) + ___ $Fe(NO_3)_3$ (aq)

$Fe^{3+}_{(aq)} + 3Cl^-_{(aq)} + 3Ag^+_{(aq)} + 3NO_3^-{}_{(aq)} \rightarrow 3AgCl_{(s)} + Fe^{3+}_{(aq)} + 3NO_3^-{}_{(aq)}$

$3Cl^-_{(aq)} + 3Ag^+_{(aq)} \rightarrow 3AgCl_{(s)}$

c) 3 KOH (aq) + ___H_3PO_4(aq) ------>___ K_3PO_4(aq) + 3 H_2O (l)

$3K^+_{(aq)} + 3(OH)^-_{(aq)} + 3H^+_{(aq)} + PO_4^{3-}{}_{(aq)} \rightarrow 3K^+_{(aq)} + PO_4^{3-}{}_{(aq)} + 3H_2O_{(l)}$

$3OH^-_{(aq)} + 3H^+_{(aq)} \rightarrow 3H_2O_{(l)}$

d) 2 HCl (aq) + ___ Na_2CO_3 (aq) -----> ___ H_2O(l) + ___CO_2(g) + 2 NaCl (aq)

$2H^+_{(aq)} + 2Cl^-_{(aq)} + 2Na^+_{(aq)} + CO_3^{2-}{}_{(aq)} \rightarrow H_2O_{(l)} + CO_{2(g)} + 2Na^+_{(aq)} + 2Cl^-_{(aq)}$

$2H^+_{(aq)} + CO_3^{2-}{}_{(aq)} \rightarrow H_2O_{(l)} + CO_{2(g)}$

e) 3 $Ba(OH)_2$ (aq) + ___$Fe_2(SO_4)_3$ (aq) -----> 2 $Fe(OH)_3$ (s) + 3 $BaSO_4$ (aq)

$3Ba^{2+}_{(aq)} + 6OH^-_{(aq)} + 2Fe^{3+}_{(aq)} + 3SO_4^{2-}{}_{(aq)} \rightarrow 2Fe(OH)_{3(s)} + 3Ba^{2+}_{(aq)} + 3SO_4^{2-}{}_{(aq)}$

$6OH^-_{(aq)} + 2Fe^{3+}_{(aq)} \rightarrow 2Fe(OH)_{3(s)}$

4) For each of the following problems, tell:

i) What type of reaction might be expected (5 choices)
ii) Whether the reaction will occur or not (assume that all double displacements will go ahead)
iii) If not, why it will not occur
iv) If so, what the balanced equation for the reaction is

a) tin and copper (II) sulphate → single replacement
→ will occur because tin is higher on activity series.

$Sn_{(s)} + CuSO_{4(aq)} \rightarrow Cu_{(s)} + SnSO_{4(aq)}$

b) iron (III) nitrate and sodium chromate → double replacement
→ will occur

$2Fe(NO_3)_{3(aq)} + 3Na_2CrO_{4(aq)} \rightarrow Fe_2(CrO_4)_{3(aq)} + 6NaNO_{3(aq)}$

c) calcium and iodine → synthesis
→ will occur.

$Ca + I_2 \rightarrow CaI_2$

d) magnesium and hydrochloric acid → single replacement
→ will occur (b/c Mg is higher on series)

$Mg_{(s)} + 2HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_{2(g)}$

e) calcium oxide —electrolyzed→ energy added
→ decomposition; yes it will occur b/c energy is added

$2CaO \xrightarrow{\text{elec}} 2Ca + O_2$

f) carbon and oxygen → synthesis
→ will occur.

$C + O_2 \rightarrow CO_2$

g) sodium carbonate and sulfuric acid → double displacement ∴ will occur

$Na_2CO_{3(aq)} + H_2SO_{4(aq)} \rightarrow Na_2SO_{4(aq)} + H_2CO_{3(aq)}$

h) iron (II)sulfide —electrolyzed→ → decomp; will occur b/c energy is added

$FeS \xrightarrow{\text{elec}} Fe + S$

i) platinum and lead(II) nitrate → single replacement
→ no reaction because lead is higher on activity series

j) propane and oxygen gas

$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

→ combustion; will occur.