Chemical Reactions (Part 2) Worksheet

A compound is ***soluble*** in a particular liquid if it dissolves in that liquid.
A compound is ***insoluble*** if it does not dissolve in the liquid.
An ***aqueous*** solution is a homogeneous mixture of a substance with water.

1. Is each compound soluble or insoluble?

   $AgBr$ not soluble

   $CaCl_2$ soluble

   $Pb(NO_3)_2$ soluble

   $PbSO_4$ not soluble

2. Write an equation for the precipitation reaction that occurs (if any) when solutions of sodium carbonate and copper (II) chloride are mixed.

2-Na-1(2)=2
1-CO-1
1-Cu-1
2-Cl-1(2)=2

$Na_2(CO_3)(aq) + CuCl_2(s) \rightarrow 2NaCl(aq) + CuCO_3(s)$

solid is the percipitate

there is a reaction

3. Write an equation for the precipitation reaction that occurs (if any) when solutions of lithium nitrate and sodium sulfate are mixed.

2(2)-Li-2
2(2)-NO-1(2)=2
1-SO-1
2-Na-1(2)=2

$2LiNO_3(aq) + Na_2SO_4(aq) \rightarrow Li_2SO_4(aq) + 2NaNO_3(aq)$

only aqueous, so there is no percipitate

there is no reaction

4. Which chemical equation is a net ionic equation?

   $K_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2\,KCl(aq)$ no

   $2\,K^+(aq) + SO_4^{2-}(aq) + Ba^{2+}(aq) + 2Cl^- \rightarrow BaSO_4(s) + 2\,K^+(aq) + 2Cl^-(aq)$ no

   $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$ yes

4. What are the clues that a chemical reaction has occurred?

* 1) color change
* 2) percipitate formation
3) emission of light
* 4) formation of gas/odor
* 5) change of temperature/energy (exo/endo)

8. List the different types of reactions and properties of each.

Single Replacement $A + BC \rightarrow B + AC$

Double Replacement $AB + CD \rightarrow AD + CB$

Synthesis $A + B \rightarrow AB$

Decomposition $AB \rightarrow A + B$

6. Which of these are redox reactions?

$2\ Mg(s) + O_2(g) \rightarrow 2\ MgO(s)$ yes - redox synthesis

$2\ HBr(aq) + Ca(OH)_2(aq) \rightarrow 2\ H_2O(l) + CaBr_2(aq)$ no double replacement

$Ca(s) + Cl_2(g) \rightarrow CaCl_2(s)$ yes - redox synthesis

~~$Zn(s) + Fe^{2+}(aq)$~~ $\rightarrow Zn^{2+}(aq) + Fe(s)$ yes - redox

Zn_2Fe

decomposition

Redox Reactions
- synthesis
- decomposition
- single replacement
- combustion

7. Write a balanced equation for the combustion of liquid methyl alcohol (CH_3OH).

$2\ CH_3OH(l) + 2\ O_2(g) \rightarrow 2\ CO_2(g) + 4\ H_2O(g)$

$2 = (2)1 - C - 1(2) = 2$

$8 = (2)4 - H - 2(2)(4) = 8$

$6 = 2(2) + 4 = (2)3 - O - 3(2)(4) = 6$

$(2)\ 2 \quad 2\ (4)$

$\times 2$

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Oxidation Reduction Worksheet Answers

1. $Mg^{0} + 2H^{+1}\,Cl^{-1} \rightarrow Mg^{+1}\,Cl_2^{-1} + H_2^{0}$
   Mg is oxidized (RA); H is reduced (OA); 2 electrons transferred

2. $\overset{0}{2Fe} + \overset{+3\ -2}{3V_2O_3} \rightarrow \overset{3\ -2}{Fe_2O_3} + \overset{+2\ -2}{6VO}$
   Fe is oxidized (RA); V is reduced (OA); 6 electrons transferred

3. $\overset{+1+7\ -2}{2KMnO_4} + \overset{+1+3-2}{5KNO_2} + \overset{+1+6-2}{3H_2SO_4} \rightarrow \overset{+2+6\ -2}{2MnSO_4} + \overset{+1\ -2}{3H_2O} + \overset{+1+5-2}{5KNO_3} + \overset{+1+6-2}{K_2SO_4}$
   N is oxidized (RA); Mg is reduced (OA); 10 electrons transferred

4. $\overset{+1\ +6\ -2}{K_2Cr_2O_7} + \overset{+2-1}{3SnCl_2} + \overset{+1-1}{14HCl} \rightarrow \overset{+3-1}{2\ CrCl_3} + \overset{+4\ -1}{3SnCl_4} + \overset{+1\ -1}{2\ KCl} + \overset{+1\ -2}{7\ H_2O}$
   Sn is oxidized (RA); Cr is reduced (OA); 6 electrons transferred

5. $\overset{+1\ +7\ -2}{2KMnO_4} + \overset{+1-1}{10NaCl} + \overset{+1+6-2}{8H_2SO_4} \rightarrow \overset{0}{5Cl_2} + \overset{+1+6-2}{K_2SO_4} + \overset{+2+6-2}{2MnSO_4} + \overset{+1-2}{8H_2O} + \overset{+1+6\ -2}{5Na_2SO_4}$
   Cl is oxidized (RA); Mn is reduced (OA); 10 electrons transferred

6. $\overset{+1\ +6\ -2}{2K_2Cr_2O_7} + \overset{+1\ -2}{2H_2O} + \overset{0}{3S} \rightarrow \overset{4-2}{3SO_2} + \overset{+1-2+1}{4KOH} + \overset{+3\ -2}{2Cr_2O_3}$
   S is oxidized (RA); Cr is reduced (OA); 12 electrons transferred

7. $\overset{+1+5-2}{8KClO_3} + \overset{0\ +1\ \ -2}{C_{12}H_{22}O_{11}} \rightarrow \overset{+1-1}{8KCl} + \overset{+1-2}{11H_2O} + \overset{+4\ -2}{12CO_2}$
   C is oxidized (RA); Cl is reduced (OA); 48 electrons transferred

8. $\overset{+1\ +3\ -2}{3H_2C_2O_4} + \overset{+1\ +6\ \ -2}{2K_2MnO_4} \rightarrow \overset{+4\ -2}{6CO_2} + \overset{+1\ -2}{2K_2O} + \overset{+3\ -2}{Mn_2O_3} + \overset{+1-2}{3H_2O}$
   C is oxidized (RA); Mn is reduced (OA); 6 electrons transferred

9. $\overset{+2\ +5\ -2}{2Mn(NO_3)_2} + \overset{+1+5\ -2}{5NaBiO_3} + \overset{+1+5-2}{16HNO_3} \rightarrow \overset{+1+7\ -2}{2HMnO_4} + \overset{+3+5-2}{5Bi(NO_3)_3} + \overset{+1+5-2}{5NaNO_3} + \overset{+1-2}{7H_2O}$
   Mn is oxidized (RA); Bi is reduced (OA); 10 electrons transferred

10. $\overset{+1\ +3\ -2}{4H_2C_2O_4} + \overset{+1+7\ -2}{2KMnO_4} \rightarrow \overset{+4\ -2}{8CO_2} + \overset{+1-2}{K_2O} + \overset{+3\ -2}{Mn_2O_3} + \overset{+1-2}{4H_2O}$
    C is oxidized (RA); Mn is reduced (OA); 8 electrons transferred