Tutorial_0010

1. Balance these chemical equations.

    (a) Na_2SO_4 (s) + C (s) $\longrightarrow$ Na_2S (s) + CO_2(g)   –

    (b) Ag_2SO_4 (aq) + BaI_2 (aq) $\longrightarrow$ $BaSO_4$(s) + AgI (s)   –

    (c)   HCl (g) + O_2 (g) $\longrightarrow$ H_2O (l) + Cl_2 (g)   –

    (d) CH_4 (g) + O_2 (g) $\longrightarrow$ CO_2 (g) + H_2O (l)   –

    (e) Cl_2 (g) + P_4 (s) $\longrightarrow$ PCl_3 (l)   –

    (f) Sodium metal reacts with liquid water produces aqueous sodium hydroxide, NaOH, and hydrogen gas.   –

    (g) Zinc metal dissolves in hydrochloric acid solution, HCl, produces zinc (II) chloride solution and hydrogen gas.   –

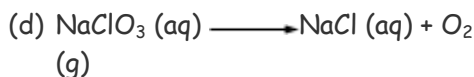   (h) Write the balanced equation for the combustion of benzene, C_6H_6.

2. Classify and balance each reaction as being combination, decomposition, single replacement, or double replacement.

    (a)   Mg (s) + H_2O (g) $\longrightarrow$ $Mg(OH)_2$ (s) + H_2(g)

    (b) C_3H_8 (g) + O_2 (g) $\longrightarrow$ CO_2 (g) + H_2O (l)

    (c) $Ba(OH)_2$ (s) + H_3PO_4 (aq) $\longrightarrow$ $Ba_3(PO_4)_2$ (aq) + H_2O (l)

    (d) $NaClO_3$ (aq) $\longrightarrow$ NaCl (aq) + O_2 (g)

    (e) SO_2 (g) + O_2 $\longrightarrow$ SO_3 (g)

    (f) $AgNO_3$ (aq) + Al (s) $\longrightarrow$ $Al(NO_3)_3$ (aq) + Ag (s)

(g) H_2SO_4 (aq) + KOH (aq) ⟶ K_2SO_4 (aq) + H_2O (l)
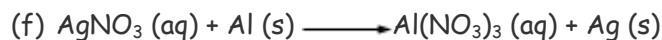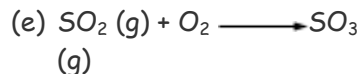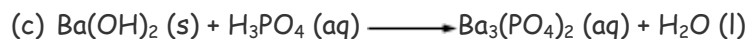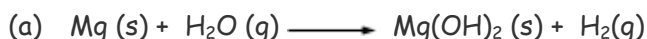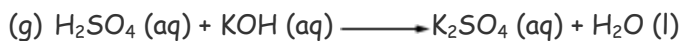
3. Chlorine gas can be made in the laboratory by the reaction of hydrochloric acid and manganese (IV) oxide:

$$4HCl \text{ (aq)} + MnO_2 \text{ (s)} \rightarrow MnCl_2 \text{ (aq)} + 2H_2O \text{ (g)} \; Cl_2 \text{ (g)}$$

When 1.82 mol of HCl reacts with excess MnO_2,

- How many <u>moles</u> of Cl_2 form?   *(0.45 mol Cl₂)*
- How many <u>grams</u> of Cl_2 form?   *(32.3 g Cl₂)*

4. Bismuth oxide reacts with carbon to form bismuth metal:

$$Bi_2O_3\text{(s)} + 3C\text{(s)} \rightarrow 2Bi \text{ (s)} + 3CO \text{ (g)}$$

When 352 g of Bi_2O_3 reacts with excess carbon,

- How many <u>moles</u> of Bi_2O_3 react?   *(0.755 moles Bi₂O₃)*
- How many <u>moles</u> of Bi form?   *(1.51 moles Bi)*
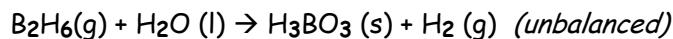
5. When heated, potassium nitrate decomposes producing potassium oxide and gaseous nitrogen and oxygen:

$$4KNO_3 \text{ (s)} \rightarrow 2K_2O \text{ (s)} + 2N_2 \text{ (g)} + 5O_2 \text{ (g)}$$
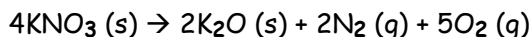
To produce 88.6 kg of oxygen,

- How many <u>moles</u> of KNO_3 must be heated?
- How many <u>grams</u> of KNO_3 must be heated?

(2.22x10³ mol KNO₃; 2.24x10⁵ g KNO₃)

6. Calculate the mass of each product formed when 33.61 g of diborane (B_2H_6) reacts with excess water:

$$B_2H_6\text{(g)} + H_2O \text{ (l)} \rightarrow H_3BO_3 \text{ (s)} + H_2 \text{ (g)} \; \textit{(unbalanced)}$$

(150.2 g H₃BO₃; 14.69 g H₂)