

Quiz 1A

1. If you burn 1.959 g of $\text{Fe}_x(\text{CO})_y$ and find 0.799 g of Fe_2O_3 and 2.200 g of CO_2 , what is the empirical formula of $\text{Fe}_x(\text{CO})_y$? (3 pts)

- (a) $\text{Fe}(\text{CO})_4$ $\text{mol Fe} = (0.799 \text{ g Fe}_2\text{O}_3) \left(\frac{1 \text{ mol Fe}_2\text{O}_3}{159.6922 \text{ g}} \right) \left(\frac{2 \text{ mol Fe}}{1 \text{ mol Fe}_2\text{O}_3} \right) \left(\frac{55.8477 \text{ g}}{1 \text{ mol Fe}} \right) = 0.010008 \text{ mol Fe} \Rightarrow 1$
- (b) $\text{Fe}_2(\text{CO})_9$ $\text{mol C} = (2.200 \text{ g CO}_2) \left(\frac{1 \text{ mol CO}_2}{44.0098 \text{ g}} \right) \left(\frac{1 \text{ mol C}}{1 \text{ mol CO}_2} \right) \left(\frac{12.011 \text{ g}}{1 \text{ mol C}} \right) = 0.04999 \text{ mol C} \Rightarrow 5$
- (c) $\text{Fe}(\text{CO})_5$ $\text{mol O} = [1.959 \text{ g} - (0.5589 \text{ g} + 0.6004 \text{ g})] \left(\frac{1 \text{ mol O}}{15.9994 \text{ g}} \right) = 0.04998 \text{ mol O} \Rightarrow 5$
- (d) $\text{Fe}(\text{CO})_6$

2. In an experiment, 1.056 g of a metal carbonate containing an unknown metal M was heated to give the metal oxide and 0.376 g CO_2 . What is the identity of the metal M ? (2 pts)

- (a) $M = \text{Ni}$ $\text{mol CO}_2 = (0.376 \text{ g CO}_2) \left(\frac{1 \text{ mol CO}_2}{44.0098 \text{ g}} \right) = 0.008544 \text{ mol CO}_2$
- (b) $M = \text{Cu}$ $\text{mol MCO}_3 = (0.008544 \text{ g CO}_2) \left(\frac{1 \text{ mol MCO}_3}{1 \text{ mol CO}_2} \right) = 0.008544 \text{ mol MCO}_3$
- (c) $M = \text{Zn}$ $\text{molar mass MCO}_3 = \frac{1.056 \text{ g}}{0.008544 \text{ mol}} = 123.602 \text{ g/mol}$
- (d) $M = \text{Ba}$ $\text{atomic mass of M} = 123.602 \text{ g/mol} - [12.011 + (3 \times 15.994)] = 63.59 \text{ g/mol}$

3. A new element, lubine (Lb), has been discovered. It forms four oxoanions: LbO_2^- , LbO_3^- , LbO_4^- , LbO_5^- . Name the following compounds: (2 pts)

- (a) NaLbO_3 sodium lubite (b) NaLbO_5 sodium perlubate

4. Identify the type of chemical reaction represented by the following equations. (3 pts)

- (a) $3 \text{H}_2(\text{g}) + \text{N}_2(\text{g}) \rightarrow 2 \text{NH}_3(\text{g})$ combination
- (b) $\text{AgNO}_3(\text{aq}) + \text{NaCl}(\text{aq}) \rightarrow \text{NaNO}_3(\text{aq}) + \text{AgCl}(\text{s})$ exchange
- (c) $\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$ decomposition

Quiz 1B

1. Same as 1A

2. Same as 1A

3. A new element, lubine (Lb), has been discovered. It forms four oxoanions: LbO_2^- , LbO_3^- , LbO_4^- , LbO_5^- . Name the following compounds: (2 pts)

- (a) NaLbO_2 sodium hypolubite (b) NaLbO_4 sodium lubate

4. Identify the type of chemical reaction represented by the following equations. (3 pts)

- (a) $\text{P}_4\text{O}_{10}(\text{s}) + 6 \text{H}_2\text{O}(\text{l}) \rightarrow 4 \text{H}_3\text{PO}_4(\text{l})$ combination
- (b) $2 \text{Al}(\text{s}) + 3 \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{Al}_2(\text{SO}_4)_3(\text{s}) + 3 \text{H}_2(\text{g})$ displacement
- (c) $2 \text{Na}(\text{s}) + 2 \text{H}_2\text{O}(\text{l}) \rightarrow 2 \text{NaOH}(\text{aq}) + \text{H}_2(\text{g})$ displacement

Quiz 1C

1. The complete reaction of 3.84 g of vanadium with 8.16 g of chlorine (Cl_2) produces a compound with the formula V_xCl_y . What is the empirical formula of the compound? (3 pts)

(a) VCl

$$\text{mol V} = (3.84 \text{ g V}) \left(\frac{1 \text{ mol V}}{50.9415 \text{ g}} \right) = 0.07538 \text{ mol V} \Rightarrow 1$$

(b) VCl_2 (c) VCl_3

$$\text{mol Cl} = (8.16 \text{ g Cl}_2) \left(\frac{1 \text{ mol Cl}_2}{70.906 \text{ g}} \right) \left(\frac{2 \text{ mol Cl}}{1 \text{ mol Cl}_2} \right) = 0.2302 \text{ mol Cl} \Rightarrow 3$$

(d) VCl_4 (e) VCl_5

2. In an experiment, 1.056 g of a metal carbonate containing an unknown metal M was heated to give the metal oxide and 0.391 g CO_2 . What is the identity of the metal M ? (2 pts)

(a) $M = \text{Ni}$

$$\text{mol CO}_2 = (0.391 \text{ g CO}_2) \left(\frac{1 \text{ mol CO}_2}{44.0098 \text{ g}} \right) = 0.008884 \text{ mol CO}_2$$

(b) $M = \text{Cu}$

$$\text{mol MCO}_3 = (0.008884 \text{ g CO}_2) \left(\frac{1 \text{ mol MCO}_3}{1 \text{ mol CO}_2} \right) = 0.008884 \text{ mol MCO}_3$$

(c) $M = \text{Zn}$ (d) $M = \text{Ba}$

$$\text{molar mass MCO}_3 = \frac{1.056 \text{ g}}{0.008884 \text{ mol}} = 118.860 \text{ g/mol}$$

$$\text{atomic mass of M} = 118.860 \text{ g/mol} - [12.011 + (3 \times 15.9994)] = 58.85 \text{ g/mol}$$

3. A new element, lubine (Lb), has been discovered. It forms four oxoanions: LbO_2^- , LbO_3^- , LbO_4^- , LbO_5^- . Name the following compounds: (2 pts)

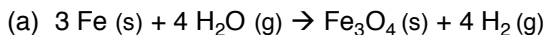
(a) $\text{Ca}(\text{LbO}_2)_2$

calcium hypolubite

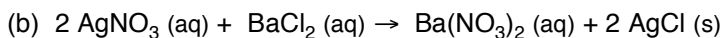
(b) $\text{Ca}(\text{LbO}_4)_2$

calcium lubate

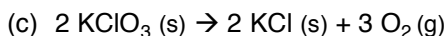
4. Identify the type of chemical reaction represented by the following equations. (3 pts)



displacement



exchange



decomposition

Quiz 1D

1. Same as 1C

2. Same as 1C

3. A new element, lubine (Lb), has been discovered. It forms four oxoanions: LbO_2^- , LbO_3^- , LbO_4^- , LbO_5^- . Name the following compounds: (2 pts)

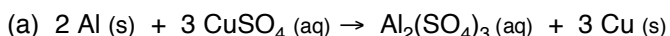
(a) $\text{Ca}(\text{LbO}_2)_2$

calcium lubite

(b) $\text{Ca}(\text{LbO}_5)_2$

calcium perlubate

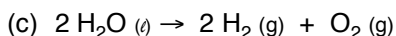
4. Identify the type of chemical reaction represented by the following equations. (3 pts)



displacement



decomposition



decomposition