WS 4.7 - Review

Balance these following chemical reactions:

1. 2 CO + ___ O_2 ---> 2 CO_2

2. 2 Al + 6 HNO_3 ---> 2 $Al(NO_3)_3$ + 3 H_2

3. ___ C_4H_9OH + 6 O_2 ---> 4 CO_2 + 5 H_2O

Use dimensional analysis to determine the following:

4. How many moles are in 3.98 g of $CuSO_4$?

$$3.98\,g \times \frac{1\ mol}{159.5\,g} =$$

Ans 0.0250 mol

5. How many molecules are in 0.1029 moles of He?

$$0.1029\ mol \times \frac{6.02 \times 10^{23}\ 'cules}{1\ mol} =$$

Ans 6.19×10^{22} 'cules

6. 8.4×10^{24} boron atoms weigh how many grams?

$$8.4 \times 10^{24}\ atoms \times \frac{1\ mol}{6.02 \times 10^{23}\ atoms} \times \frac{10.8\ g}{1\ mol} =$$

Ans 150 g

7. **$2\,KClO_3 \longrightarrow 2\,KCl + 3\,O_2$**

How many grams of O_2 will be produced from 55.4 g of $KClO_3$?

$$55.4\,g \times \frac{1\ mol\ KClO_3}{122.5\,g} \times \frac{3\ mol\ O_2}{2\ mol\ KClO_3} \times \frac{32.0\,g}{1\ mol\ O_2} =$$

Ans 21.7 g

8. **$2\,Na + Cl_2 \longrightarrow 2\,NaCl$**

a. Starting with 30.1 g of Na and 22.4 g of Cl_2, how many grams of NaCl can be made?

$$30.1\,g\ Na \times \frac{1\ mol\ Na}{23.0\,g} \times \frac{2\ mol\ NaCl}{2\ mol\ Na} \times \frac{58.5\,g}{1\ mol\ NaCl} = 76.6\,g$$

$$22.4\,g\ Cl_2 \times \frac{1\ mol\ Cl_2}{71.0\,g} \times \frac{2\ mol\ NaCl}{1\ mol\ Cl_2} \times \frac{58.5\,g}{1\ mol\ NaCl} = 36.9\,g$$

Smaller

Ans 36.9 g

b. Afterwards, 17.1 grams of NaCl are produced by the reaction. What is the % yield?

$$(17.1\,g \div 36.9\,g) \times 100 =$$

Ans 46.3 %

9a. A compound is 38.7% C, 16.1% H, and rest is N. What is its empirical formula?

100 - 38.7 - 16.1 = 45.2% N

38.7 g C × $\frac{1 \text{ mol}}{12.0 \text{ g}}$ = 3.23 mol C

16.1 g H × $\frac{1 \text{ mol}}{1.0 \text{ g}}$ = 16.1 mol H

45.2 g N × $\frac{1 \text{ mol}}{14.0 \text{ g}}$ = 3.23 mol N

$C_{\frac{3.23}{3.23}}\ H_{\frac{16.1}{3.23}}\ N_{\frac{3.23}{3.23}}$ = ↘

Ans $C_1H_5N_1$

9b. The compound above has a molecular weight of 124 g/mol, determine its molecular formula.

CH_5N = 31.0 g/mol

$\frac{124 \text{ g/mol}}{31.0 \text{ g/mol}}$ = 4

Ans $C_4H_{20}N_4$

multiply empirical formula by 4 ↑

Use the activity series (at right) to predict whether the following reactions will occur...
If **YES**, then write the products -- If **NO**, then write 'N. R.' (no reaction)

Li
K
Ca
Na
Mg
Al
Mn
Zn
Cr
Fe
Cd
Co
Ni
Sn
Pb
H
Cu
Hg
Ag
Pt
Au

10. $Al + FeCl_2$ ---> $Fe + AlCl_3$

11. $Cu(NO_3)_2 + Ca$ ---> $Cu + Ca(NO_3)_2$

12. $Zn + NaCl$ ---> N. R.

13. $K + Ag_2S$ ---> $Ag + K_2S$

Predict the products:

14. $CuSO_4 + AgCl$ ---> $CuCl_2 + Ag_2SO_4$

15. $C_2H_6 + O_2$ ---> $CO_2 + H_2O$

16. NI_3 ----> $N_2 + I_2$

17. In the penny lab, you used an acid called HCl to react with a metal called Zn which was inside the penny. This single replacement reaction produced two substances: H_2 gas and zinc chloride.
($Zn + 2HCl \rightarrow H_2 + ZnCl_2$)

18. Suppose you made a Micro-Rocket with butane (C_4H_{10}) as the fuel.
What is the correct ratio of fuel to O_2?

$2\ C_4H_{10} + 13\ O_2 \rightarrow 8\ CO_2 + 10\ H_2O$

the correct ratio of butane to O_2 is: 2:13