Name: KEY

Period: 1 2 3 4 5 6

Chemical Equations and Stoichiometry Review

Balancing Equations:

Balance the following equations:

1. 6 K + ____ B_2O_3 → 3 K_2O + 2 B

2. 2 H_3PO_4 + 3 $Mg(OH)_2$ → ____ $Mg_3(PO_4)_2$ + 6 HOH ~~H_2O~~

3. ____ $Al(OH)_3$ + 3 HBr → ____ $AlBr_3$ + 3 HOH ~~H_2O~~

4. 3 Li + ____ $AlCl_3$ → 3 LiCl + ____ Al

Types of Reactions:

Balance and determine the type of reaction.

5. 2 $NaClO_3$ → 2 NaCl + 3 O_2 Type: decomp.

6. ____ CH_4 + 2 O_2 → 2 H_2O + ____ CO_2 Type: combust.

7. 4 $(NH_4)_3PO_4$ + 3 $Pb(NO_3)_4$ → ____ $Pb_3(PO_4)_4$ + 12 ~~8~~ NH_4NO_3 Type:

8. 2 Na + ____ Cl_2 → 2 NaCl Type:

9. 2 Na + 2 ~~H_2O~~ HOH → 2 NaOH + ____ H_2 Type:

Predicting Products:

Predict the products of the following equations.

10. 2 Al + ____ Fe_3N_2 → 3Fe + 2AlN

11. 2 Na + ____ Cl_2 → 2NaCl

12. 4 $(NH_4)_3PO_4$ + 3 $Pb(NO_3)_4$ → 12NH_4NO_3 + $Pb_3(PO_4)_4$

13. 2 BF_3 + 3 Li_2SO_3 → $B_2(SO_3)_3$ (B: +3) + 6LiF

14. 2 Na + 2 HOH → H_2 + 2NaOH

Mole Conversions:

Perform the following conversions.

15. Determine the number of moles in 35.2 grams of $C_6H_{12}O_6$.

$$35.2\text{g } C_6H_{12}O_6 \times \frac{1\text{ mol}}{180\text{ g}} = .20\text{ mol}$$

C = 6 x 12 = 72
H = 12 x 1 = 12
O = 6 x 16 = 96
) 180 g/mol

16. Determine the number of moles in 152.3 grams of $Mg_3(PO_4)_2$.

$$152.3\text{g } Mg_3(PO_4)_2 \times \frac{1\text{ mol}}{262\text{ g}} = 0.58\text{ mol } Mg_3(PO_4)_2$$

Mg = 3 x 24 = 72
P = 2 x 31 = 62
O = 8 x 16 = 128
262

17. Determine the number of moles in 65.23 grams of chromium (II) nitrate.

$$65.23\text{g } Cr(NO_3)_2 \times \frac{1\text{ mol}}{176\text{ g}} = .37\text{ mol } Cr(NO_3)_2$$

Cr = 1 x 52 = 52
N = 2 x 14 = 28
O = 6 x 16 = 96
176

18. Determine the number of grams in 8.2 moles of $(NH_4)_2CO_3$.

$N = 2 \times 14 = 28$
$H = 8 \times 1 = 8$
$C = 1 \times 12 = 12$
$O = 3 \times 16 = 48$
96

$$8.2 \text{ mol } (NH_4)_2CO_3 \times \frac{96 \text{ g } (NH_4)_2CO_3}{1 \text{ mol } (NH_4)_2CO_3}$$

$$= 787.2 \text{ g } (NH_4)_2CO_3$$

19. Determine the number of grams in 23.1 moles of $NaClO_3$.

$$23.1 \text{ mol } NaClO_3 \times \frac{106 \text{ g}}{1 \text{ mol}} = 2{,}448.6 \text{ g } NaClO_3$$

$Na = 1 \times 23 = 23$
$Cl = 1 \times 35 = 35$
$O = 3 \times 16 = 48$
106

20. Determine the number of grams in 10.2 moles of diphosphorus pentasulfide.

$$10.2 \text{ mol } P_2S_5 \times \frac{222 \text{ g}}{1 \text{ mol}} = 2264.4$$

$P = 2 \times 31 = 62$
$S = 5 \times 32 = 160$
222

Mole Ratio:

Solve the following problems using mole ratios.

21. How many moles of O_2 are needed if we wish to make 6.2 moles of Fe react?

$$4Fe + 3O_2 \rightarrow 2Fe_2O_3$$

$$\frac{6.2 \text{ mol Fe}}{x \text{ mol } O_2} = \frac{4 \text{ mol Fe}}{3 \text{ mol } O_2}$$

$$\frac{6.2 \times 3}{4}$$

$$= 4.65 \text{ mol } O_2$$

22. How many moles of Mg are needed in order to produce 2.8 moles of Mg_3P_2?

$$6Mg + P_4 \rightarrow 2Mg_3P_2$$

$$\frac{2.8 \text{ mol } Mg_3P_2}{x \text{ mol Mg}} = \frac{2 \text{ mol } Mg_3P_2}{6 \text{ mol Mg}} \qquad = 8.4 \text{ mol Mg}$$

23. If 8.45 moles of magnesium chloride react with enough aluminum, how many moles of aluminum chloride are produced?

$$3MgCl_2 + 2Al \rightarrow 3Mg + 2AlCl_3$$

$$\frac{8.45 \text{ mol } MgCl_2}{x \text{ mol } AlCl_3} = \frac{3 \text{ mol } MgCl_2}{2 \text{ mol } AlCl_3}$$

$$= 5.63 \text{ mol } AlCl_3$$

Stoichiometry:

Solve for the following stoichiometry problems.

1. Find the mass of oxygen required to react with 28.4 g of ethyl alcohol, C_2H_5OH, according to the following equation.

$C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$

28.4 g	X g			
46 $\frac{g}{mol}$	32 $\frac{g}{mol}$			molar mass
1 mol	3 mols			moles

C = 2 x 12 = 24
H = 5 x 1 = 5
O = 1 x 16 = 16
H = 1 x 1 = 1
46
O = 2 x 16 = 32

= 59.3 g O_2

25. What is the mass of iron(III) oxide, Fe_2O_3, produced by the rusting of 10.0 g of iron with excess oxygen?

$4Fe(s) + 3O_2(g) \rightarrow 2Fe_2O_3(s)$

10 g		X g
56 $\frac{g}{mol}$		160 $\frac{g}{mol}$
4 mol		2 mol

Fe = 2 x 56 = 112
O = 3 x 16 = 48
160 $\frac{g}{mol}$

= 14.3 g Fe_2O_3

26. How many moles of carbon dioxide is produced by the decomposition of 72 g of aluminum carbonate, $Al_2(CO_3)_3$, according to the following equation.

$Al_2(CO_3)_3(s) \rightarrow Al_2O_3(s) + 3CO_2(g)$

72 g		X mol
234 $\frac{g}{mol}$		X
1 mol		3 mol

Al = 2 x 27 = 54
C = 3 x 12 = 36
O = 9 x 16 = 144
234 $\frac{g}{mol}$

= .923 mol CO_2