Name _____ Teacher _____ Class ____ Date ____

Chapter 11   The Mathematics of Chemical Equations

Find the answer to each problem and write it in the space at the right. In solving the problems, use the table of atomic masses below.

bromine, Br	79.9 u	oxygen, O	16.0
calcium, Ca	40.0	silver, Ag	108
carbon, C	12.0	sodium, Na	23.0
chlorine, Cl	35.5	sulfur, S	32.0
hydrogen, H	1.01	uranium, U	238
nitrogen, N	14.0	zinc, Zn	65.4

Potassium, K   39.1

1. When potassium chlorate, $KClO_3$, is heated, it decomposes to produce potassium chloride, KCl, and oxygen gas, O_2. If 4.0 moles of potassium chlorate are decomposed, how many moles of oxygen gas will be produced? $2KClO_3 \longrightarrow 2KCl + 3O_2$

1. ___6.0 moles___

2. When zinc is added to a solution of silver nitrate, the equation for the reaction that takes place is $Zn(s) + 2AgNO_3(aq) \longrightarrow 2Ag(s) + Zn(NO_3)_2(aq)$. How many moles of zinc are required to precipitate 5.0 moles of silver?

2. ___2.5 moles___

3. At STP, a 1000-mL sample of a gas has a mass of 4.00 g. What is the gram molecular mass of the gas?

3. ___89.6 grams/mole___

4. In the combustion of methane, $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$, how many liters of oxygen are required to burn 14 liters of methane if both volumes are measured at STP?

4. ___28 L___

5. In the reaction, $NH_3(g) + HCl(g) \longrightarrow NH_4Cl(s)$, how many liters of ammonia (NH_3) at STP are required to produce 107 grams of ammonium chloride?

5. ___44.8 L___

20

① $\dfrac{3 \text{ mole } O_2}{2 \text{ mole } KClO_3} = \dfrac{X \text{ mole } O_2}{4.00 \text{ mole } KClO_3}$ $\boxed{X = 6.0 \text{ moles}}$ Balance, Mole → Mole

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⑤ #2 D $\dfrac{2 \text{ mole } Ag}{1 \text{ mole } Zn} = \dfrac{5.0 \text{ mole } Ag}{X \text{ mole } Zn}$ $\boxed{X = 2.5 \text{ mole}}$ Mole → Mole

20

③ $\dfrac{1 \text{ mole}}{22.4 L} = \dfrac{X \text{ mole}}{1.0 L}$ $X = 0.04464 \text{ mole}$ $\dfrac{4.00 g}{0.04464 \text{ mole}} = \text{Mol mass} = \boxed{89.6 \text{ g/mole}}$ vol → mole, Mole → MM

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④ $\dfrac{14 L}{X \text{ mole}} = \dfrac{22.4 L}{1 \text{ mole}}$ $X = 0.625 \text{ mole } CH_4$ needs $1.250 \text{ mole } O_2 \Rightarrow \boxed{28 L O_2}$ L → mole, Mole → Mole, Mole → L

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⑤ moles $NH_4Cl = \dfrac{107 g}{53.54 g/\text{mole}} = 2.00 \text{ mole } NH_4Cl$ comes from $2.00 \text{ mole } NH_3 (g) \Rightarrow \boxed{44.8 L NH_3}$

mass → mole
mole → mole
Mole → L