STOICHIOMETRY: MIXED PROBLEMS
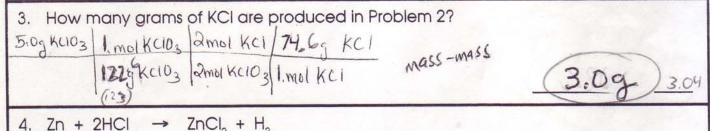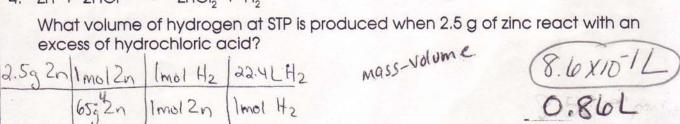
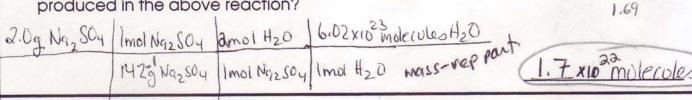Name **KEY**

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1. $N_2 + 3H_2 \rightarrow 2NH_3$

   What volume of NH_3 at STP is produced if 25.0 g of N_2 is reacted with an excess of H_2?

   $$\frac{25.0 \text{ g } N_2}{} \left| \frac{1 \text{ mol } N_2}{28 \text{ g } N_2} \right| \frac{2 \text{ mol } NH_3}{1 \text{ mole } N_2} \right| \frac{(22.4 L) NH_3}{1 \text{ mol } NH_3}$$

   mass - volume

   $\boxed{4.00 \times 10^1 \text{ L}}$

   40.0 L

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2. $2KClO_3 \rightarrow 2KCl + 3O_2$

   If 5.0 g of $KClO_3$ is decomposed, what volume of O_2 is produced at STP?

   $$\frac{5.0 \text{ g } KClO_3}{} \left| \frac{1 \text{ mol } KClO_3}{122.6 \text{ g } KClO_3 \, (123)} \right| \frac{3 \text{ mol } O_2}{2 \text{ mol } KClO_3} \right| \frac{(22.4 L) O_2}{1 \text{ mol } O_2}$$

   2016

   mass-volume

   $\boxed{1.4 \text{ L}}$ 1.37

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3. How many grams of KCl are produced in Problem 2?

   $$\frac{5.0 \text{ g } KClO_3}{} \left| \frac{1 \text{ mol } KClO_3}{122 \text{ g } KClO_3 \, (123)} \right| \frac{2 \text{ mol } KCl}{2 \text{ mol } KClO_3} \right| \frac{74.6 \text{ g } KCl}{1 \text{ mol } KCl}$$

   mass - mass

   $\boxed{3.0 \text{ g}}$ 3.04

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4. $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

   What volume of hydrogen at STP is produced when 2.5 g of zinc react with an excess of hydrochloric acid?

   $$\frac{2.5 \text{ g } Zn}{} \left| \frac{1 \text{ mol } Zn}{65 \text{ g } Zn} \right| \frac{1 \text{ mol } H_2}{1 \text{ mol } Zn} \right| \frac{22.4 L \, H_2}{1 \text{ mol } H_2}$$

   mass-volume

   $\boxed{8.6 \times 10^{-1} \text{ L}}$

   0.86 L

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5. $H_2SO_4 + 2NaOH \rightarrow 2H_2O + Na_2SO_4$

   How many molecules of water are produced if 2.0 g of sodium sulfate are produced in the above reaction?

   1.69

   $$\frac{2.0 \text{ g } Na_2SO_4}{} \left| \frac{1 \text{ mol } Na_2SO_4}{142 \text{ g } Na_2SO_4} \right| \frac{2 \text{ mol } H_2O}{1 \text{ mol } Na_2SO_4} \right| \frac{6.02 \times 10^{23} \text{ molecules } H_2O}{1 \text{ mol } H_2O}$$

   mass-rep part

   $\boxed{1.7 \times 10^{22} \text{ molecules}}$

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6. $2AlCl_3 \rightarrow 2Al + 3Cl_2$

   If 10.0 g of aluminum chloride are decomposed, how many molecules of Cl_2 are produced?

   $$\frac{10.0 \text{ g } AlCl_3}{} \left| \frac{1 \text{ mol } AlCl_3}{133.5 \text{ g } AlCl_3} \right| \frac{3 \text{ mol } Cl_2}{2 \text{ mol } AlCl_3} \right| \frac{(6.02 \times 10^{23}) \text{ molecules } Cl_2}{1 \text{ mol } Cl_2}$$

   6.76

   mass- rep part

   $\boxed{\times 10^{22} \text{ molecules}}$