Chemistry stoichiometry color by number answer key fish.
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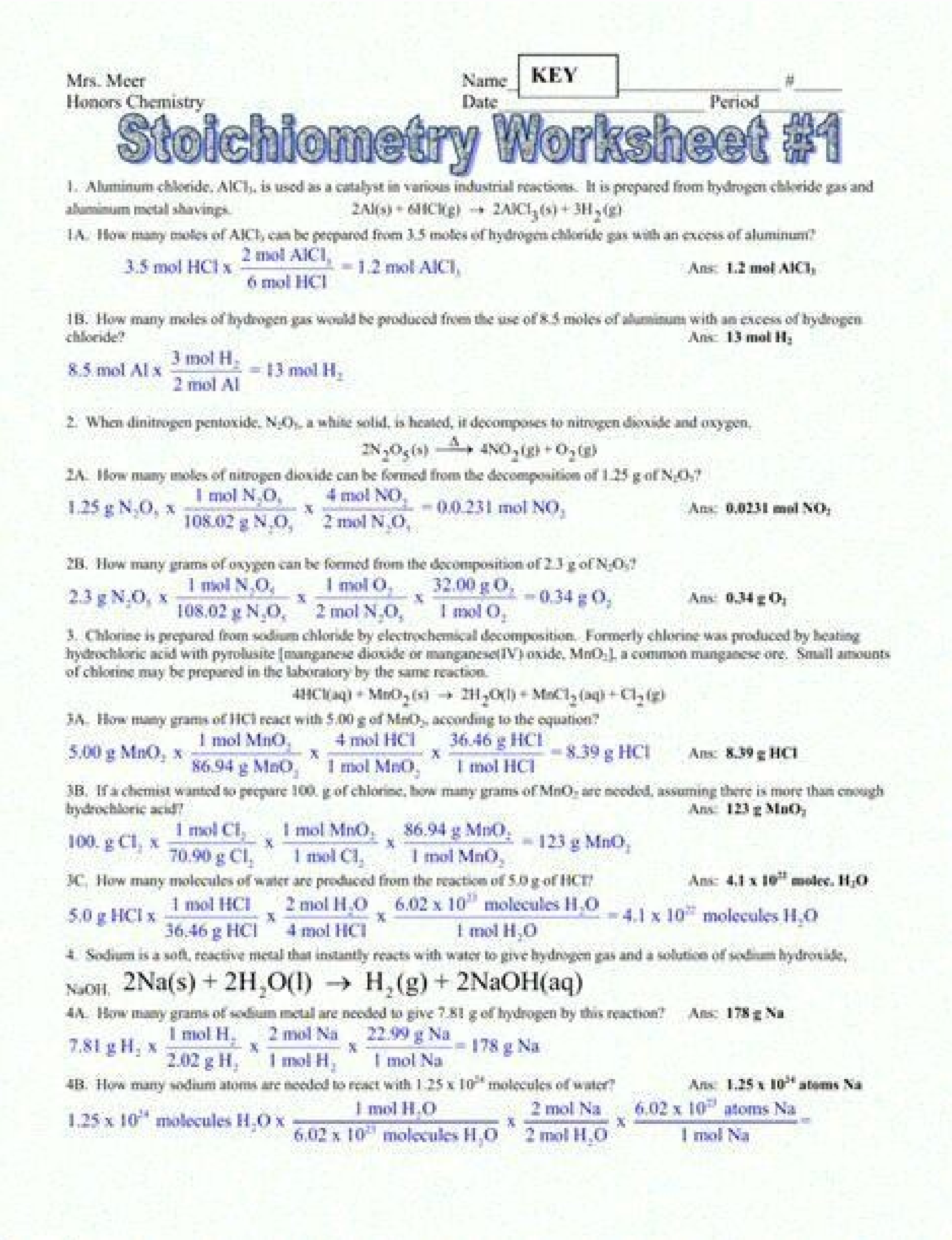
Mrs. Meer — Name **KEY** #
Honors Chemistry — Date — Period

Stoichiometry Worksheet #1

1. Aluminum chloride, $AlCl_3$, is used as a catalyst in various industrial reactions. It is prepared from hydrogen chloride gas and aluminum metal shavings. $2Al(s) + 6HCl(g) \rightarrow 2AlCl_3(s) + 3H_2(g)$

1A. How many moles of $AlCl_3$ can be prepared from 3.5 moles of hydrogen chloride gas with an excess of aluminum?

$$3.5 \text{ mol HCl} \times \frac{2 \text{ mol } AlCl_3}{6 \text{ mol HCl}} = 1.2 \text{ mol } AlCl_3$$

Ans: **1.2 mol $AlCl_3$**

1B. How many moles of hydrogen gas would be produced from the use of 8.5 moles of aluminum with an excess of hydrogen chloride?

Ans: **13 mol H_2**

$$8.5 \text{ mol Al} \times \frac{3 \text{ mol } H_2}{2 \text{ mol Al}} = 13 \text{ mol } H_2$$

2. When dinitrogen pentoxide, N_2O_5, a white solid, is heated, it decomposes to nitrogen dioxide and oxygen.

$$2N_2O_5(s) \xrightarrow{\Delta} 4NO_2(g) + O_2(g)$$

2A. How many moles of nitrogen dioxide can be formed from the decomposition of 1.25 g of N_2O_5?

$$1.25 \text{ g } N_2O_5 \times \frac{1 \text{ mol } N_2O_5}{108.02 \text{ g } N_2O_5} \times \frac{4 \text{ mol } NO_2}{2 \text{ mol } N_2O_5} = 0.0.231 \text{ mol } NO_2$$

Ans: **0.0231 mol NO_2**

2B. How many grams of oxygen can be formed from the decomposition of 2.3 g of N_2O_5?

$$2.3 \text{ g } N_2O_5 \times \frac{1 \text{ mol } N_2O_5}{108.02 \text{ g } N_2O_5} \times \frac{1 \text{ mol } O_2}{2 \text{ mol } N_2O_5} \times \frac{32.00 \text{ g } O_2}{1 \text{ mol } O_2} = 0.34 \text{ g } O_2$$

Ans: **0.34 g O_2**

3. Chlorine is prepared from sodium chloride by electrochemical decomposition. Formerly chlorine was produced by heating hydrochloric acid with pyrolusite [manganese dioxide or manganese(IV) oxide, MnO_2], a common manganese ore. Small amounts of chlorine may be prepared in the laboratory by the same reaction.

$$4HCl(aq) + MnO_2(s) \rightarrow 2H_2O(l) + MnCl_2(aq) + Cl_2(g)$$

3A. How many grams of HCl react with 5.00 g of MnO_2, according to the equation?

$$5.00 \text{ g } MnO_2 \times \frac{1 \text{ mol } MnO_2}{86.94 \text{ g } MnO_2} \times \frac{4 \text{ mol HCl}}{1 \text{ mol } MnO_2} \times \frac{36.46 \text{ g HCl}}{1 \text{ mol HCl}} = 8.39 \text{ g HCl}$$

Ans: **8.39 g HCl**

3B. If a chemist wanted to prepare 100. g of chlorine, how many grams of MnO_2 are needed, assuming there is more than enough hydrochloric acid?

Ans: **123 g MnO_2**

$$100. \text{ g } Cl_2 \times \frac{1 \text{ mol } Cl_2}{70.90 \text{ g } Cl_2} \times \frac{1 \text{ mol } MnO_2}{1 \text{ mol } Cl_2} \times \frac{86.94 \text{ g } MnO_2}{1 \text{ mol } MnO_2} = 123 \text{ g } MnO_2$$

3C. How many molecules of water are produced from the reaction of 5.0 g of HCl?

Ans: **4.1 x 10^{22} molec. H_2O**

$$5.0 \text{ g HCl} \times \frac{1 \text{ mol HCl}}{36.46 \text{ g HCl}} \times \frac{2 \text{ mol } H_2O}{4 \text{ mol HCl}} \times \frac{6.02 \times 10^{23} \text{ molecules } H_2O}{1 \text{ mol } H_2O} = 4.1 \times 10^{22} \text{ molecules } H_2O$$

4. Sodium is a soft, reactive metal that instantly reacts with water to give hydrogen gas and a solution of sodium hydroxide, NaOH. $2Na(s) + 2H_2O(l) \rightarrow H_2(g) + 2NaOH(aq)$

4A. How many grams of sodium metal are needed to give 7.81 g of hydrogen by this reaction?

Ans: **178 g Na**

$$7.81 \text{ g } H_2 \times \frac{1 \text{ mol } H_2}{2.02 \text{ g } H_2} \times \frac{2 \text{ mol Na}}{1 \text{ mol } H_2} \times \frac{22.99 \text{ g Na}}{1 \text{ mol Na}} = 178 \text{ g Na}$$

4B. How many sodium atoms are needed to react with 1.25 x 10^{24} molecules of water?

Ans: **1.25 x 10^{24} atoms Na**

$$1.25 \times 10^{24} \text{ molecules } H_2O \times \frac{1 \text{ mol } H_2O}{6.02 \times 10^{23} \text{ molecules } H_2O} \times \frac{2 \text{ mol Na}}{2 \text{ mol } H_2O} \times \frac{6.02 \times 10^{23} \text{ atoms Na}}{1 \text{ mol Na}} =$$

Stoichiometry color by number fish.

In this educational resource, students are encouraged to engage creatively with stoichiometry by personalizing their work with backgrounds and color on unnumbered sections of a drawing. This approach serves as an effective review tool, particularly useful for days when a substitute teacher may be present. The material is tailored to accommodate diverse learning needs, offering three distinct problem sets that progressively introduce more complex concepts: - **Version #1** covers fundamental stoichiometry calculations, including mole-to-mole, mole-to-mass, mass-to-mole, and mass-to-mass conversions. - **Version #2** incorporates calculations involving molar volume at standard temperature and pressure (STP). - **Version #3** extends to include calculations for limiting and excess reactants, as well as percentage yield. The lesson package includes: - Three sets of questions, each with an answer key. - A color-by-number activity featuring a butterfly, which serves as a visual aid for learning. - A variety of keys: a colored completed key, a quick key with highlighted answers, and a comprehensive key with detailed solutions. - Guidance for teachers on how to effectively integrate this resource into their instruction. Students should have a solid understanding of chemical nomenclature, molar mass computation, balancing of chemical equations, and the foundational principles of stoichiometry, including limiting and excess reactants, and how to calculate percentage yield. This turnkey solution is designed for immediate classroom implementation and is suitable for students in grades 9 through 12 studying chemistry. For educators seeking additional resources, other related offerings include complete lessons on stoichiometry, as well as specialized topics such as limiting and excess reactants, and percentage yield calculations, all structured to support a comprehensive high school chemistry curriculum.