Name: _____ **Date:** _____

Stoichiometry Alchemy: 11th Grade Quantitative Mastery Quiz

Limiting reactants, percent yield, and gas volume conversions — transition from theoretical formulas to predicting industrial chemical outcomes with precision.

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1. In the synthesis of alum from scrap aluminum, how many moles of H_2 gas are produced for every 2 moles of Al consumed according to the balanced equation: $2Al + 2KOH + 6H_2O$ ’$2KAl(OH)_4 + 3H_2$?

A. 1.5 moles
B. 2.0 moles
C. 3.0 moles
D. 6.0 moles

2. The limiting reactant in a chemical process is always the substance present with the smallest initial mass.

A. True
B. False

3. If the decomposition of 100g of calcium carbonate ($CaCO_3$, molar mass 100 g/mol) theoretically produces 44g of CO_2, but a student captures only 33g in the lab, the percent yield is _____.

A. 33%
B. 75%
C. 100%
D. 44%

4. What is the total number of atoms present in a 0.25 mole sample of pure silver (Ag)?

A. 1.506×10^{23} atoms
B. 6.022×10^{23} atoms
C. 2.408×10^{24} atoms
D. 3.011×10^{23} atoms

5. In the combustion of propane ($C_3H_{-E} + 5O_2$ ’$3CO_2 + 4H_2O$), the volume of oxygen gas required to react with 2.0L of propane at STP is _____.

A. 2.0 L
B. 5.0 L
C. 10.0 L
D. 22.4 L

6. A empirical formula always represents the actual number of atoms of each element in a molecule of a compound.

A. True
B. False

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7. If you are provided with 1 mole of Magnesium and 2 moles of Hydrochloric Acid (Mg + 2HCl ’$MgCl_2$ + H_2), which reagent is in excess if you add an additional 0.5 moles of Magnesium?

A. Hydrochloric Acid
B. Magnesium
C. Magnesium Chloride
D. Neither are in excess

8. The molar mass of hydrated copper(II) sulfate ($CuSO_4 \cdot 5H_2O$) is approximately _____ g/mol. (Atomic weights: Cu=63.5, S=32, O=16, H=1)

A. 159.5 g/mol
B. 177.5 g/mol
C. 249.5 g/mol
D. 18.0 g/mol

9. How many moles of solute are contained in 500 mL of a 0.10 M solution of Silver Nitrate ($AgNO_3$)?

A. 0.05 moles
B. 0.50 moles
C. 5.0 moles
D. 0.01 moles

10. In the reaction $2NaN_3$ ’$2Na + 3N_2$, used in car airbags, the production of 3 moles of Nitrogen gas requires the decomposition of 130 grams of Sodium Azide (NaN_3 = 65 g/mol).

A. True
B. False