Name: _____ **Date:** _____

Crush the Chemical Code: 8th Grade Stoichiometry Challenge

Students calculate theoretical yields and analyze atomic ratios to solve complex conservation of mass puzzles using advanced mole-to-mass conversions.

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1. A chemist ignites 10 grams of Magnesium (Mg) in a pressurized chamber filled with pure Oxygen (O_2). According to the Law of Conservation of Mass, which analytical result would most likely indicate an experimental error in the final white powder (MgO)?

A. The mass of the product is exactly 10 grams.
B. The mass of the product is greater than 10 grams.
C. The product contains more oxygen atoms than the initial gas provided.
D. The ratio of Mg to O atoms in the product is 1:1.

2. Consider the decomposition of Silver Oxide: $2Ag_2O$ ’ $4Ag + O_2$. To produce exactly 2.0 moles of pure Silver (Ag), you must start with ____ mole(s) of Silver Oxide.

A. 0.5 moles
B. 1.0 moles
C. 2.0 moles
D. 4.0 moles

3. True or False: In a balanced chemical equation, the total number of moles of reactants must always equal the total number of moles of products.

A. True
B. False

4. An industrial engineer is producing Iron (Fe) from Hematite (Fe_2O_3) using Carbon Monoxide. If the engineer discovers the 'Yield' was only 75%, what does this imply about the stoichiometry?

A. The balanced equation was incorrect.
B. The molar mass of Iron changed during the reaction.
C. The actual amount of Iron recovered was less than the calculated theoretical amount.
D. The reaction used 75% more reactant than necessary.

5. Identify the 'Limiting Reactant': If you have 5 moles of Nitrogen (N_2) and 9 moles of Hydrogen (H_2) for the reaction $N_2 + 3H_2$ ’ $2NH_3$, the reactant that will run out first is ____.

A. Nitrogen (N_2)
B. Hydrogen (H_2)
C. Ammonia (NH_3)
D. Neither; they are in perfect ratio.

6. Which of these samples contains the greatest number of individual atoms?

A. 1 mole of pure Gold (Au)

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B. 1 mole of Water (H2O)
C. 1 mole of Methane (CH4)
D. All contain the same number of atoms.

7. True or False: If you know the molar mass of a compound is 180 g/mol, a 90-gram sample of that compound represents exactly 0.5 moles.

A. True
B. False

8. A balloon is filled with 12.044 x 10^23 molecules of Helium gas. Based on Avogadro's number, this quantity is equal to ____ mole(s).

A. 0.5 moles
B. 1.0 moles
C. 2.0 moles
D. 4.0 moles

9. In the combustion of Glucose (C6H12O6 + 6O2 ’6CO2 + 6H2O), what is the specific molar ratio of Oxygen gas required to Water produced?

A. 1:6
B. 6:1
C. 1:1
D. 6:12

10. True or False: The molar mass of a molecule can be determined by solely looking at its atomic number on the Periodic Table.

A. True
B. False