Name: _____ **Date:** _____

A Weighty Matter: College Stoichiometry & Molar Analysis Quiz

Can you balance the scales of a chemical reactor? Quantify the invisible by linking microscopic molecular behavior to macroscopic industrial yields.

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1. A 10.0 g sample of a polymer contains 0.139 moles of the repeating monomer unit. If the monomer is known to be a vinyl derivative (C_2H_3R), which of the following is the most likely identity of the substituent group 'R'?

A. -Cl (Chlorine)
B. -CH_3 (Methyl)
C. -C_6H_5 (Phenyl)
D. -OH (Hydroxyl)
E. -Cl (Chlorine)

2. In a combustion analysis, the mass of carbon in the original sample can be determined solely by the mass of the CO_2 trapped, regardless of whether the combustion was complete or incomplete (forming CO).

A. True
B. False

3. The synthesis of urea (NH_2CONH_2) involves reacting ammonia with carbon dioxide. If 136 grams of ammonia (NH_3) reacts with excess CO_2 to produce 210 grams of urea, the percent yield is approximately ___%.

A. 75%
B. 82%
C. 88%
D. 95%

4. Consider the reaction of 3.0 g of Magnesium with 2.0 g of Nitrogen gas to form Magnesium Nitride (Mg_3N_2). Which reagent is limiting, and how much excess remains?

A. Mg is limiting; 0.85g N_2 remains
B. N_2 is limiting; 0.50g Mg remains
C. Mg is limiting; 1.43g N_2 remains
D. Reactants are in stoichiometric equivalence

5. An unknown metal oxide has the formula M_2O_3. If 0.548 moles of the oxide has a mass of 87.7 grams, the atomic mass of the metal 'M' is approximately ___ g/mol.

A. 27.0 (Aluminum)
B. 52.0 (Chromium)
C. 55.8 (Iron)
D. 102.9 (Rhodium)

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6. The actual yield of a chemical reaction can occasionally exceed the theoretical yield if the sample is not properly dried or contains unreacted starting materials.

A. True
B. False

7. A solution contains 0.500 M Silver Nitrate. If 25.0 mL of this solution is reacted with excess Sodium Phosphate, what is the maximum mass of Silver Phosphate (Ag_3PO_4) precipitate formed? (MW of Ag_3PO_4 = 418.6 g/mol)

A. 1.74 g
B. 5.23 g
C. 0.58 g
D. 3.48 g

8. In the combustion of a hydrocarbon, if the molar ratio of CO_2 produced to H_2O produced is 1:1, the empirical formula of the hydrocarbon must be in the form ___.

A. CH
B. CH_2
C. CH_3
D. C_2H

9. Avogadro's number is defined as the number of atoms in exactly 12.000 grams of Carbon-12.

A. True
B. False

10. A mixture of 2.0 moles of H_2 and 1.0 mole of O_2 is ignited in a sealed container. After the reaction to form water vapor is complete, what is the total number of moles of gas in the container (assuming T and P remain constant)?

A. 1.0 mole
B. 2.0 moles
C. 3.0 moles
D. 0.0 moles