Name: _____ **Date:** _____

Stoichiometry Summit: Climbing the Apex of 12th Grade Quantitative Chemistry

Can you predict the theoretical yield of a multi-step synthesis? Apply the mole concept to combustion analysis and transition metal coordination complexes.

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1. A 10.00 g sample of an unknown hydrocarbon yields 30.88 g of CO_2 upon complete combustion. What is the mass percent of carbon in the original sample?

A. 27.3%
B. 84.3%
C. 75.0%
D. 92.3%

2. In the synthesis of cisplatin, $Pt(NH_3)_2Cl_2$, a student starts with 0.50 moles of K_2PtCl_4. If the reaction produces 120 g of cisplatin (Molar Mass = 300.1 g/mol), the percent yield is approximately _____.

A. 40%
B. 60%
C. 80%
D. 100%

3. In a redox titration, the equivalence point occurs when the moles of the oxidizing agent are exactly equal to the moles of the reducing agent, regardless of the stoichiometric coefficients in the balanced equation.

A. True
B. False

4. Which of the following contains the greatest number of individual atoms?

A. 1.0 mole of S_8 molecules
B. 2.0 moles of P_4 molecules
C. 4.0 moles of CaO units
D. 8.0 moles of Argon atoms

5. Consider the decomposition of potassium chlorate: $2KClO_3 \rightarrow 2KCl + 3O_2$. To produce 15 moles of oxygen gas, _____ moles of $KClO_3$ are required.

A. 5
B. 7.5
C. 10
D. 15

6. Avogadro's hypothesis states that equal volumes of different gases at the same temperature and pressure contain the same number of molecules.

A. True

B. False

7. An oxide of iron is 69.9% iron by mass. What is its empirical formula?

A. FeO
B. Fe2O3
C. Fe3O4
D. Fe2O

8. A solution is prepared by dissolving 40.0 g of NaOH (MW=40.0) in enough water to make 500 mL of solution. The molarity of this solution is _____ M.

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

9. In the Haber process (N2 + 3H2 -> 2NH3), if 2 moles of N2 and 3 moles of H2 are reacted, which is the limiting reactant and how much excess of the other remains?

A. H2 is limiting; 1 mole N2 remains
B. N2 is limiting; 1 mole H2 remains
C. H2 is limiting; 0.5 mole N2 remains
D. Neither; they are in stoichiometric proportion

10. The molar mass of a substance is numerically equivalent to its atomic or molecular weight in atomic mass units (amu).

A. True
B. False