Name: _____ **Date:** _____

Answer Key: Stoichiometry Showdown: Can You Build the Perfect Chemical Recipe?

Calculate precise mass-to-particle conversions and analyze chemical formulas to solve a high-stakes laboratory challenge during your next bell-ringer or group activity.

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1. An alchemist wants to create a specific amount of Silver Nitrate for a photo experiment. If they have 2 moles of Silver (Ag), but the recipe requires a 1:3 ratio of Silver to Nitrate, how many moles of Nitrate are needed to keep the reaction balanced?

Answer: C) 6 moles

In a 1:3 ratio, you multiply the starting amount by 3. Since we have 2 moles of Silver, 2 x 3 = 6 moles of Nitrate.

2. In the world of the very small, a 'mole' is simply a counting unit, much like a 'dozen' represents 12. If a baker has 3 moles of sugar molecules, they have approximately _____ molecules in total.

Answer: B) 18.066 x 10^23

To find the total number of particles, multiply Avogadro's number (6.022 x 10^23) by the number of moles (3). 3 x 6.022 = 18.066.

3. True or False: If you have 1 mole of Gold atoms and 1 mole of Helium atoms, both groups will contain the exact same number of individual atoms.

Answer: A) True

A mole is a universal counting constant. Regardless of the element's weight, one mole always contains Avogadro's number of particles.

4. A scientist is studying a fuel that uses Magnesium. If the balanced equation is 2Mg + O2 ’2MgO, what is the stoichiometric ratio of Magnesium used to Magnesium Oxide produced?

Answer: C) 1:1

The coefficients in front of Mg and MgO are both 2. A 2:2 ratio simplifies to a 1:1 ratio.

5. Imagine the 'molar mass' is the weight of a giant bag containing exactly one mole of atoms. If one atom of Element X weighs 10 units, and one atom of Element Y weighs 20 units, the molar mass of a molecule made of XY2 would be _____.

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Answer: C) 50 units

Calculation: (1 x 10) + (2 x 20) = 10 + 40 = 50. You must sum the masses of all atoms in the formula.

6. True or False: If a reaction has a 1:1 ratio, but you provide 5 moles of reactant A and only 2 moles of reactant B, you will still be able to produce 5 moles of product.

Answer: B) False

Reactant B is the 'limiting reactant.' Once you use up the 2 moles of B, the reaction stops, regardless of how much A is left.

7. Using the 'recipe' Phosphorus + 5 Oxygen 'Phosphorus Pentoxide, if you start with 10 moles of Oxygen, how many moles of Phosphorus do you need to ensure no oxygen is left over?

Answer: A) 2 moles

The ratio is 1 Phosphorus for every 5 Oxygen. If you have 10 Oxygen molecules, you divide by 5 to find that 2 Phosphorus moles are required.

8. If you are trying to find the molar mass of Calcium Carbonate (CaCO3), and the masses are Ca=40, C=12, and O=16, the total mass for one mole is _____ g/mol.

Answer: C) 100

Calculated as: 40 (Ca) + 12 (C) + (3 x 16 for O) = 40 + 12 + 48 = 100 g/mol.

9. True or False: Stoichiometry is based on the Law of Conservation of Mass, which states that matter cannot be created or destroyed in a chemical reaction.

Answer: A) True

Stoichiometry is the mathematical proof of this law; the mass of the reactants must equal the mass of the products in a balanced system.

10. If a reaction produces 1 mole of Water (H2O) for every 1 mole of Sodium Chloride (NaCl), and your experiment produced 3.5 moles of NaCl, how many moles of Water were also created?

Answer: B) 3.5 moles

Since the ratio is 1:1, the number of moles produced for one product will be exactly the same as the other.