

Name: _____ Date: _____

Could You Feed the Whole Colony? 6th Grade Mole Calculations

Analyze chemical recipes to predict mass outcomes and verify Avogadro's constant in real-world scenarios designed to bridge foundational chemistry with analytical reasoning.

1. A team of space explorers needs to synthesize 180 grams of water (H₂O) for their journey. If the molar mass of water is 18 g/mol, how many moles of water does the team need to produce to survive?

- A. 1 mole
- B. 10 moles
- C. 18 moles
- D. 180 moles

2. If a balanced chemical equation shows a 1:2 ratio between Methane (CH₄) and Oxygen (O₂), calculating how much Oxygen is needed for 5 moles of Methane would require _____ moles of Oxygen.

- A. 2.5
- B. 5
- C. 7.5
- D. 10

3. True or False: Avogadro's number (6.022×10^{23}) represents a different quantity of atoms if you are measuring Lead compared to when you are measuring Helium.

- A. True
- B. False

4. In a lab experiment, you have 2 moles of Silver (Ag) and 2 moles of Gold (Au). Which of the following statements is true regarding their physical properties?

- A. They have the same number of atoms, but different masses.
- B. They have different numbers of atoms, but the same mass.
- C. They have the same number of atoms and the same mass.
- D. Gold has twice as many atoms because it is more valuable.

5. A chef is using a chemical reaction to carbonate water. The formula requires 2 moles of Bicarbonate for every 1 mole of Citric Acid. To react with 0.5 moles of Citric Acid, the chef needs _____ moles of Bicarbonate.

- A. 0.25
- B. 0.5
- C. 1.0
- D. 2.0

6. You discover a mystery substance with a molar mass of 32 g/mol. If you have a 64-gram sample, how many individual particles (atoms or molecules) are in that sample?

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- A. 6.022×10^{23}
- B. 1.204×10^{24}
- C. 3.011×10^{23}
- D. 2.0

7. True or False: Stoichiometry is primarily used in chemistry to determine the speed (velocity) at which a reaction occurs.

- A. True
- B. False

8. Analyze the reaction: $2\text{Al} + 3\text{Cl}_2 \rightarrow 2\text{AlCl}_3$. If an industrial plant wants to create 50 moles of AlCl_3 , how many moles of Chlorine gas (Cl_2) must they start with?

- A. 25 moles
- B. 50 moles
- C. 75 moles
- D. 100 moles

9. A scientist has 3.011×10^{23} atoms of Iron. This represents _____ of a mole.

- A. $1/4$ (0.25)
- B. $1/2$ (0.5)
- C. 1 (1.0)
- D. 2 (2.0)

10. Why is the mole used as a standard unit in chemistry instead of just measuring everything by its weight in grams?

- A. Because atoms react in specific number ratios, not mass ratios.
- B. Because grams are too large of a unit to measure single atoms.
- C. Because gravity is different in every laboratory.
- D. Because chemicals only react when they are in liquid form.