

Name: _____

Honors Chemistry Practice: The Mole; Concepts, Calculations and Comparisons

1. Concepts:

- _____ Which SI base unit is used to define the amount of substance?
- _____ The number 6.02×10^{23} is named in honor of the Italian chemist _____.
- _____ What is the mass of 6.02×10^{23} molecules of water?
- _____ STP refers to a temperature of _____ °C and _____ kPa pressure.
- _____ What is the mass of 1 mole of Mg atoms.
- _____ What volume will 1.0 mol of mercaptin gas occupy at STP?
- _____ How many molecules of SO_2 are in 1.0 mol of SO_2 gas?
- _____ One mole of an element was found to have a mass of 65.4 grams. What is the element?
- _____ How many molecules of hydrogen are contained in 11.2 dm^3 of H_2 gas?
- _____ How many atoms of Br are in 1.00 mol of Br_2 ?



2. Conversions:

- | | |
|---|---|
| a.) What is the mass of 2.50 moles of potassium chloride? | f.) What is the mass of 3.88×10^{21} units (molecules) of magnesium nitrate? |
| b.) How many grams of oxygen gas are contained in 30.0 dm^3 of oxygen gas at STP? | g.) 3.00g of dry ice (solid carbon dioxide) is converted to a gas at STP. How many moles are present of this gas? |
| c.) How many molecules of tetraphosphorous decoxide are in $2.00 \times 10^3 \text{ g}$ of tetraphosphorous decoxide? | h.) How many molecules are in a 1.86 mol sample of riboflavin? |
| d.) What volume at STP will 0.50 mol of ammonia gas have? | i.) What is the mass of 3.62 moles of sodium carbonate? |
| e.) 0.0032 grams of nicotine (F.M.= 162 g/mol) are contained in 1 cigarette. How many molecules is this? | j.) What volume will 325 grams of sulfur dioxide occupy at STP? What is the density of this gas at STP? |

3. Comparisons:

- _____ 1 mole of Ag atoms contains (more / less / the same number of) atoms than/as 1 mole of Au.
- _____ 1 mole of H_2O contains (more / less / the same) mass as one mole of UF_6 .
- _____ 1 mole of $\text{C}_6\text{H}_{12}\text{O}_6$ contains (the same number as / more / less) atoms of C as 1 mol of CO_2 ?
- _____ 1 mol of H_2 gas occupies (more / less / the same) volume as 1 mole of SO_2 .
- _____ Rank from LEAST to GREATEST amount of Ca atoms:
A.) 0.2 mol Ca B.) 1×10^{20} Ca atoms C.) 10 g Ca

The Grumpy Mole Saloon
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EXPOSE YOURSELF TO THE BEST OF THE WEST

1. Complete the table for the substances listed.

Substance	Mass	Moles	Number of Molecules or Formula Units	Volume at STP if a gas
C ₄ H ₁₀	15.0 g			
K ₂ SO ₄		0.0250 mol		XXXXXX
UF ₆			3.1 x10 ²⁵	
H ₂ S				4.00 dm ³

2. Perform the following conversions. Report all answers with correct sig figs and units. Show work on a separate piece of paper.

- _____ 25.0 grams of Fe to moles
- _____ 0.50 moles of CO₂ to grams
- _____ 2.0 x10⁻¹ grams of Au to atoms
- _____ 10.0g of F₂ gas at STP to Liters
- _____ 257.2 grams of HNO₃ to molecules
- _____ 9.0x10²² molecules of PH₃ to grams
- _____ 50.0dm³ of O₂ to moles
- _____ 91.8 mg of Ca(NO₃)₂ to formula units
- _____ 7.1x10¹⁷ molecules of benzene to moles
- _____ 3.20 liters of propane gas to molecules

2. More Mole Investigations:

- 0.00572 moles of an unknown substance composed of carbon, oxygen, sulfur, and hydrogen has a mass of 3.860 grams. What is its molecular mass?
- What mass of magnesium is needed to equal the number of atoms that are contained in 5.00 grams of carbon?
- Avogadro's Principle: Tank A and B are identical (pressure, volume, and temperature). If tank A contains 2.0 x10⁴ grams of oxygen gas, then how many grams of chlorine would be in tank B?
- How many atoms of gold are contained in 1.00 gram of the compound Au₂S₃?