The Mole, Mass, and Molar Mass

Mole (mol) - Measurement of how many particles exist.	1 mole = 6.022×10^{23} particles
Molar mass - How much 1 mole of a substance weighs	(g/mol) Examples 1 mole of Fe(s) weighs 55.85 g $N_{2(g)}$ $M_N = (14.01 \text{ g/mol}) \times (2)$ $\quad = 28.02 \text{ g/mol}$ $NH_4NO_{3(s)}$ $M_{total} = 2M_N + 4M_H + 3M_{Oxy}$ $\quad\quad = 2(14.01) + 4(1.01) + 3(16.00)$ $\quad\quad = 80.06 \text{ g/mol}$
Formula $\quad m = Mn$ $\quad m$ = mass (g) $\quad M$ = molar mass (g/mol) $\quad N$ = # of moles (mol)	Examples 1.50 mol of $NaCl_{(s)}$
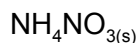
4.00 mol of $CO_{2(g)}$

$m = Mn$ $= \frac{58.44g}{mol} \times (1.50 \; mol)$ $= 87.66 \; g$	$M_{total} = M_{Na} + M_{Cl}$ $= 22.99 + 35.45$ $= 58.44$ g

4.00 mol of $CO_{2(g)}$

$m = Mn$ $= (44.01 \; g/mol \times 4.00 \; mol$ $= 176.04 \; g$	$M = M_C + 2M_{Oxy}$ $= 12.01 + 2(16.00)$ $= 44.01$ g/mol

Chemical x

$m = 35.00g$ $n = 0.125 \; mol$ $M = \; ??$	$m = Mn$ $m \div n = Mn \div n$ $M = \frac{m}{n}$ $= \frac{35.00 \; g}{0.125 \; mol}$ $= 280 \; g/mol$

Chemistry 20 - Science 10 Review - Stoichiometric Calculations; The Mole

Name: _____

Ensure that you show all of your work, including the formulas used and substitution of numerical values. Record each answer with units and pay attention to the appropriate number of significant digits.

You may find the following formula useful: m = Mn

1. Write the chemical formula and then calculate the molar mass of each of the following elements and compounds.

a. Elemental phosphorus	
b. Elemental sulfur.	h. Lanthanum iodate
c. Magnesium chloride.	i. Actinium peroxide
d. Osmium nitride.	j. Tungsten dichromate
e. Vanadium (V) hydrogen oxalate.	k. Praseodymium thiocyanate
f. Zirconium permanganate	l. Zinc sulfide.
g. Ammonium benzoate	m. Copper (I) perchlorate

2. Calculate the number of moles of each of the following entities.

a. 3.6 grams of elemental phosphorus.	d. 3.1 grams of osmium nitride.
b. 14.8 grams of elemental sulfur.	e. 2.12 grams of vanadium (V) hydrogen oxalate.
c. 32.6 grams of magnesium chloride.	f. 7.89 grams of zirconium permanganate.

3. Calculate the mass of each of the following entities.
   a. 3.2 moles of elemental phosphorus.

   b. 0.18 moles of elemental sulfur.

   c. 2.34 moles of magnesium chloride.

   d. 4.5 moles of osmium nitride.

   e. 5.0 moles of vanadium (V) hydrogen oxalate.

   f. 0.011 moles of zirconium permanganate.

   g. 1.34 moles of ammonium benzoate.

   h. 0.0023 moles of lanthanum iodate.

Challenge Problem:
A sample of an unknown element has a mass of 0.080 grams. A particle counter reveals that this sample contains 1.5055×10^{21} particles. What is the identity of the unknown element?