

Name _____

Atoms Worksheet #3 (More Practice Problems)

SHOW ALL WORK USING DIMENSIONAL ANALYSIS!!!!

1. Calculate the following:

a. molecules in 5.00 moles of nitrogen gas

$$5.00 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} = 3.01 \times 10^{24} \text{ molecules}$$

b. molecules in 8.78 moles of oxygen gas

$$8.78 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} = 5.29 \times 10^{24} \text{ molecules}$$

c. atoms in 4.89 moles of calcium

$$4.89 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = 2.94 \times 10^{24} \text{ atoms}$$

d. atoms in 6.0 moles of nitrogen gas

$$6.0 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = 3.61 \times 10^{24} \text{ atoms}$$

2. Calculate the number of grams represented by the following:

a. 3.01×10^{23} atoms of sodium

$$3.01 \times 10^{23} \text{ atoms} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ atoms}} \times \frac{22.99 \text{ g}}{1 \text{ mol}} = 11.5 \text{ g}$$

b. 1.20×10^{24} atoms of sulfur

$$1.20 \times 10^{24} \text{ atoms} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ atoms}} \times \frac{32.06 \text{ g}}{1 \text{ mol}} = 63.9 \text{ g}$$

c. 1.44×10^{26} molecules of carbon dioxide CO_2

$$1.44 \times 10^{26} \text{ molecules CO}_2 \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ molecules}} \times \frac{44.01 \text{ g CO}_2}{1 \text{ mol}} = 10527 \text{ g}$$

3. How many atoms are in 2.73×10^{-2} moles of magnesium?

$$2.73 \times 10^{-2} \text{ mol Mg} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = 1.64 \times 10^{22} \text{ atoms}$$

4. How many moles of SO_3 are in 2.4×10^{24} molecules of SO_3 ?

$$2.4 \times 10^{24} \text{ molecules SO}_3 \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ molecules}} = 4.0 \text{ mol}$$

5. The chemical formula for aspirin is $\text{C}_9\text{H}_8\text{O}_4$. What is the mass in grams of 0.40 moles of aspirin?

$$0.40 \text{ mol} \times \frac{180.154 \text{ g}}{1 \text{ mol}} = 72.06 \text{ g}$$

6. 65.3 grams of lithium would contain how many atoms of lithium?

$$65.3 \text{ g} \times \frac{1 \text{ mol}}{6.939 \text{ g}} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = 5.67 \times 10^{24} \text{ atoms}$$

7. A sample of potassium contains 7.00×10^{26} atoms of potassium. What is the mass in grams of this sample?

$$7.00 \times 10^{26} \text{ atoms} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ atoms}} \times \frac{39.10 \text{ g}}{1 \text{ mol}} = 45465 \text{ g}$$

* answers posted on the website *

Name -Key-

Atoms Worksheet: (The Mole)

1. Counting Atoms – How many atoms are in the following compounds?

a) How many atoms are in 10.0 g of calcium chloride?

$$10\text{g CaCl}_2 \times \frac{1 \text{ mol}}{110.98 \text{ g CaCl}_2} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = 5.42 \times 10^{22}$$

2. Calculate the molar mass of the following compounds:

a) NaCl = 58.44 b) Fe₂O₃ = 159.7 c) LiOH = 23.95

d) NH₃ = 17.03 e) AlPO₄ = 121.95

3. Mole-to-Gram/Gram-to-Mole Conversions (One Step Problems)

a) How many grams of Ca are present in 3.28 moles?

$$3.28 \text{ mol} \times \frac{40.08 \text{ g}}{1 \text{ mol}} = 131 \text{ g}$$

b) How many grams of S are present in 5.39 moles?

$$5.39 \text{ mol} \times \frac{32.06 \text{ g}}{1 \text{ mol}} = 172 \text{ g}$$

c) How many moles of Ag are there in 4.98 gram?

$$4.98 \text{ g} \times \frac{1 \text{ mol}}{107.9 \text{ g}} = 0.462 \text{ mol}$$

d) How many moles of Mg are present in 303 grams?

$$303 \text{ g} \times \frac{1 \text{ mol}}{24.31 \text{ g}} = 12.5 \text{ mol}$$

4. Conversions using Avogadro's number (One Step Problems)

a) How many atoms are present in 34.69 moles of Mg?

$$34.69 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = 2.088 \times 10^{25} \text{ atoms}$$

b) How many atoms are present in 0.529 moles of Li?

$$0.529 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = 3.18 \times 10^{23} \text{ atoms}$$

c) How many moles of Mn are present in 4.09×10^{24} atoms of Mn?

$$4.09 \times 10^{24} \text{ atoms} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ atoms}} = 6.79 \text{ mol}$$

d) How many moles of Ni are present in 5.88×10^{19} atoms?

$$5.88 \times 10^{19} \text{ atoms} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ atoms}} = 9.77 \times 10^{-5} \text{ mol}$$

5. Grams ↔ Moles ↔ Particles OR Atoms OR Molecules (Two Step Problems)

a) Calculate the number of molecules in 8.33 grams of O₂

$$8.33 \text{ g} \times \frac{1 \text{ mol}}{32 \text{ g}} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} = 1.57 \times 10^{23} \text{ molecules}$$

b.) Calculate the number of atoms in 43.33 grams of iron, Fe?

$$43.33 \text{ g} \times \frac{1 \text{ mol}}{55.85 \text{ g}} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = 4.67 \times 10^{23} \text{ atoms}$$

c) Calculate the number of particles in 32.8 grams of Cu₂S.

$$32.8 \text{ g Cu}_2\text{S} \times \frac{1 \text{ mol}}{159.16 \text{ g}} \times \frac{6.02 \times 10^{23} \text{ particles}}{1 \text{ mol}} = 1.24 \times 10^{23} \text{ particles}$$

e) Calculate the number of grams of lithium in 5.44×10^{21} atoms of lithium.

$$5.44 \times 10^{21} \text{ atoms} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ atoms}} \times \frac{6.939 \text{ g}}{1 \text{ mol}} =$$

f) Calculate the number of grams of SO₃ in 3.92×10^{25} molecules of sulfur trioxide.

$$3.92 \times 10^{25} \text{ molecules} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ molecules}} \times \frac{80.06 \text{ g}}{1 \text{ mol}} = 5213 \text{ g}$$