

Moles & Mass Practice Problems

1. Identify and calculate the number of representative particles in each of the following quantities

a. 2.15 moles of gold

b. 0.151 mole of nitrogen oxide

c. 11.5 moles of potassium bromide

2. Calculate the number of moles of the substance that contains the following number of representative particles.

a. 8.92×10^{23} atoms of barium

b. 5.50×10^{25} molecules of carbon monoxide

c. 2.66×10^{22} formula units of potassium iodide

3. Determine the mass in grams of each of the following quantities.

a. 1.24 moles of beryllium

b. 3.35 moles of calcium

c. 0.155 mole of sulfur

4. Calculate the number of moles in each of the following quantities.

a. 6.35 g lithium

b. 346 g zinc

c. 115 g nickel

5. How many atoms are in the following samples?

a. 1.24 g cobalt

b. 0.575 g cesium

c. 65.6 g silicon

6. Which quantity has the greatest mass?

a. 4.16×10^{23} atoms of radium

b. 1.50×10^{20} atoms of cadmium

c. 1.33×10^{24} atoms of argon

7. Calculate the number of moles in each of the following quantities.

a. atoms of each element in 3.35 moles of aspirin ($C_9H_8O_4$)

b. positive and negative ions in 1.75 moles of calcium fluoride (CaF_2)

8. Determine the molar mass of each of the following compounds.

a. formic acid (CH_2O_2)

b. ammonium dichromate ($(NH_4)_2Cr_2O_7$)

9. What is the mass in grams of each of the following quantities?

a. 2.53 moles of lead (II) nitrate ($\text{Pb}(\text{NO}_3)_2$)

b. 4.62 moles of magnesium bromide (MgBr_2)

10. Calculate the number of moles in each of the following samples.

a. 3.75 g calcium carbide (CaC_2)

b. 245 g aluminum nitrite ($\text{Al}(\text{NO}_2)_3$)

11. Determine the percent composition of each of the following compounds.

a. manganese oxide (MnO)

b. propanol ($\text{C}_3\text{H}_8\text{O}$)

12. Determine the empirical formula for a 100.00-g sample of a compound having the following percent composition.

a. 94.07% sulfur and 5.93% hydrogen

b. 80.68% mercury, 12.87% oxygen, and 6.45% sulfur

13. A 48.30-g sample of an aluminum-iodine compound contains 3.20 g of aluminum. What is the empirical formula for the compound?

14. A 50.00-g sample of hydrated manganese(II) chloride yields 31.75 g of the anhydrous compound after heating. Determine the chemical formula and name of the hydrate.

15. Caffeine is a compound found in some natural coffees and teas and in some colas.

a. Determine the empirical formula for caffeine, using the following composition of a 100.00-g sample.

**49.47 grams of carbon
28.85 grams of nitrogen
16.48 grams of oxygen
5.20 grams of hydrogen**

b. If the molar mass of caffeine is 194.19 g/mol, calculate its molecular formula.