

Define:

mole: $1 \text{ mole} = 6.02 \times 10^{23}$ particles (or atoms or molecules or formula units)

molar mass: $\frac{\text{g}}{\text{mol}}$ ← periodic table or $\frac{\text{mol}}{\text{g}}$

particles: atoms or molecules or formula units
(CO_2) (NaCl)

molar volume: $\frac{22.4 \text{ L}}{1 \text{ mol}}$ or $\frac{1 \text{ mol}}{22.4 \text{ L}}$

Solve:

1. Determine the mass of 1 mole of the following substances.

a. Ca 40.078 g/mol Ca	b. H_2S $1.01(2)$ + 32.1 $= 34.1 \text{ g/mol}$ H_2S	c. O_2 $15.9 \rightarrow 16.0 \times 2$ $= 32.0 \text{ g/mol}$ O_2
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2. Determine the number of moles present in each of the following masses.

a. 5.6 g Na $5.6 \text{ g Na} \times \frac{1 \text{ mol Na}}{22.9 \text{ g Na}} =$ 0.24 mol Na	b. 15.78 g CO_2	c. $1.4 \times 10^2 \text{ g N}_2$
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3. Calculate the mass of each of the following number of moles.

a. 2.0 moles of C $2.0 \text{ mol C} \times \frac{12.01 \text{ g C}}{1 \text{ mol C}} =$ $24. \text{ g C}$	b. $0.75 \text{ moles of H}_2\text{O}$	c. $157 \text{ moles of NaCl}$
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4. How many particles are present in each of the following substances?

a. 2.5 moles of Fe $2.5 \text{ mol Fe} \times \frac{6.02 \times 10^{23} \text{ atoms Fe}}{1 \text{ mol Fe}}$ $= 1.5 \times 10^{24} \text{ atoms Fe}$	b. $0.781 \text{ moles of Cu}_2\text{SO}_4$	c. 120 moles of F_2
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5. Determine the number of moles present in each of the following.

a. 5×10^{23} atoms of Ni $5 \times 10^{23} \text{ atoms Ni} \times \frac{1 \text{ mol Ni}}{6.02 \times 10^{23} \text{ atoms Ni}}$ $= 0.8 \text{ mol Ni}$	b. 1.68×10^{25} molecules of Cl_2	c. 3.2×10^{22} particles of CaCl_2

6. What volume of gas is present at STP?

a. 5.0 moles of N_2 $5.0 \text{ mol N}_2 \times \frac{22.4 \text{ L N}_2}{1 \text{ mol N}_2}$ $= 110 \text{ L N}_2$	b. 20.0 moles of $\text{H}_2\text{O(g)}$	c. 1.5×10^{-3} moles of CO_2

7. Determine the number of moles present in each of the following volumes of gases at STP.

a. 2.5 L F_2 $2.5 \text{ L F}_2 \times \frac{1 \text{ mol F}_2}{22.4 \text{ L F}_2}$ $= 0.11 \text{ mol F}_2$	b. 20.5 L Xe	c. 50 L Ne

8. Calculate the number of particles in each of the following @ STP.

a. 25 g of Li $25 \text{ g Li} \times \frac{1 \text{ mol Li}}{6.9 \text{ g Li}} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol Li}}$ $= 2.2 \times 10^{24} \text{ atoms Li}$	b. 0.725 g of Br_2	c. 28 L of NO(g)

9. What is the mass of each of the following substances?

a. 5.6×10^{23} particles of Pb $5.6 \times 10^{23} \text{ atoms Pb} \times \frac{1 \text{ mol Pb}}{6.02 \times 10^{23} \text{ atoms}} \times \frac{207 \text{ g Pb}}{1 \text{ mol Pb}}$ $= 190 \text{ g Pb}$	b. 1.02×10^{25} particles of NO_2	c. 25 L of CO_2 @ STP

10. Determine the volume of gas for each of the following @ STP.

a. 7.3×10^{20} particles of Cl_2 $7.3 \times 10^{20} \text{ molecules Cl}_2 \times \frac{1 \text{ mol Cl}_2}{6.02 \times 10^{23} \text{ molecules}} \times \frac{22.4 \text{ L Cl}_2}{1 \text{ mol Cl}_2}$ $= 0.027 \text{ L Cl}_2$	b. 5.0 g of H_2	c. 1.8×10^{26} particles of Ne