

Molar Volume Worksheet

1. Find the volume in the problems below. Assume they are gasses at STP.

a. 4.5 moles of H_2

$$\frac{4.5 \text{ moles}}{1 \text{ mol}} \times 22.4 \text{ L} = 100.8 \text{ L} = \boxed{1.0 \times 10^2 \text{ L}}$$

b. 56.0 grams of O_2

$$\frac{56.0 \text{ g}}{32.00 \text{ g}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times 22.4 \text{ L} = 39.2 \text{ L} = \boxed{39.2 \text{ L}}$$

c. 0.0023 moles of CO_2

$$\frac{0.0023 \text{ moles}}{1 \text{ mol}} \times 22.4 \text{ L} = 0.05152 \text{ L} = \boxed{0.052 \text{ L}}$$

d. 5.2×10^{26} molecules of CH_4

$$\frac{5.2 \times 10^{26} \text{ molecules}}{6.02 \times 10^{23} \text{ molecules}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times 22.4 \text{ L} = 19348 \text{ L} = \boxed{1.9 \times 10^5 \text{ L}}$$

2. Find the molecules in the problems below.

a. 500 moles of Cl_2

$$\frac{500 \text{ moles}}{1 \text{ mole}} \times 6.02 \times 10^{23} \text{ molecules} = 3.01 \times 10^{26} \text{ molecules}$$

b. 20,484 grams of H_2O

$$\frac{20484 \text{ g}}{18.02 \text{ g}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times 6.02 \times 10^{23} \text{ molecules} = 6.843156 \times 10^{26} \text{ molecules} = \boxed{6.8432 \times 10^{26} \text{ molecules}}$$

c. 75.0 liters of F_2 at STP

$$\frac{75.0 \text{ L}}{22.4 \text{ L}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times 6.02 \times 10^{23} \text{ molecules} = 2.015625 \times 10^{24} = \boxed{2.02 \times 10^{24} \text{ molecules}}$$

3. Find the mass in the problems below

a. 9.0×10^{17} molecules of He gas at STP

$$\frac{9.0 \times 10^{17} \text{ molecules}}{6.02 \times 10^{23} \text{ molecules}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times 4.00 \text{ g} = 5.98 \times 10^{-6} \text{ g} = \boxed{5.98 \times 10^{-6} \text{ g}}$$

b. 11.5 liters of Cl_2 gas at STP

$$\frac{11.5 \text{ L}}{22.4 \text{ L}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times 70.90 \text{ g} = 36.3995 \text{ g} = \boxed{36.4 \text{ g}}$$

c. 75.0 moles of Argon gas at STP

$$\frac{75.0 \text{ mol}}{1 \text{ mol}} \times 39.95 \text{ g} = 2996 \text{ g}$$

4. Find the moles of hydrogen in the problems below

a. 4 moles of CH₄

32 grams CH₄

3.01 × 10²³ molecules of CH₄

44.8 liters CH₄

$$\frac{4 \text{ moles CH}_4}{1} \times \frac{4}{1} = 16 \text{ moles} = 2 \times 10^1 \text{ moles}$$

$$\frac{3.01 \times 10^{23}}{6.02 \times 10^{23}} \times \frac{4}{1} = 2.00 \text{ moles}$$

$$\frac{32 \text{ g}}{16.05 \text{ g}} \times \frac{4}{1} = 7.975 \text{ moles} = 8.0 \text{ moles}$$

$$\frac{44.8 \text{ L}}{22.4 \text{ L}} \times \frac{4}{1} = 8.00 \text{ moles}$$

5. Do the problems below. Show all your work

a. Find the volume of 3.0 × 10²⁵ molecules of Neon gas at STP

$$\frac{3.0 \times 10^{25} \text{ molecules}}{6.02 \times 10^{23} \text{ molecules}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times 22.4 \text{ L} = 1116 \text{ L} = 1.1 \times 10^3 \text{ L}$$

b. You have 36.0 grams of Iron. How many moles of iron do you have?

$$\frac{36.0 \text{ g}}{55.85 \text{ g}} \times \frac{1 \text{ mol}}{1 \text{ mol}} = 0.645 \text{ mol Fe}$$

c. Calculate the number of molecules in 17.0 liters of oxygen gas at STP

$$\frac{17.0 \text{ L}}{22.4 \text{ L}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times 6.02 \times 10^{23} \text{ molecules} = 4.57 \times 10^{23} \text{ molecules}$$

d. Jim has 300 grams of sulfur dioxide. How many moles of oxygen are in Jim's sulfur dioxide?

$$\frac{300 \text{ g}}{64.07 \text{ g}} \times \frac{1 \text{ mol SO}_2}{1 \text{ mol SO}_2} \times \frac{2 \text{ mol O}}{1 \text{ mol SO}_2} = 9.36 \text{ mol O}$$

e. Billy has 5.6 × 10²⁴ molecules of Helium gas to fill balloons at a ballgame. If each balloon holds 1.5 liters, how many balloons can he fill? Assume STP

$$\frac{5.6 \times 10^{24} \text{ molecules}}{6.02 \times 10^{23} \text{ molecules}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times 22.4 \text{ L} = 138 \text{ balloons}$$

↓
cant fill 1/2 balloon