

Mole Conversions - Numbers 1-15 First

Key

1. A sample of silver has a mass of 125.0 grams. How many moles of silver atoms are in this sample?

$$125.0 \text{ g Ag} \times \frac{1 \text{ mol Ag}}{107.87 \text{ g Ag}} = 1.159 \text{ mol Ag}$$

2. A sample of sodium hydroxide is known to have 0.885 moles of formula units. What is the mass of this sample of sodium hydroxide?

$$0.885 \text{ mol NaOH} \times \frac{40 \text{ g NaOH}}{1 \text{ mol NaOH}} = 35.4 \text{ g NaOH}$$

3. There are 5.22×10^{24} molecules of carbon dioxide in a given quantity of this gas. How many moles ^{are} present in this sample of carbon dioxide?

$$5.22 \times 10^{24} \text{ molecules CO}_2 \times \frac{1 \text{ mol CO}_2}{6.022 \times 10^{23} \text{ molecules CO}_2} = 8.67 \text{ mol CO}_2$$

4. A sample of copper contains 3.55 moles of copper atoms. How many atoms are in this sample?

$$3.55 \text{ moles Cu} \times \frac{6.022 \times 10^{23} \text{ atoms Cu}}{1 \text{ mole Cu}} = 2.14 \times 10^{24} \text{ atoms Cu}$$

5. A quantity of calcium acetate has a mass of 25.00 grams. How many moles of calcium acetate is this?

$$25.00 \text{ g Ca}(\text{C}_2\text{H}_3\text{O}_2)_2 \times \frac{1 \text{ mole Ca}(\text{C}_2\text{H}_3\text{O}_2)_2}{158.165 \text{ g Ca}(\text{C}_2\text{H}_3\text{O}_2)_2} = 0.1581 \text{ mol Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$$

6. A sample of oxygen molecules contains 7.88×10^{22} molecules. What is the mass of the sample of oxygen?

$$7.88 \times 10^{22} \text{ molecules O}_2 \times \frac{1 \text{ mol O}_2}{6.022 \times 10^{23} \text{ molecules O}_2} \times \frac{32 \text{ g O}_2}{1 \text{ mol O}_2} = 4.19 \text{ g O}_2$$

7. A sample of manganic chloride has a mass of 85.0 grams. How many formula units is in this sample of this ionic compound?

$$85.0 \text{ g MnCl}_3 \times \frac{1 \text{ mol MnCl}_3}{161.297 \text{ g MnCl}_3} \times \frac{6.022 \times 10^{23} \text{ F. units MnCl}_3}{1 \text{ mol MnCl}_3} = 3.17 \times 10^{23} \text{ F. units MnCl}_3$$

8. What is the mass of 6.85×10^{25} molecules of the gas hydrogen?

$$6.85 \times 10^{25} \text{ molecules H}_2 \times \frac{1 \text{ mol H}_2}{6.022 \times 10^{23} \text{ molecules H}_2} \times \frac{2.0158 \text{ g H}_2}{1 \text{ mol H}_2} = 230. \text{ g H}_2$$

9. How many atoms of aluminum would there be in a sample of aluminum with a mass of 250.0 grams?

$$250.0 \text{ g Al} \times \frac{1 \text{ mol Al}}{26.982 \text{ g Al}} \times \frac{6.022 \times 10^{23} \text{ atoms Al}}{1 \text{ mol Al}} = 5.580 \times 10^{24} \text{ atoms Al}$$

10. How many atoms of carbon are in a sample of table sugar, $\text{C}_{12}\text{H}_{22}\text{O}_{11}$, that has a mass of 500.0 grams?

$$500.0 \text{ g C}_{12}\text{H}_{22}\text{O}_{11} \times \frac{1 \text{ mol C}_{12}\text{H}_{22}\text{O}_{11}}{342.29 \text{ g C}_{12}\text{H}_{22}\text{O}_{11}} \times \frac{12 \text{ C atoms}}{1 \text{ mol C}_{12}\text{H}_{22}\text{O}_{11}} = 17.53 \text{ C atoms}$$

11. A sample of oxygen gas at STP has a volume of 245 L. How many moles of oxygen is this?

$$245 \text{ L O}_2 \times \frac{1 \text{ mol O}_2}{22.4 \text{ L O}_2} = 10.9 \text{ mol O}_2$$

12. What is the volume, in liters, of a gas at STP that contains 3.24×10^{24} molecules?

$$3.24 \times 10^{24} \text{ molecules gas} \times \frac{1 \text{ mol gas}}{6.022 \times 10^{23} \text{ molecules gas}} \times \frac{22.4 \text{ L gas}}{1 \text{ mol gas}} = 121 \text{ L gas}$$

13. How many molecules are in a 20.0 g sample of carbon dioxide?

$$20.0 \text{ g CO}_2 \times \frac{1 \text{ mol CO}_2}{44 \text{ g CO}_2} \times \frac{6.022 \times 10^{23} \text{ molecules CO}_2}{1 \text{ mol CO}_2} = 2.74 \times 10^{23} \text{ molecules CO}_2$$

14. A sample of hydrogen gas is known to have a volume of 225 L at STP. What is the mass of the sample of hydrogen gas?

$$225 \text{ L H}_2 \times \frac{1 \text{ mol H}_2}{22.4 \text{ L H}_2} \times \frac{2.0158 \text{ g H}_2}{1 \text{ mol H}_2} = 20.2 \text{ g H}_2$$

15. A sample of ammonium chloride has a mass of 89.0 grams. How many moles is this?

$$89.0 \text{ g NH}_4\text{Cl} \times \frac{1 \text{ mol NH}_4\text{Cl}}{53.49 \text{ g NH}_4\text{Cl}} = 1.66 \text{ mol NH}_4\text{Cl}$$

16. What is the mass of 7.67×10^{20} molecules of methane, CH_4 ?

17. What is the total number of ions present in 7.3 moles of potassium phosphate?

18. What is the total number of atoms in 425 grams of water?

19. What is the total mass of a mixture of 3.50×10^{23} formula units of Na_2SO_4 , 0.500 moles of water, and 7.23 grams of silver chloride?

20. How many iodide ions are in 32.4 moles of barium iodide?

21. Dimethylnitrosamine ($\text{CH}_3)_2\text{N}_2\text{O}$, is a cancer causing agent that may be formed in foods, beverages, or gastric juices from the reaction of nitrite ions (used as a food preservative) with other substances.

a. Calculate the molar mass of dimethylnitrosamine.

b. How many moles of dimethylnitrosamine would there be in 500.0 mg?

c. How many nitrogen atoms would there be in 1.00 grams of dimethylnitrosamine?