

#### Answers to Review #4: Calculations using Moles, Simplest Formulas and Molecular Formulas

- How many atoms are there in one molecule of acetic acid? 8 atoms ( $\text{CH}_3\text{COOH}$ )
- How many atoms are there in one molecule of  $\text{Cr}(\text{NO}_3)_3$ ? 13 atoms
- How many things are there in one mole?  $6.02 \times 10^{23}$  things
- What is the mass of one molecule of water in a.m.u.? 18.02 amu
- What is the molar mass of water? 18.02 g/mol
- You are given 30.0 grams of water. How many:
  - moles of water is this? 1.66 moles  $\text{H}_2\text{O}$
  - molecules of water is this?  $1.00 \times 10^{24}$  molecules
  - atoms is this (in total)?  $3.01 \times 10^{24}$  atoms
  - atoms of hydrogen is this?  $2.00 \times 10^{24}$  atoms of H
  - grams of oxygen is this? 26.6 g of oxygen
- What volume is occupied by 10.0 grams of water vapour at STP? 12.4 L at STP
- What is the mass of 100.0 L of methane gas ( $\text{CH}_4$ ) at STP? 71.7 g
- How many molecules of water are there in 5.00 L of water vapour at STP?  $1.34 \times 10^{23}$  molecules
- What is the molar mass of  $\text{Sn}_3(\text{PO}_4)_2$ ? 546.07 g/mol
- How many moles are there in 195 g of  $\text{CO}_2$ ? 4.43 mol
- How many molecules are there in 195 g of  $\text{CO}_2$ ?  $2.67 \times 10^{24}$  molecules
- If you have  $4.80 \times 10^{24}$  molecules of  $\text{CO}_2$  :
  - how many moles is this? 7.97 mol
  - what is the mass? 351 g
  - what volume will this gas occupy at STP? 179 L
- What is the mass of 89.6 L of carbon dioxide at STP? 176 g
- You have 8.50 g of carbon dioxide.
  - How many moles of  $\text{CO}_2$  is this? 0.193 mol
  - How many molecules of  $\text{CO}_2$  is this?  $1.16 \times 10^{23}$  molecules
  - How many atoms of oxygen are in this amount of  $\text{CO}_2$ ?  $2.33 \times 10^{23}$  atoms of O
  - What is the mass of carbon in this amount of  $\text{CO}_2$ ? 2.32 g of C
  - What volume will this amount of  $\text{CO}_2$  occupy at STP? 4.32 L
- How many moles are there in:
  - 1.5 g of NaCl 0.026 mol
  - 4.5 L of  $\text{CH}_4$  gas at STP 0.20 mol
  - $5.0 \times 10^{25}$  molecules of NO 83 mol
  - $1.50 \times 10^6$  atoms of neon, Ne  $2.49 \times 10^{-18}$  mol
  - 2.00 L of a solution of 6.00 M HCl 12.0 mol HCl
  - 1.22 L of propane gas at STP 0.0545 mol
  - 300.0 mL of a 2.00 M NaOH solution 0.600 mol NaOH

17. Find the percentage by mass of nitrogen in  $\text{Al}(\text{NO}_3)_3$ . 19.7%
18. Calculate the mass of 0.0250 mol of NaF. 1.05 g
19. Calculate the mass of 1.50 L of argon gas, Ar, at STP. 2.68 g
20. A sample of a chemical was analyzed and found to contain 138 grams of sodium, 36 grams of carbon and 144 grams of oxygen. Determine the simplest formula for the compound.  $\text{Na}_2\text{CO}_3$
21. A chemist analyzes a sample of rock from the centre of the earth. It contains 18.61 g of iron and 8.00 g of oxygen. What is the simplest formula for the iron compound in the rock?  $\text{Fe}_2\text{O}_3$
22. Analysis of an organic compound shows that it contains 61.02% carbon, 11.86% hydrogen and 27.12% oxygen. What is the simplest formula of the compound? If the molar mass of the compound is 118.1 g/mol, what is the molecular formula of the compound?
- simplest formula is  $\text{C}_3\text{H}_7\text{O}$ , and the molecular formula is  $\text{C}_6\text{H}_{14}\text{O}_2$
23. Find the simplest formula for the compound with composition:
- a) 38.7% carbon, 9.7% hydrogen and 51.6% oxygen  $\text{CH}_3\text{O}$
- b) 82.4% nitrogen and 17.6% hydrogen  $\text{NH}_3$
24. A certain compound is 40.0% carbon, 6.7% hydrogen and 53.3% oxygen by weight. One mole of this substance weighs 180 grams. What is the molecular formula of the compound?  $\text{C}_6\text{H}_{12}\text{O}_6$