

Review Assignment: The Mole

1.
 - a) The molar mass of aluminum nitrate nonahydrate, $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$ is:
 - b) The number of moles of oxygen in 3.0 moles of aluminum nitrate nonahydrate, $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$, is:
 - c) The number of oxygen atoms present in 0.153 mol of dinitrogen trioxide, N_2O_3 :
 - d) The number of molecules of water in 1.25 mol H_2O is:
 - e) If the molar mass of an unknown substance is found to be 56.2 g/mol, the mass of 2.5 mol of the substance is:
 - f) The number of moles of ethane, C_2H_6 , in 72.1 g is:
 - g) The percent of nitrogen, by mass, in N_2O_3 is:
 - h) The mass of nitrogen in 34 g of N_2O_3 is:
 - i) The percent water in $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$
 - j) The mass of one atom of nitrogen in grams is:
 - k) A compound has a molar mass of 144.98 g/mol and an empirical formula of $\text{C}_4\text{H}_8\text{O}$. The compound's molecular formula is:
2. A 40.5 g sample of a compound is made up of 10.5 g of nitrogen and 30.0 g of oxygen. Determine the empirical formula of the compound.
3. A compound with a molar mass of 116.73 g/mol is found to contain 61.73% carbon and 10.36% hydrogen and 27.41% oxygen, by mass. Determine the molecular formula of the compound.
4. Complete the following chart:

Formula	Name
$\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$	
	Iron (III) sulfide trihydrate
5. A sample of a hydrated compound of NaNO_3 is massed, gently heated to remove the water and then remassed. Using the following data, calculate the % water of the hydrate and the "x" in the formula $\text{NaNO}_3 \cdot x\text{H}_2\text{O}$.
 Mass before heating: 6.25 g
 Mass after heating: 3.82 g
6. Determine the hydrated formula of copper (II) carbonate if the percent water is 50.52%.

7. Compare the following pairs of terms:

- a) Empirical formula, molecular formula
- b) Mole, molecule
- c) Atomic mass, molar mass
- d) Error, percent error

8. A water molecule contains one central oxygen atom and two hydrogen atoms. How many oxygen atoms in 2.2 moles of water?

- a) 1.32×10^{24}
- b) 1.32×10^{25}
- c) 1.32×10^{23}
- d) 6.02×10^{23}

9. Copper wire consists of copper atoms connected through metallic bonds. Find the moles of copper in 1.87×10^{24} copper atoms.

- a) 1.00
- b) 3.1
- c) 3.11
- d) 6.02×10^{23}

10. Tungsten is the metal used in most light bulb filaments. One filament contains around 0.018 grams of tungsten. The atomic mass of tungsten is 183.84 g/mol. How many moles of tungsten are in a light bulb filament?

- a) 9.8×10^{-5}
- b) 3.3
- c) 1.1×10^{20}
- d) 0.0054

11. Uranium is a radioactive metal that can be refined and used for nuclear power plants. The atomic mass of uranium is 238. How many uranium atoms are present in 1.00 kg of uranium?

- a) 4.20
- b) 6.02×10^{27}
- c) 1.43×10^{27}
- d) 2.53×10^{24}

12. How many moles of C_3H_8 are present in 451 g C_3H_8 ?

- a) 3.84
- b) 0.879
- c) 10.2
- d) 1.44

13. Calculate the number of moles of hydrogen atoms in 4.75 mol sulfuric acid.

- a) 2.38
- b) 4.75
- c) 9.50
- d) 33.2

14. Ethanol is C_2H_5OH . How many atoms of hydrogen are in 92 grams of ethanol?

- a) 7.2×10^{24}
- b) 1.2×10^{24}
- c) 6.0×10^{24}
- d) 3.0×10^{24}

15. What is the percent composition of carbon dioxide CO_2 ?

- a) 73% C and 27% O
- b) 27% C and 73% O
- c) 33% C and 66% O
- d) 50% C and 50% O

16. An empirical formula mass is found to be 17 g/mol. The molar mass is found to be 34 g/mol. What is the number of empirical formula units in this molar mass?

- a) 2 units
- b) 0.50 units
- c) 17 units
- d) 1 units

17. A sample of a metal salt contains 36.1 % calcium and 63.9 % chlorine. What is the empirical formula?

- a) $CaCl$
- b) Ca_2Cl_2
- c) Ca_2Cl
- d) $CaCl_2$

18. A compound that has a specific number of water molecules bound to the structure is _____?

- a) A hydrate
- b) an anhydrate
- c) aqueous
- d) waterlogged

19. A sample is 50.7% $CaCl_2$ and 49.3 % H_2O . How many water molecules are associated with this hydrate?

- a) 5
- b) 6
- c) 8
- d) 10