



# Worksheet: Empirical and Molecular Formulas

1. Compound M contains 40% carbon, 6.7% hydrogen, and 53.3% oxygen by mass. Determine its empirical and molecular formulas.

Empirical Formula:  $\text{CH}_2\text{O}$   
Molecular Formula:  $\text{C}_2\text{H}_4\text{O}_2$

2. Compound N has the following composition: 55.8% carbon, 13.1% hydrogen, and 31.1% oxygen by mass. Determine its empirical and molecular formulas.

Empirical Formula:  $\text{C}_4\text{H}_{10}\text{O}_2$   
Molecular Formula:  $\text{C}_8\text{H}_{20}\text{O}_4$

3. Compound O is composed of 30.45% phosphorus and 69.55% oxygen by mass. Determine its empirical and molecular formulas.

Empirical Formula:  $\text{P}_2\text{O}_5$   
Molecular Formula:  $\text{P}_4\text{O}_{10}$

4. Compound P has an empirical formula of  $\text{CH}_2\text{O}$  and a molar mass of approximately 180 g/mol. Determine its molecular formula.

Molecular Formula:  $\text{C}_6\text{H}_{12}\text{O}_6$

5. Compound Q has an empirical formula of  $\text{NH}_3$  and a molar mass of approximately 17 g/mol. Determine its molecular formula.

Molecular Formula:  $\text{NH}_3$

6. Compound R consists of 62.1% carbon, 10.4% hydrogen, and 27.5% oxygen by mass. Determine its empirical and molecular formulas.

Empirical Formula:  $\text{C}_4\text{H}_{10}\text{O}_2$   
Molecular Formula:  $\text{C}_8\text{H}_{20}\text{O}_4$

7. Compound S contains 40% carbon, 53.3% chlorine, and 6.7% hydrogen by mass. Determine its empirical and molecular formulas.

Empirical Formula:  $\text{CHCl}_3$   
Molecular Formula:  $\text{C}_2\text{H}_2\text{Cl}_6$

8. Compound T is composed of 30% nitrogen and 70% oxygen by mass. Determine its empirical and molecular formulas.



Empirical Formula:  $\text{N}_2\text{O}_5$

Molecular Formula:  $\text{N}_4\text{O}_{10}$

9. Compound U has an empirical formula of  $\text{C}_2\text{H}_4$  and a molar mass of approximately 116 g/mol. Determine its molecular formula.

Molecular Formula:  $\text{C}_6\text{H}_{12}$

10. Compound V has an empirical formula of  $\text{N}_2\text{O}_4$  and a molar mass of approximately 92 g/mol. Determine its molecular formula.

Molecular Formula:  $\text{N}_4\text{O}_8$



## Answers

1. Compound M:

- Empirical Formula:  $\text{CH}_2\text{O}$

- Molecular Formula:  $\text{C}_2\text{H}_4\text{O}_2$

2. Compound N:

- Empirical Formula:  $\text{C}_4\text{H}_{10}\text{O}_2$

- Molecular Formula:  $\text{C}_8\text{H}_{20}\text{O}_4$

3. Compound O:

- Empirical Formula:  $\text{P}_2\text{O}_5$

- Molecular Formula:  $\text{P}_4\text{O}_{10}$

4. Compound P:

- Molecular Formula:  $\text{C}_6\text{H}_{12}\text{O}_6$

5. Compound Q:

- Molecular Formula:  $\text{NH}_3$

6. Compound R:

- Empirical Formula:  $\text{C}_4\text{H}_{10}\text{O}_2$

- Molecular Formula:  $\text{C}_8\text{H}_{20}\text{O}_4$

7. Compound S:

- Empirical Formula:  $\text{CHCl}_3$

- Molecular Formula:  $\text{C}_2\text{H}_2\text{Cl}_6$

8. Compound T:

- Empirical Formula:  $\text{N}_2\text{O}_5$

- Molecular Formula:  $\text{N}_4\text{O}_{10}$

9. Compound U:



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- Molecular Formula:  $C_6H_{12}$

10. Compound V:

- Molecular Formula:  $N_4O_8$