9. MOLECULAR FORMULAS

CH30S UNIT 1 WIEBE

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REVIEW

- We can use a variety of methods to find the **% composition** of an unknown compound (ie. combustion analysis, elemental analysis)
- From the % composition, we can determine the **empirical formula** of a compound (last lesson)
- The empirical formula of a compound is the **lowest whole number ratio** of elements in the compound.

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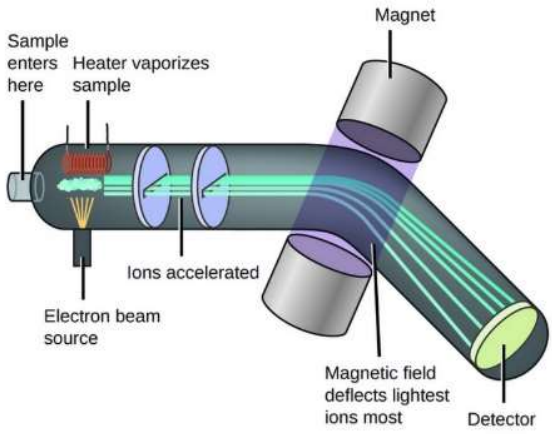
MOLECULAR FORMULA DETERMINATION

- Using a **mass spectrometer**, we can determine the **molar mass** of an unknown compound.
- If we compare this measured molar mass with the molar mass of the empirical formula, we can determine the molecular formula of the unknown compound!



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RELATING EMPIRICAL TO MOLECULAR

	EMPIRICAL FORMULA	E.F. MOLAR MASS	M.F. MOLAR MASS	MOLECULAR FORMULA
EXAMPLE #1	C_4H_8NO		**258.24 g/mol**	
EXAMPLE #2	C_7H_{12}		**192.24 g/mol**	

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EXAMPLE #1

Caffeine is the component of coffee and tea that stimulates the cerebral cortex. A typical cup of coffee or tea contains about 0.10 g of caffeine. Combustion analysis indicates that caffeine is 49.47% carbon, 5.20% hydrogen, 16.48% oxygen, and the remainder nitrogen. If the molar mass of caffeine is 194.22 g/mol, what is the empirical and molecular formula of caffeine?

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EXAMPLE #2

Serotonin is a compound that conducts nerve impulses in the brain and influences the moods we experience. It is composed of 68.2% carbon, 6.86% hydrogen, 15.9% nitrogen, and 9.08% oxygen. Its molar mass is 176 g/mol. Determine the empirical and molecular formula for serotonin.

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