Determination of Empirical and Molecular Formulas

Empirical Formula, **E.F. (atom ratio)**: from % composition by weight.

Substance contains 40.0% carbon, 6.7% hydrogen, (assume remainder, 53.3% is oxygen).

Since the composition is independent of the size of the sample, choose a 100 gram sample for convenience.

Element	**Amount (grams)**	**Atomic Mass (grams/mole)**	**Amount (moles)**	**Mole Ratio**	**Atom Ratio**
Carbon	**40.0**	**12.01**	**3.33**	**1**	**1**
Hydrogen	**6.7**	**1.008**	**6.65**	**2**	**2**
Oxygen	**53.3**	**16.00**	**3.33**	**1**	**1**

Atom ratio reexpressed: $C_1H_2O_1$, or CH_2O

Molecular Formula, **M.F. (atom number)**; from **E.F.** + molecular weight:

If the molecular weight is 30, the molecular formula is CH_2O

If the molecular weight is 60, the molecular formula is $C_2H_4O_2$

If the molecular weight is 90, the molecular formula is $C_3H_6O_3$

etc.

Structural Formula **(atom connections)**; from **M.F.** + properties