

## CHEM 1094

## EMPIRICAL AND MOLECULAR FORMULAS

- Calculate the empirical (simplest) formula from the following information.
  - C = 52.9%      O = 47.1%    **(C<sub>3</sub>O<sub>2</sub>)**
  - C = 54.5%      O = 36.6%      H = 9.1%    **(C<sub>2</sub>H<sub>4</sub>O)**
  - P = 56.3%      S = 43.7    **(P<sub>4</sub>S<sub>3</sub>)**
  - H = 4.55      P = 47.0      O = 48.5    **(H<sub>3</sub>PO<sub>2</sub>)**
  - Si = 30.2      O = 8.59      F = 61.2    **((Si<sub>2</sub>OF<sub>6</sub>)**
- Determine the molecular formulas of the compounds for which the following empirical formulas and molar masses are given.
  - CH<sub>2</sub>      42.0    **(C<sub>3</sub>H<sub>6</sub>)**      b) SbO<sub>2</sub>      307.6    **(Sb<sub>2</sub>O<sub>4</sub>)**
  - B<sub>2</sub>H<sub>3</sub>      98.4    **(B<sub>8</sub>H<sub>12</sub>)**      d) SeS      111.1    **(SeS)**
  - SCl      135.2    **(S<sub>2</sub>Cl<sub>2</sub>)**
- Caffeine has an elemental composition of 49.5% carbon, 5.15% hydrogen, 28.9% nitrogen and the rest is oxygen. What is the simplest formula of caffeine? The molar mass of caffeine is 194.2 g. Calculate its molecular formula. **(C<sub>4</sub>H<sub>5</sub>N<sub>2</sub>O, C<sub>8</sub>H<sub>10</sub>N<sub>4</sub>O<sub>2</sub>)**
- Monosodium glutamate (MSG) has 35.51% carbon, 4.77% hydrogen, 37.85% oxygen, 8.29% nitrogen, and 13.60% sodium. What is its molecular formula if its molar mass is 169 g?  
**(Same EF and MF of C<sub>5</sub>H<sub>8</sub>O<sub>4</sub>NNa)**
- When 5.00 g of phosphorus (symbol P) is burned in air, 11.44 g of the oxide is produced. Calculate the simplest formula of the oxide. **(P<sub>2</sub>O<sub>5</sub>)**
- When 3.46 g of the hydrate of sodium carbonate is heated to drive off the water of hydration, the anhydrous residue has a mass of 1.28 g. What is the formula of the hydrate? **(Na<sub>2</sub>CO<sub>3</sub> 10 H<sub>2</sub>O)**