

Science 10 Honours Percentage Composition, Empirical Formula, and Molecular Formula

- Calculate the percentage composition of the following:
  - $C_2H_6$
  - $FeCl_2$
  - $FeCl_3$
  - $C_2H_4O_2$
  - $CaCO_3$
  - $NaOH$
  - $CaCl_2 \cdot 2H_2O$
  - $(NH_4)_3PO_4$
- Calculate the percentage of the underlined molecules contained in one mole of the following:
  - $CaCl_2 \cdot \underline{2H_2O}$
  - $CuSO_4 \cdot \underline{5H_2O}$
  - $Cr(\underline{NH_3})_6Cl_3 \cdot H_2O$
- Find the empirical formula for the following compounds:
  - 77.7% Fe, 22.3% O
  - 70.0% Fe, 30.0% O
  - 72.4% Fe, 27.6% O
  - 46.3% Li, 53.7% O
  - 26.6% K, 35.4% Cr, 38.0% O
  - 21.8% Mg, 27.9% P, 50.3% O
- Convert the following into empirical formula:
  - A 24.0g sample contains 5.5g of Ca, 9.7g Cl and 8.8g of O.
  - An 8.3g sample contains 2.4g of Mg, 1.2g of C, and 4.7g of O.
  - A sample contains 11.24g of Na, 17.34g of Cl, and 7.82g of O.
  - A sample contains 25.5g of Ni, 10.4g of C, and 27.8g of O.
  - A sample contains 6.54g of Zn, 2.80g of N, and 11.20g of O.
- A 7.30g sample of a hydrocarbon (contains only hydrogen and carbon) is burned to give 23.8g of  $CO_2$  and 7.30g of  $H_2O$ . What is the empirical formula of the compound?
- Sample A contains 13.4 g of Fe, 7.4g of P, and 15.4g of O.  
Sample B contains 14.23g of Fe, 5.27g of P, and 10.88 g of O  
Which one is ferrous phosphate?
- Calculate the molecular formula for each of the following:
  - An artificial flavoring sample contains 4.32g of oxygen atoms, 3.24g of carbon atoms, and 0.54g of hydrogen atoms. Its molecular formula is 90.0g/mol.
  - Melamine has a molecular mass of 126g/mol. A sample contains 27.0g of carbons atoms, 63.0g of nitrogen atoms, and 4.5g of hydrogen atoms.
  - Naphthalene or mothballs has a molecular mass of 128.0g/mol. A sample contains 168.0g of carbon atoms, and 11.2g of hydrogen atoms.
  - 3,4-benzopyrene is a carcinogen found in cigarettes. A sample of this compound has 76.8g of carbon atoms, and 3.84g of hydrogen atoms. The molecular mass of this compound is 252.0g/mol.
- The explosive, TNT, is composed of 37.0% carbon, 2.20% hydrogen, 18.5% nitrogen, and 42.3% oxygen.
  - Determine the empirical formula for TNT.
  - The molar mass for TNT is 227g/mol. What is the molecular formula for TNT?

ANSWERS: Remember, it is the work that is important!  
Copying the answers only cheats yourself!

- 1a. 20.0% H, 80.0% C
- b. 44.0% Fe, 56.0%Cl
- c. 34.4% Fe, 65.6%Cl
- d. 40.0% C, 6.7% H, 53.3% O
- e. 40.0% Ca, 12.0% C, 48.0% O
- f. 57.5% Na, 40.0% O, 2.5% H
- g. 27.3% Ca, 48.3% Cl, 2.7% H, 21.7% O
- h. 28.2% N, 8.0% H, 20.8% P, 43.0% O

- 2a. 24.5% H<sub>2</sub>O
- b. 36.0% H<sub>2</sub>O
- c. 36.6% NH<sub>3</sub>

- 3a. FeO
- b. Fe<sub>2</sub>O<sub>3</sub>
- c. Fe<sub>3</sub>O<sub>4</sub>
- d. Li<sub>2</sub>O
- e. K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>
- f. Mg<sub>2</sub>P<sub>2</sub>O<sub>7</sub>

- 4a. CaCl<sub>2</sub>O<sub>4</sub>
- b. MgCO<sub>3</sub>
- c. NaClO
- d. NiC<sub>2</sub>O<sub>4</sub>
- e. ZnN<sub>2</sub>O<sub>7</sub>

5. C<sub>2</sub>H<sub>3</sub>

6. Sample B, but be sure to show your work so you can explain why!

- 7a. C<sub>3</sub>H<sub>6</sub>O<sub>3</sub>
- b. C<sub>3</sub>N<sub>6</sub>H<sub>6</sub>
- c. C<sub>10</sub>H<sub>8</sub>
- d. C<sub>20</sub>H<sub>12</sub>

- 8a. C<sub>7</sub>H<sub>5</sub>N<sub>3</sub>O<sub>6</sub>
- b. C<sub>7</sub>H<sub>5</sub>N<sub>3</sub>O<sub>6</sub> or better yet, C<sub>7</sub>H<sub>5</sub>(NO<sub>2</sub>)<sub>3</sub>