

EMPIRICAL AND MOLECULAR FORMULA WORKSHEET

1. An oxide of chromium is found to have the following % composition: 68.4 % Cr and 31.6 % O. Determine this compound's empirical formula.
2. The percent composition of a compound was found to be 63.5 % silver, 8.2 % nitrogen, and 28.3 % oxygen. Determine the compound's empirical formula.
3. A 170.00 g sample of an unidentified compound contains 29.84 g sodium, 67.49 g chromium, and 72.67 g oxygen. What is the compound's empirical formula?
4. A 60.00 g sample of tetraethyl lead, a gasoline additive, is found to contain 38.43 g lead, 17.83 g carbon, and 3.74 g hydrogen. Find its empirical formula.
5. A compound containing 5.9265 % H and 94.0735 % O has a molar mass of 34.01468 g/mol. Determine the empirical and molecular formula of this compound.

Empirical and Molecular Formulas Worksheet

Objectives:

- be able to calculate empirical and molecular formulas

Empirical Formula

1) What is the empirical formula of a compound that contains 0.783g of Carbon, 0.196g of Hydrogen and 0.521g of Oxygen?

2) What is empirical formula of a compound which consists of 89.14% Au and 10.80% of O?

3) What is empirical formula if compound consists of 21.2%N, 6.1%H, 24.2%S and 48.5%O?

Molecular Formula

4) Empirical formula of a substance is CH_2O . Molar mass is 180. What is the molecular formula?

5) Sample (3.585g) contains 1.388g of C, 0.345g of H, 1.850g O and its molar mass is 62g. What is molecular formula of this substance?

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| 1. | $\text{C}_2\text{H}_6\text{O}$ |
| 2. | Au_2O_3 |
| 3. | $\text{N}_2\text{H}_8\text{SO}_4$ |
| 4. | $\text{C}_6\text{H}_{12}\text{O}_6$ |
| 5. | $\text{C}_3\text{H}_6\text{O}_2$ |

Percent Composition and Molecular Formula Worksheet

1. What's the empirical formula of a molecule containing 65.5% carbon, 5.5% hydrogen, and 29.0% oxygen?
2. If the molar mass of the compound in problem 1 is 110 grams/mole, what's the molecular formula?
3. What's the empirical formula of a molecule containing 18.7% lithium, 16.3% carbon, and 65.0% oxygen?
4. If the molar mass of the compound in problem 3 is 73.8 grams/mole, what's the molecular formula?

Write the molecular formulas of the following compounds:

5. A compound with an empirical formula of C_2OH_4 and a molar mass of 88 grams per mole.
6. A compound with an empirical formula of C_4H_4O and a molar mass of 136 grams per mole.
7. A compound with an empirical formula of $CFBrO$ and a molar mass of 254.7 grams per mole.
8. A compound with an empirical formula of C_2H_8N and a molar mass of 46 grams per mole.

Answer the following questions:

9. The percentage composition of acetic acid is found to be 39.9% C, 6.7% H, and 53.4% O. Determine the empirical formula of acetic acid.
10. The molar mass for question #9 was determined by experiment to be 60.0 g/mol. What is the molecular formula?
11. Aniline, a starting material for urethane plastic foams, consists of C, H, and N. Combustion of such compounds yields CO_2 , H_2O , and N_2 as products. If the combustion of 9.71 g of aniline yields 6.63 g H_2O and 1.46 g N_2 , what is its empirical formula?
12. The molar mass of aniline is 93 g/mol. What is its molecular formula?
13. Calculate the mass percent of carbon, nitrogen and oxygen in acetamide, C_2H_5NO .
14. A 50.51 g sample of a compound made from phosphorus and chlorine is decomposed. Analysis of the products showed that 11.39 g of phosphorus atoms were produced. What is the empirical formula of the compound?
15. When 2.5000 g of an oxide of mercury, (Hg_xO_y) is decomposed into the elements by heating, 2.405 g of mercury are produced. Calculate the empirical formula.
16. The compound benzamide has the following percent composition. What is the empirical formula?
C = 69.40 % H = 5.825 % O = 13.21 % N = 11.57 %
17. A component of protein called serine has an approximate molar mass of 100 g/mole. If the percent composition is as follows, what is the empirical and molecular formula of serine?
C = 34.95 % H = 6.844 % O = 46.56 % N = 13.59 %

Empirical and Molecular Formula Worksheet

SHOW WORK ON A SEPARATE SHEET OF PAPER.

Write the empirical formula for the following compounds.

- 1) C_6H_6
- 2) C_8H_{18}
- 3) WO_2
- 4) $C_2H_6O_2$
- 5) $X_{39}Y_{13}$
- 6) A compound with an empirical formula of C_2OH_4 and a molar mass of 88 grams per mole. What is the molecular formula of this compound?
- 7) A compound with an empirical formula of C_4H_4O and a molar mass of 136 grams per mole. What is the molecular formula of this compound?
- 8) A compound with an empirical formula of $CFBrO$ and a molar mass of 254.7 grams per mole. What is the molecular formula of this compound?
- 9) A compound with an empirical formula of C_2H_3N and a molar mass of 46 grams per mole. What is the molecular formula of this compound?
- 10) A well-known reagent in analytical chemistry, dimethylglyoxime, has the empirical formula C_2H_4NO . If its molar mass is 116.1 g/mol, what is the molecular formula of the compound?
12. Nitrogen and oxygen form an extensive series of oxides with the general formula N_xO_y . One of them is a blue solid that comes apart, reversibly, in the gas phase. It contains 36.84% N. What is the empirical formula of this oxide?
13. A sample of indium chloride weighing 0.5000 g is found to contain 0.2404 g of chlorine. What is the empirical formula of the indium compound?
14. An unknown compound was found to have a percent composition as follows: 47.0 % potassium, 14.5 % carbon, and 38.5 % oxygen. What is its empirical formula? If the true molar mass of the compound is 166.22 g/mol, what is its molecular formula?
15. Rubbing alcohol was found to contain 60.0 % carbon, 13.4 % hydrogen, and the remaining mass was due to oxygen. What is the empirical formula of rubbing alcohol?