P 6.5 (pg 1 of 2) Empirical & Molecular Formulas

Name______________________

Please do your work on another piece of paper and show your work so that you can refer to it later to check for mistakes and use for review.

1. A particular air pollutant is composed of nitrogen and oxygen. A 17.7 g sample of the compound is analyzed and found to be 4.0 g of nitrogen. Determine the empirical formula of this molecular compound.

2. Acetylene is a gas used in welding torches. As a fossil fuel it contains carbon and hydrogen. It contains 92.3 % carbon, and 7.7 % hydrogen. The molecular mass is 26 g/mole. Determine the empirical and molecular formula.

3. All simple saccharides contain 40.0 % carbon, 6.7 % hydrogen, and 53.3 % oxygen. The molecular mass of these saccharides (also known as carbohydrates) is 180 g/mole. Determine the empirical and molecular formula.

4. The hydrocarbon butane - the fuel in bic lighters - has the following composition: 82.7 % carbon and 17.3% hydrogen. The molecular mass of butane is 58.2 g/mole. Determine the empirical and molecular formulas.

5. Chlorofluorocarbons (CFCs), the propellant that was widely used in aerosol cans until it was found to have a detrimental effect on the upper atmosphere ozone layer. One particular CFC is made of 37.3 % carbon, 6.2 % hydrogen, 19.7 % fluorine, and 36.8 % chlorine. The molecular mass of this compound is 96.5 g/mole. Determine the molecular and empirical formulas.

6. Hydrazine is used as a rocket fuel. Its molecular mass is 92.0 g/mole. Analysis of this compound shows that for every 1.0 g of nitrogen there will be 2.28 g of oxygen. Determine the empirical and molecular formulas.

7. Tobacco leaves contain between 2 to 8 % nicotine. Nicotine is made of 74.0 % carbon, 8.7 % hydrogen, and 17.3 % nitrogen. The molecular mass is 162 g/mole. Determine the empirical and molecular formulas.

8. Sulfadiazine, a drug used for the treatment of bacterial infections, analyzes to 48 % carbon, 4.0 % hydrogen, 22.4 % nitrogen, 12.8 % sulfur, and 12.8 % oxygen. The molecular mass is 250.0 g/mole. Determine the empirical and molecular formulas.

9. What is the empirical formula for a compound which contains 0.0134 g of iron, 0.00769 g of sulfur and 0.0115 g of oxygen?

10. Find the empirical formula for a compound which contains 32.8% chromium and 67.2% chlorine. Name this compound.

11. Some molecular compound made of phosphorus and oxygen with a molar mass of 284 g/mole is made of 43.7% phosphorus. Determine the empirical and molecular formulas of this compound.

12. Barry Um has a sample of a compound which weighs 200 grams and contains only carbon, hydrogen, oxygen and nitrogen. By analysis, he finds that it contains 97.56 grams of carbon, 4.878 g of hydrogen, 52.03 g of oxygen and the rest nitrogen. Find its empirical formula.

13. Determine the formula of of an iron(II) sulfate hydrate that is 45.3 % water. Name this compound.

14. Determine and name the formula of a hydrate that was found to be 42.2 % zirconium, 32.8 % chloride, 22.3 % oxygen, and the rest hydrogen.

15. The characteristic odor of pineapple is due to ethyl butyrate, an organic compound which contains only carbon, hydrogen and oxygen. If a sample of ethyl butyrate is known to contain 0.62069 g of carbon, 0.103448 g of hydrogen and 0.275862 g of oxygen, what is the empirical formula for ethyl butyrate? The molar mass of this compound is 232.3 g/mole. Use this molar mass to determine the molecular formula.

16. Epinephrine (adrenaline) is a hormone secreted into the bloodstream in times of danger and stress. It is 59.1% carbon, 13% hydrogen, 7.7% nitrogen, and 26.2% oxygen mass. Its molar mass is about 180 g/mol.

17. A compound has an empirical formula of C_2H_3O and a molar mass of 172 g/mol. Determine the empirical formula.

18. 200.000 grams of an organic compound is known to contain 83.884 grams of carbon, 10.486 grams of hydrogen, 18.640 grams of oxygen and the rest is nitrogen. What is the empirical formula of the compound?

19. Can the molecular formula of a compound ever be the same as the empirical formula? Explain your answer.

 Empirical & Molecular Formulas Name_______________________

Answers

1.	NO_3	
2.	CH	C_2H_2
3.	CH_2O	$C_6H_{12}O_6$
4.	C_2H_5	C_4H_{10}
5.	C_3H_6FCl	same
6.	NO_2	N_2O_4
7.	C_5H_7N	$C_{10}H_{14}N_2$
8.	$C_{10}H_{10}N_4SO_2$	same
9.	$FeSO_3$	
10.	$CrCl_3$	
11.	P_2O_5	
12.	$C_5H_3O_2N_2$	
13.	$FeSO_4 \cdot 7H_2O$	
14.	$ZrCl_2 \cdot 3\ H_2O$	
15.	$C_{12}H_{12}O_4$	
16.	$C_9H_{13}NO_3$	
17.	$C_8H_{12}O_4$	
18.	$C_6H_9ON_5$	
19.	Yes, water is a good example: H_2O is both an empirical and molecular formula	