Review Questions: Empirical Formula-Molecular Formula

Multiple Choice

1. A 100.0-g sample of a compound is made up of 35.9 g of aluminum and 64.1 g of sulfur. The empirical formula of the compound is:

a. Al_2S_3 b. Al_4S_6 c. AlS d. Al_3S_2

2. A 100.0-g sample of a compound is composed of 16.3 g of carbon, 32.1 g of chlorine, and 51.6 g of fluorine. The empirical formula of the compound is:

a. CClF b. $CClF_3$ c. $C_2Cl_2F_6$ d. $C_3Cl_2F_6$

3. A compound containing carbon, hydrogen, and chlorine is composed of 49.0% carbon and 2.74% hydrogen by mass; the remainder is chlorine. The empirical formula of the compound is:

a. CHCl b. C_3H_2Cl c. C_2H_2Cl d. C_2H_3Cl

4. A compound has a molar mass of 170.0 g/mol and an empirical formula of SiF_3. The compound's molecular formula is:

a. SiF_3 b. Si_5F_{15} c. Si_2F_6 d. Si_4F_{12}

5. A compound with a molar mass of 78.0 g/mol is found to contain 92.29% carbon and 7.71% hydrogen, by mass. The molecular formula of the compound is:

a. CH b. C_2H_3 c. C_3H_3 d. C_6H_6

6. A compound consists of 49.0% carbon, 2.72% hydrogen, and 48.3% chlorine, by mass. A lab analysis shows that the compound has a molar mass of 147.0 g/mol. The molecular formula of the compound is:

a. C_3H_2Cl b. $C_9H_6Cl_3$ c. $C_9H_3Cl_3$ d. $C_6H_4Cl_2$

Multiple Choice Answers

1. B 2. D 3. B 4. C 5. D 6. D

Problems

1. What is the empirical formula of a compound whose percentage composition is found to be 62.60% lead, 8.40% nitrogen, and 29.0% oxygen? (Answer: $Pb(NO_3)_2$)
2. One of the most widespread environmental carcinogens, (cancer-causing agents), is benzopyrene. It is found in coal dust, cigarette smoke, and even in charcoal-grilled meat. Analysis of this hydrocarbon shows the following percent by mass: 95.21 % carbon, and 4.79 % hydrogen. If the molecular mass of benzopyrene is 252.30 g mol^{-1}, what is its molecular formula ? (Answer: $C_{20}H_{12}$)
3. A sugar contains 39.95% C, 6.71% H, and 53.34% O, by mass. If the molar mass of the sugar was found experimentally to have a molar mass of 180.0 g/mol, calculate its molecular formula. (Answer: $C_6H_{12}O_6$)
4. A compound was found to contain 33.0% Si and 67.0% F, by mass. If the molar mass of the compound is 170.0 g/mol, calculate its molecular formula. (Answer: Si_2F_6)
5. Narceine is a narcotic in opium. It crystallizes from water solution as a hydrate that contains by mass 10.8 % water and has a molecular mass of 499.52 g/mol.
   Determine x in narceine **.** x H_2O (Answer: x = 3)