

1. The molecular formula of the antifreeze ethylene glycol is  $C_2H_6O_2$ . What is the empirical formula?
2. Calculate the molecular mass of tetraphosphorus decaoxide,  $P_4O_{10}$ , a corrosive substance which can be used as a drying agent.
  - a) 469.73 g/mol
  - b) 283.89 g/mol
  - c) 190.97 g/mol
  - d) 139.88 g/mol
  - e) 94.97 g/mol
3. Household sugar, sucrose, has the molecular formula  $C_{12}H_{22}O_{11}$ . What is the % of carbon in sucrose, by mass?
  - a) 26.7 %
  - b) 33.3 %
  - c) 41.4 %
  - d) 42.1 %
  - e) 52.8 %
4. What is the percent carbon in  $CH_3CH_2OH$ ?
  - a) 13%
  - b) 24%
  - c) 35%
  - d) 46%
  - e) 52%
5. Hydroxylamine nitrate contains 29.17 mass % N, 4.20 mass % H, and 66.63 mass % O. Determine its empirical formula.
  - a) HNO
  - b)  $H_2NO_2$
  - c)  $HN_6O_{16}$
  - d)  $HN_{16}O_7$
  - e)  $H_2NO_3$ .

6. 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?
7. 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?
8. 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?

9. What is the average mass, in grams, of one atom of iron ( $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$ )?
- a)  $6.02 \times 10^{23} \text{ g}$
  - b)  $1.66 \times 10^{-24} \text{ g}$
  - c)  $9.28 \times 10^{-23} \text{ g}$
  - d)  $55.85 \text{ g}$
  - e)  $55.85 \times 10^{-23} \text{ g}$
10. The number of hydrogen atoms in 0.050 mol of  $\text{C}_3\text{H}_8\text{O}_3$  is
- a)  $3.0 \times 10^{22} \text{ H atoms}$
  - b)  $1.2 \times 10^{23} \text{ H atoms}$
  - c)  $2.4 \times 10^{23} \text{ H atoms}$
  - d)  $4.8 \times 10^{23} \text{ H atoms}$
  - e) none of these choices is correct
11. What is the mass in grams of 0.250 mol of the common antacid calcium carbonate?
- a)  $4.00 \times 10^2 \text{ g}$
  - b)  $25.0 \text{ g}$
  - c)  $17.0 \text{ g}$
  - d)  $4.00 \times 10^{-2} \text{ g}$
  - e)  $2.50 \times 10^{-3} \text{ g}$
12. Aluminum oxide,  $\text{Al}_2\text{O}_3$ , is used as a filler for paints and varnishes as well as in the manufacture of electrical insulators. Calculate the number of moles in 47.51 g of  $\text{Al}_2\text{O}_3$ .
- a) 2.377 mol
  - b) 2.146 mol
  - c) 1.105 mol
  - d) 0.4660 mol
  - e) 0.4207 mol