

### 3 • Molecules and Compounds

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#### HYDRATES & COMPOSITION PROBLEMS

1. Cupric chloride,  $\text{CuCl}_2$ , when heated to  $100^\circ\text{C}$  is dehydrated. If 0.235 g of  $\text{CuCl}_2 \cdot x \text{H}_2\text{O}$  gives 0.185 g of  $\text{CuCl}_2$  on heating, what is the value of  $x$ ?
2. The “alum” used in cooking is potassium aluminum sulfate hydrate,  $\text{KAl}(\text{SO}_4)_2 \cdot x \text{H}_2\text{O}$ . To find the value of  $x$ , you can heat a sample of the compound to drive off all of the water and leave only  $\text{KAl}(\text{SO}_4)_2$ . Assume you heat 4.74 g of the hydrated compound and that the sample loses 2.16 g of water. What is the value of  $x$ ?
3. If “Epsom salt,”  $\text{MgSO}_4 \cdot x \text{H}_2\text{O}$  is heated to  $250^\circ\text{C}$ , all the water of hydration is lost. On heating a 1.687-g sample of the hydrate, 0.824 g of  $\text{MgSO}_4$  remains. What is the formula of Epsom salt?
4. When  $\text{CaSO}_4 \cdot x \text{H}_2\text{O}$  is heated, all of the water is driven off. If 34.0 g of  $\text{CaSO}_4$  (molar mass = 136) is formed from 43.0 g of  $\text{CaSO}_4 \cdot x \text{H}_2\text{O}$ , what is the value of  $x$ ?