

An analysis of sodium dichromate gives the following mass percentages: 17.5% Na, 39.7% Cr, and 42.8% O. What is the empirical formula of the compound?

Solution:

For 100g of sodium dichromate:

$$m(\text{Na})=17.5\text{g}$$

$$m(\text{Cr})=39.7\text{g}$$

$$m(\text{O})=42.8\text{g}$$

$$n(\text{Na})=m(\text{Na})/M(\text{Na})=17.5/23=0.76\text{mol}$$

$$n(\text{Cr})=m(\text{Cr})/M(\text{Cr})=39.7/52=0.76\text{ mol}$$

$$n(\text{O})=m(\text{O})/M(\text{O})=42.8/16=2.67\text{mol}$$

$$n(\text{Na}):n(\text{Cr}):n(\text{O})=0.76:0.76:2.67$$

$$n(\text{Na}):n(\text{Cr}):n(\text{O})=1:1:3.5$$

$$n(\text{Na}):n(\text{Cr}):n(\text{O})=2:2:7$$

empirical formula of sodium dichromate $\text{Na}_2\text{Cr}_2\text{O}_7$

Answer: $\text{Na}_2\text{Cr}_2\text{O}_7$