

Answer to the Question 86033

A student has 470.0 mL of a 0.1429 M aqueous solution of Na_2SO_4 to use in an experiment. He accidentally leaves the container uncovered and comes back the next week to find only a solid residue. The mass of the residue is 21.64 g. Determine the chemical formula of this residue.

Decision:

unknown substance: $\text{Na}_2\text{SO}_4 \cdot x \text{H}_2\text{O}$

$$n(\text{Na}_2\text{SO}_4 \cdot x\text{H}_2\text{O}) = C * V$$

$$V = 470.0 \text{ mL} = 0.47\text{L}$$

$$n(\text{Na}_2\text{SO}_4 \cdot x\text{H}_2\text{O}) = 0.1429 \frac{\text{mol}}{\text{L}} * 0.47\text{L} = 0.067163 \text{ mol}$$

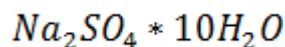
$$M(\text{Na}_2\text{SO}_4 \cdot x\text{H}_2\text{O}) = \frac{m}{n(\text{Na}_2\text{SO}_4 \cdot x\text{H}_2\text{O})}$$

$$M(\text{Na}_2\text{SO}_4 \cdot x\text{H}_2\text{O}) = \frac{21.64 \text{ g}}{0.067163 \text{ mol}} = 322 \text{ g/mol}$$

$$M(\text{Na}_2\text{SO}_4 \cdot x\text{H}_2\text{O}) = (142 + 18x) \text{ g/mol}$$

$$(142 + 18x) = 322$$

$$x = 10$$



Answer: $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$