Answer to the Question 86225

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: $Na_2SO_4*x\ H_2O$

$$n(Na_2SO_4 * xH_2O) = C * V$$

$$V = 470.0\ mL = 0.47L$$

$$n(Na_2SO_4 * xH_2O) = 0.1429\frac{mol}{L} * 0.47L = 0.067163\ mol$$

$$M(Na_2SO_4 * xH_2O) = \frac{m}{n(Na_2SO_4 * xH_2O)}$$

$$M(Na_2SO_4 * xH_2O) = \frac{21.64\ g}{0.067163\ mol} = 322\ g/mol$$

$$M(Na_2SO_4 * xH_2O) = (142 + 18x)g/mol$$

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

$$x = 10$$

$$Na_2SO_4 * 10H_2O$$

Answer: $Na_2SO_4*10H_2O$

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