

Answer on Question #64988 - Chemistry - General Chemistry

Question: How do I calculate the volume of water needed (containing 53.79 mg/L SO₄) to react with a BaCl₂ solution in excess, to yield 2 mg/L of BaSO₄ precipitate?

Solution: At first, find the amount of BaSO₄ in 2 mg of precipitate. For this step, use formula: $v = \frac{m}{M}$, where v is the amount of substance (in moles), m is the mass of precipitate (in grams) and M is the molar mass of BaSO₄ (in grams per mole). Calculate: $v = \frac{0.002}{233.3896} = 8,57 * 10^{-6}$.

The precipitate is formed by one Ba ion and one SO₄ ion per molecule. So, if Ba ions are in excess (as given), for forms 2 mg of precipitate we need $8.57 * 10^{-6}$ moles of SO₄. The next step is to find the volume of water (containing 53.79 mg/L SO₄) contain $8.57 * 10^{-6}$ moles of SO₄. For this step, find the mass of this amount of SO₄: $m = v * M = 8.57 * 10^{-6} * 96.0626 = 823.26 * 10^{-6} g = 0.823 mg$, where M is the molar mass of SO₄ (96.0626 g/mole). Then, find the volume by proportion:

a liter contain 53.79 mg of SO₄ and V contain 0.823 mg of SO₄, so $V = 0.823/53.79 = 0.015L = 15 mL$.

Answer: 15 ml of water (containing 53.79 mg/L SO₄) must be added to one liter of BaCl₂ solution for yield 2mg/L of BaSO₄ precipitate.

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