

Answer on Question #56565 – Chemistry – General Chemistry

Question

How many drops of 0.0010 mol/L silver nitrate solution will just begin to precipitate AgCl from 5.0x10⁴ of a 0.90% (m/v) solution of NaCl? (Assume that one drop equals 0.050 mL) K_{sp} for AgCl is 1.8x10⁻¹⁰

Solution:

The molar mass of NaCl is equal 58,5 g/mol. Then molar concentration of 0,90% of solution is equal

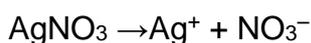
$$M(\text{NaCl}) = (0.90 \cdot 1000) / (58.5 \cdot 100) = 0.154 \text{ mol/l}$$

Equation of dissociation of NaCl:



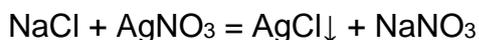
Then molar concentration of ions of Cl⁻ is equal in initial solution 0.154 mol/l.

Equation of dissociation of AgNO₃:

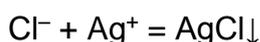


Then molar concentration of ions of Ag⁺ is equal in initial solution 0.0010 mol/l.

Reaction of sedimentation of AgCl is described by the equation:



Or in an ionic look:



To start loss of a deposit work of concentration of Cl⁻ and Ag⁺ has to be equal 1.8 · 10⁻¹⁰

Then concentration of ions of silver in solution after mixing has to be not less

$$\frac{1,8 \cdot 10^{-10}}{0,154} = 1,17 \cdot 10^{-9}$$

Thus, on each liter of NaCl solution it is necessary to add 1,17 · 10⁻⁹ mol of AgNO₃.

The volume of 0,0010 mol/l of solution of AgNO₃ necessary for this purpose it is equal

$$1,17 \cdot 10^{-9} / 0,0010 = 1,17 \cdot 10^{-6} \text{ l} = 1,17 \cdot 10^{-3} \text{ ml.}$$

For 5,0 · 10⁴ l of NaCl solution it will be required

$$1,17 \cdot 10^{-3} \cdot 5,0 \cdot 10^4 = 58,44 \text{ ml of AgNO}_3 \text{ solution}$$

In terms of drops: 58,44/0,05 = 1169 drops

For 5,0 · 10⁴ ml of NaCl solution it will be required

$$1,17 \cdot 10^{-3} \cdot 5,0 \cdot 10^4 = 0.058 \text{ ml of AgNO}_3 \text{ solution}$$

In terms of drops: 0.058/0,05 = 1.17 drops

Therefore, 2 drops of solution will be required.

Answer: To begin to precipitate of AgCl from $5,0 \cdot 10^4$ l of NaCl solution will be required 1169 drops of 0,0010 mol/l of AgNO₃ solution.

To begin to precipitate of AgCl from $5,0 \cdot 10^4$ ml of NaCl solution will be required 2 drops of 0,0010 mol/l of AgNO₃ solution.