Answer on Question #54728 – Chemistry – General Chemistry

Question:

Calculate the mass of barium chloride crystals ($BaCl_2 \cdot 2H_2O$) required to prepare 200ml of solution of 0.50 mol L^{-1} concentration.

Answer:

Molar concentration or molarity is most commonly expressed in units of moles of solute per litre of solution.

$$c = \frac{n}{V} = \frac{m}{M \times V}$$

Here, **n** is the amount of the solute in moles, **n** is the number of molecules present in the volume **V** (in litres), **m** is the amount of the solute in grams, **M** is molar mass of the solute.

That's why we can write the following expression:

m = c × M × V = 0.5 × 208.23 × 0.2 =20.823 g of pure barium chloride we have to add.

where 208.23 g/mol is molar mass of $BaCl_2$

But in ourcase we have to prepare solution from $BaCl_2 \cdot 2H_2O$, so we need to include water which is already in barium chloride crystals.

20.823 g of pure **barium chloride** corresponds to **208.23 g/mol** (molar mass of **$BaCl_2$**)

x g of pure **barium chloride crystals** corresponds to **244.26 g/mol** (molar mass of **$BaCl_2 \cdot 2H_2O$**)

then x = 20.823 × 244.26/208.23 = 24.426 g ≈24.43 g

Answer: 24.43 g of barium chloride crystals (**$BaCl_2 \cdot 2H_2O$**) is required to prepare 200ml of solution of 0.50 mol L^{-1} concentration.