

Answer on Question #56477 – Chemistry – General Chemistry

Question:

calculate the volume of industrial HCl of density 1.16 and w/v 32% needed to prepare 100 cm³ of 0.1M HCl

Answer:

Let's calculate the number of the moles of HCl in 100 cm³ of 0.1 M HCl:

$$n(\text{HCl}) = cV = 0.1(\text{mol L}^{-1}) \cdot 0.1(\text{L}) = 0.01(\text{mol})$$

Then, the number of the moles of HCl should be added to water is 0.01 mol. The mass of 0.01 mol of HCl is calculated by multiplying its molar mass by the number of the moles:

$$m(\text{HCl}) = M(\text{HCl}) \cdot n(\text{HCl}) = 36.46 (\text{g mol}^{-1}) \cdot 0.01(\text{mol}) = 0.3646 (\text{g})$$

The volume of the industrial HCl needed to take 0.3646 g of HCl is:

$$V(\text{HCl}_{\text{ind}})(\text{mL}) = \frac{m(\text{HCl})(\text{g})}{\% \frac{w}{v}} = \frac{0.3646 (\text{g})}{0.32} = 1.14\text{mL}$$

Using the density, we can calculate the mass of industrial HCl needed to add:

$$m(\text{HCl}_{\text{ind}}) = d(\text{HCl}_{\text{ind}}) \cdot V(\text{HCl}_{\text{ind}}) = 1.16 (\text{g mL}^{-1}) \cdot 1.14 (\text{mL}) = 1.32 (\text{g})$$