Answer on Question #43784 - Chemistry - Physical Chemistry

Question:

What is the [OH]⁻ in the final solution prepared by mixing 20ml of 0.5M HCl with 30ml of 0.1M Ba(OH)$_2$?

**Answer:**

$$molarity = \frac{moles\ of\ solute}{liter\ of\ solution}$$

From this equation we calculate moles of solute of HCl in 20 mL of 0.5 M.

$moles\ of\ solute\ of\ HCl =\ molarity * liter\ of\ solution = 0.5\ M * 0.02\ L = 0.01\ moles$

Also from the same equation we calculate moles of solute of Ba(OH)$_2$in 30 mL of 0.1 M.

$moles\ of\ solute\ of\ Ba(OH)_2 =\ molarity * liter\ of\ solution = 0.1\ M * 0.03\ L = 0.003\ moles$

The chemical reaction between HCl and Ba(OH)$_2$ is:

$$Ba(OH)_2 + 2HCl = BaCl_2 + 2H_2O$$
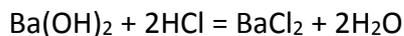
From this reaction we can see that it needs to be in two times more HCl than Ba(Cl)$_2$. According to the chemical reaction: if all Ba(OH)$_2$ (0.003 mole) react with HCl (0.01 mole) then after chemical reaction it won't be any more Ba(OH)$_2$ but it will leave 0.004 mole of HCl. It means that HCl is in excess. That's why we can't calculate the concentration of [OH]⁻ in the final prepared solution because it won't be any Ba(OH)$_2$ in it. All Ba(OH)$_2$ is used in chemical reaction.