Question #83994, Chemistry / General Chemistry | for completion

200cm3 of 0.45M HCL solution was added to 300cm3 of 0.25M NaOH solution. Calculate the concentration of chloride ions in solution

Solution.

V(HCl)=200cm³=200ml=0.2l

Cm(HCl)=0.45M

V(NaOH)=300cm³=300ml=0.3l

Cm(NaOH)=0.25M

Cm(Cl–)-?

HCl+NaOH=NaCl+H2O

n(HCl)=Cm*V(HCl)=0.45*0.2=0,09moles

Then,In solution there are 0.09 moles of Cl-, because 1 mole of HCl contains one mole of Cl-

n(NaOH)=Cm*V(NaOH)=0.25*0.3=0,075moles

HCl is in excess, mole ratio from the reaction equation is 1:1.

Extra HCl: n(HClexc)= 0.09-0.075= 0.015 moles. And it contains 0.015 moles of Cl-

0.075 moles of HCl reacts with NaOH, and NaCl is formed.

n(NaCl)=n(NaOH)= 0.075 moles. And 0.075 moles of NaCl contsins 0.075 moles of Cl-

NaCl in solution is fully dissociated:

NaCl=Na+ + Cl -

So, full n(Cl-)=0.075+0.015= 0.09 moles

C(Cl-)= n/V

We can suggest that densities of these two solutions are equal to density of H2O. Then, we may:

Vsum=V(NaOH)+V(H2O)=0.2+0.3 = 0.5 l

C(Cl-)= 0.09/0.5=0,18M

Answer:

C(Cl-)=0,18M