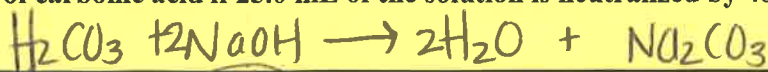


KEY

1. What is the molarity of carbonic acid if 25.0 mL of the solution is neutralized by 48.3 mL of 0.20 M NaOH?

Balanced equation:



Moles of acid/base with given molarity & volume: 0.0250L 0.0483L 0.2M → Step 1 - use given info. to find moles of base
 $0.2\text{M} = \frac{x \text{ mole NaOH}}{0.0483\text{L}}$ $x = 0.00966 \text{ mol NaOH}$

Moles of remaining acid/base: Step 2 → use mole ratio to find moles of acid that reacted
 $\frac{0.00966 \text{ mol NaOH}}{2 \text{ mol NaOH}} \times \frac{1 \text{ mol H}_2\text{CO}_3}{1 \text{ mol H}_2\text{CO}_3} = 0.00483 \text{ mol H}_2\text{CO}_3$

Molarity of acid/base: Step 3 → find molarity of unknown $M = \frac{0.00483 \text{ mol H}_2\text{CO}_3}{0.0250\text{L}}$ $M = 0.193\text{M} \rightarrow \text{H}_2\text{CO}_3$

2. What is the molarity of sodium hydroxide if 20.0 mL of the solution is neutralized by 17.4 mL of 1.0 M H₃PO₄?

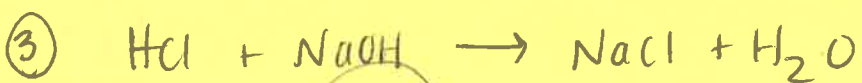
Balanced equation:



Moles of acid/base with given molarity & volume: 0.0200L 0.0174L 1.0M → Step 1 $1.0 = \frac{x \text{ mole H}_3\text{PO}_4}{0.0174\text{L}}$ $x = 0.0174 \text{ mol H}_3\text{PO}_4$

Moles of remaining acid/base: Step 2 → $\frac{0.0174 \text{ mol H}_3\text{PO}_4}{1 \text{ mol H}_3\text{PO}_4} \times \frac{3 \text{ mol NaOH}}{1 \text{ mol H}_3\text{PO}_4} = 0.0522 \text{ mol NaOH}$

Molarity of acid/base: Step 3 → $M = \frac{0.0522 \text{ mol NaOH}}{0.0200\text{L}} = 2.61\text{M} \rightarrow \text{NaOH}$



0.0250L
3 M

0.0155L
0.800M

↓
Step 1

$$0.800\text{M} = \frac{x \text{ mol NaOH}}{0.0155\text{L}}$$

$$x = 0.0124 \text{ mol NaOH}$$

Step 2 $\frac{0.0124 \text{ mol NaOH}}{1 \text{ mol NaOH}} \times \frac{1 \text{ mol HCl}}{1 \text{ mol HCl}} = 0.0124 \text{ mol HCl}$

Step 3 $M = \frac{0.0124 \text{ mol HCl}}{0.0250\text{L}}$ $M = 0.496\text{M}$ HCl