

WARMUP

These are the same problems that were tough on Tuesday night's Mr Clean worksheet. Whether or not you succeeded on those ones, clarify your thinking by following the thinking process here. Do the four steps in order.

(1) Read the Story Problem:

1. What volume of 0.200 M hydrochloric acid solution is needed to neutralize 25.0 mL of 0.150 M sodium hydroxide solution? (this was #5 on last night's homework)

(2) Here, fix any inconvenient units.

- mL to L get fixed by jumping the decimal 3 places to the left.
- Concentrations like 0.15 M should be rewritten as $\frac{0.15 \text{ moles}}{1 \text{ liter}}$

0.200 M is really $\frac{0.200 \text{ moles}}{1 \text{ liter}}$

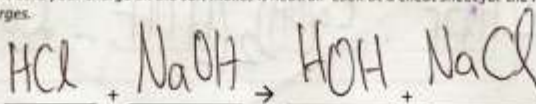
25.0 mL is also 0.0250 L

0.150 M is also $\frac{0.150 \text{ moles}}{1 \text{ L}}$

(3) Here, balance the reaction.

You know acid + base → water + salt

Make sure your charge on the salt makes it neutral. Look at a cheat sheet for the ion charges.



(5) If one volume is given, write it at the far left of your box →
If TWO volumes are known, write them as volume of the known substance / volume of the unknown substance

(4) Write the answer unit and formula

$$0.025 \text{ L NaOH} \times \left(\frac{0.150 \text{ mol NaOH}}{1 \text{ L NaOH}} \right) \times \left(\frac{1 \text{ mol HCl}}{1 \text{ mol NaOH}} \right) \times \left(\frac{1 \text{ L HCl}}{0.2 \text{ mol HCl}} \right) = 0.019 \text{ L HCl}$$

These are the same problems that were tough on Tuesday night's Mr Clean worksheet. Whether or not you succeeded on those ones, clarify your thinking by following the thinking process here. Do the four steps in order.

(1) Read the Story Problem:

If 335 mL of a 0.20 M solution of $\text{Ca}(\text{OH})_2$ is required to titrate 450.0 mL of HBr, what is the concentration of the acid solution? (This was #11 on last night's homework).

(2) Here, fix any inconvenient units.

mL to L get fixed by jumping the decimal 3 places to the left.

Concentrations like 0.15 M should be rewritten as $\frac{0.15 \text{ moles}}{1 \text{ liter}}$

$$335 \text{ mL is } 0.335 \text{ L}$$

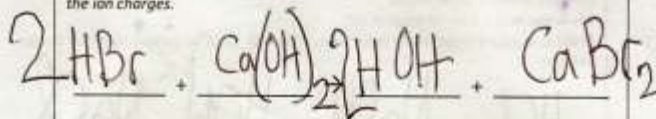
$$450 \text{ mL} \xrightarrow{\quad} 0.450 \text{ L}$$

$$0.20 \text{ M is } \frac{0.20 \text{ moles}}{1 \text{ LITERS}}$$

(3) Here, balance the reaction.

You know acid + base \rightarrow water + salt

Make sure your charge on the salt makes it neutral. Look at a cheat sheet for the ion charges.



(5) If one volume is given, write it at the far left of your box \rightarrow
If TWO volumes are known, write them as $\frac{\text{volume of the known substance}}{\text{volume of the unknown substance}}$

$$\frac{335 \text{ L } \text{Ca}(\text{OH})_2}{450 \text{ L HBr}} \times \frac{0.20 \text{ mol } \text{Ca}(\text{OH})_2}{1 \text{ L } \text{Ca}(\text{OH})_2} \times \frac{2 \text{ mol HBr}}{1 \text{ mol } \text{Ca}(\text{OH})_2} = 0.30 \frac{\text{mol HBr}}{\text{L HBr}}$$

(4) Write the answer unit and formula after the equals sign. This is your goal!

Done early? Use the above steps to solve #12 from last night. If you can do this, you're in okay shape for Friday's titration problems on the test.

12. If 3.59 mL of a 0.040 M solution of $\text{Ca}(\text{OH})_2$ is required to titrate 840.0 mL of HBr, what is the concentration of the acid solution?