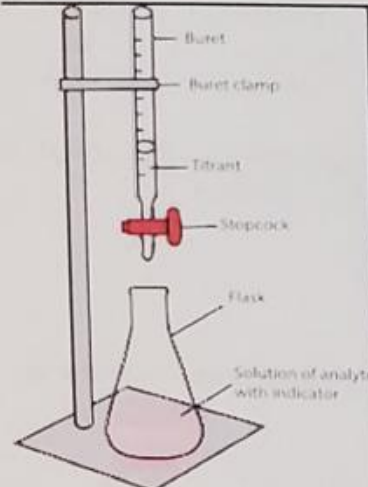


Acid-Base Sample Questions

Titration Questions



Titration = Volumetric Analysis

Carefully measure the volume of a known concentration (titrant) that is needed to react a volume of an unknown concentration (analyte) in order to find the concentration of the analyte.

*Usually stop the titration at equivalence pt (also known as the stoichiometric pt.) → when enough titrant added to react all analyte

This can be revealed by the color change of an indicator (species that changes color based upon the $[H_3O^+]$ in its environment)

End Point → pH where indicator changes color

- 9) A 25.0 ml sample of 0.105 M HCl was titrated with 31.5 ml of NaOH. What is the concentration of the NaOH?
- A) 0.0833 M
 - B) 0.132 M
 - C) 0.105 M
 - D) 0.075 M
 - E) none of the above

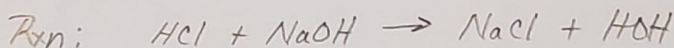
2) How much of a 1.5 M NaOH solution is needed to neutralization 20.0 mL of 2.5 M H_3PO_4 ?

3) What is the molarity of a NaOH solution if 15.0 mL is exactly neutralized by 7.5 mL of a 0.020M acetic acid solution?

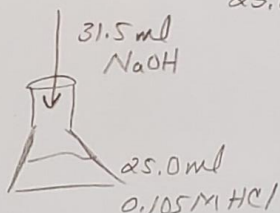
9) A 25.0 ml sample of 0.105 M HCl was titrated with 31.5 ml of NaOH. What is the concentration of the NaOH?

- A) 0.0833 M
 B) 0.132 M
 C) 0.105 M
 D) 0.075 M
 E) none of the above

A

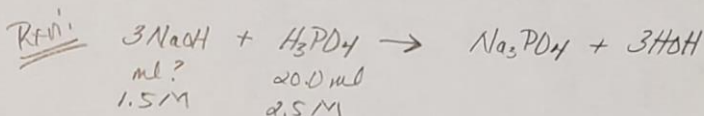


25.0 ml 31.5 ml
 0.105 M M?



$$25.0 \text{ mL HCl Soln.} \left(\frac{1.00 \text{ L HCl Soln.}}{1000 \text{ mL HCl Soln.}} \right) \left(\frac{0.105 \text{ mol HCl}}{1.00 \text{ L HCl Soln.}} \right) \left(\frac{1 \text{ mol NaOH}}{1 \text{ mol HCl}} \right) \left(\frac{1000 \text{ mL NaOH Soln.}}{1.00 \text{ L NaOH Soln.}} \right) \left(\frac{1}{31.5 \text{ mL NaOH Soln.}} \right) = 0.0833 \text{ M NaOH}$$

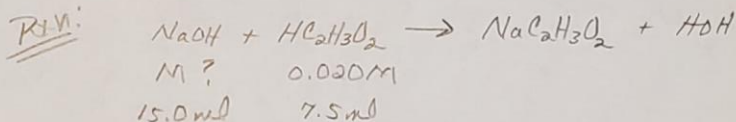
2) How much of a 1.5 M NaOH solution is needed to neutralize 20.0 mL of 2.5 M H₃PO₄?



$$20.0 \text{ mL H}_3\text{PO}_4 \text{ Soln.} \left(\frac{1.00 \text{ L H}_3\text{PO}_4 \text{ Soln.}}{1000 \text{ mL H}_3\text{PO}_4 \text{ Soln.}} \right) \left(\frac{2.5 \text{ mol H}_3\text{PO}_4}{1.00 \text{ L H}_3\text{PO}_4 \text{ Soln.}} \right) \left(\frac{3 \text{ mol NaOH}}{1 \text{ mol H}_3\text{PO}_4} \right) \left(\frac{1.00 \text{ L NaOH Soln.}}{1.5 \text{ mol NaOH}} \right) \left(\frac{1000 \text{ mL Soln.}}{1.00 \text{ L NaOH Soln.}} \right) = 100 \text{ mL NaOH Soln.}$$

↳ 2 SF: $1.0 \times 10^2 \text{ mL NaOH Soln.}$

3) What is the molarity of a NaOH solution if 15.0 mL is exactly neutralized by 7.5 mL of a 0.020 M acetic acid solution?



$$7.5 \text{ mL HC}_2\text{H}_3\text{O}_2 \text{ Soln.} \left(\frac{1.00 \text{ L HC}_2\text{H}_3\text{O}_2 \text{ Soln.}}{1000 \text{ mL HC}_2\text{H}_3\text{O}_2 \text{ Soln.}} \right) \left(\frac{0.020 \text{ mol HC}_2\text{H}_3\text{O}_2}{1.00 \text{ L HC}_2\text{H}_3\text{O}_2 \text{ Soln.}} \right) \left(\frac{1 \text{ mol NaOH}}{1 \text{ mol HC}_2\text{H}_3\text{O}_2} \right) \left(\frac{1000 \text{ mL NaOH}}{1.00 \text{ L NaOH}} \right) = 0.010 \text{ M NaOH}$$

$\left(\frac{1}{15.0 \text{ mL NaOH Soln.}} \right) \left(\frac{1000 \text{ mL NaOH}}{1.00 \text{ L NaOH Soln.}} \right) = 0.010 \text{ M NaOH}$