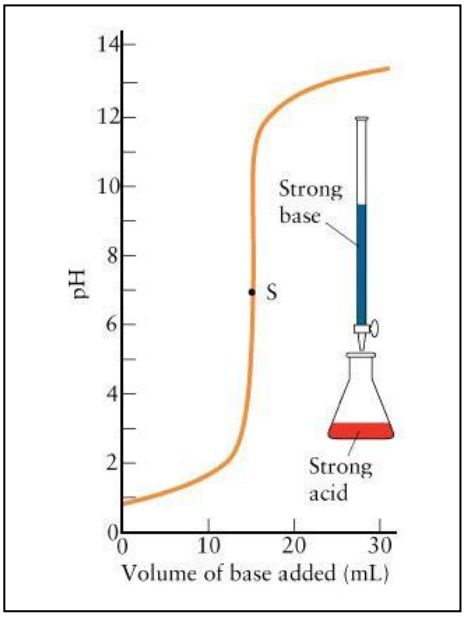
Titration Calculations



At Enpoint:

1. Moles Standard (Given) Added:

(Moles / 1000 ml x ml added)

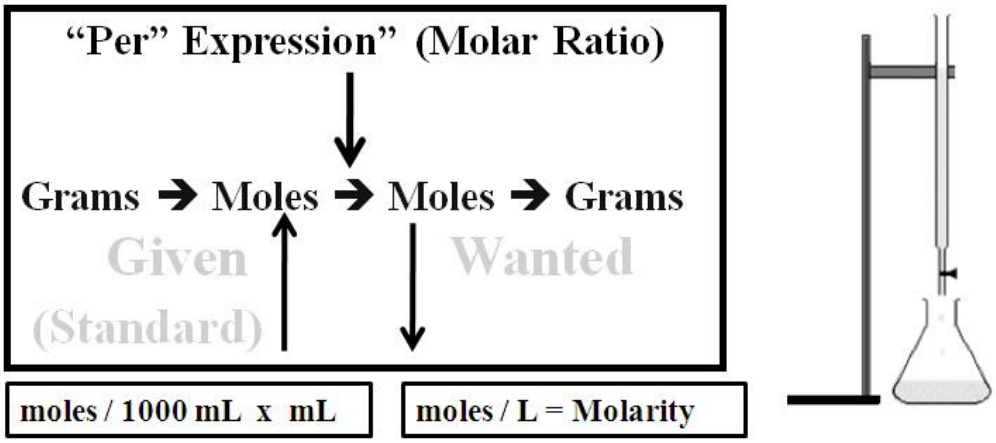
2. Moles in Unknown:

1 x (Reaction Coefficient Wanted / Reaction Coefficient Given)

3. Unknown Molarity (mole/Liter):

2 x (Moles Unknown / Volume Unknown)

Generalized Titration Pathway



Entry & Exit Points Depend On:

Given

Wanted

A student finds that 15.80 mL of 0.2840 M H_2SO_4 are required to neutralize a 20.00 mL sample of a certain NaOH solution. What is the molarity of the NaOH solution? **H_2SO_4 + 2 NaOH ➔ Na_2SO_4 + 2 H_2O**

Given: 15.8 mL of 0.248 M sulfuric acid
Wanted: molarity of 20 mL solution of sodium hydroxide

1. The flow of logic: Start with given and get moles H_2SO_4

$$\frac{0.284 \text{ moles}}{\text{L}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times 15.8 \text{ mL} = 4.487 \times 10^{-3} \text{ moles} \rightarrow 4.49\ 10^{-3} \text{ moles } H_2SO_4$$

2. Use "per expression" to convert to moles sodium hydroxide

$$4.49\ 10^{-3} \text{ moles } H_2SO_4 \times \frac{2 \text{ mole NaOH}}{1 \text{ moles } H_2SO_4} = 8.97 \times 10^{-3} \text{ moles NaOH}$$

3. Convert moles NaOH to molarity of the solution:

$$\frac{8.97 \times 10^{-3} \text{ moles NaOH}}{20.0 \text{ mL}} \times \frac{1000 \text{ ml}}{1 \text{ L}} = 0.4485 \text{ moles/L} \rightarrow 0.449 \text{ M}$$

But, we should solve as linear string in one continuous operation

A student finds that 34.8 mL of 0.483 M KOH are required to neutralize a 10.0 mL sample of a H_3PO_4 solution. What is the molarity of the H_3PO_4 solution?

$$H_3PO_4 + 3\ KOH \rightarrow K_3PO_4 + 3\ H_2O$$

1. Start with standard molarity **2.** **3.**

$$\frac{0.4830 \text{ moles KOH}}{1000 \text{ mL}} \times 34.80 \text{ mL} \times \frac{1 \text{ mole } H_3PO_4}{3 \text{ moles KOH}} \times \frac{1}{0.01000 \text{ L}} = 0.5603 \text{ M}$$

1. Start with standard added **2.** **3.**

$$34.80 \text{ mL} \times \frac{0.4830 \text{ moles KOH}}{1000 \text{ mL}} \times \frac{1 \text{ mole } H_3PO_4}{3 \text{ moles KOH}} \times \frac{1}{0.01000 \text{ L}} = 0.5603 \text{ M}$$

A student finds that 20.0 mL of 0.395 M HNO_3 are required to neutralize a 29.7 mL sample of a certain KOH solution. What is the molarity of the KOH solution?

$$HNO_3 + KOH \rightarrow KNO_3 + H_2O$$

1. Start with standard molarity 2. 3.

$$\frac{0.3950 \text{ moles}}{1000 \text{ mL}} \times 20.00 \text{ mL} \times \frac{1 \text{ mole KOH}}{1 \text{ mole } HNO_3} \times \frac{1}{0.02970 \text{ L}} = 0.2660 \text{ M}$$

1. Start with standard added 2. 3.

$$20.00 \text{ mL} \times \frac{0.3950 \text{ moles}}{1000 \text{ mL}} \times \frac{1 \text{ mole KOH}}{1 \text{ mole } HNO_3} \times \frac{1}{0.02970 \text{ L}} = 0.2660 \text{ M}$$

A student finds that 46.1 mL of 0.244 M NaOH are required to neutralize a 25.0 mL sample of a certain $H_2C_2O_4$ solution. What is the molarity of the $H_2C_2O_4$ solution? $H_2C_2O_4 + 2\ NaOH \rightarrow Na_2C_2O_4 + 2\ H_2O$

1. Start with standard molarity 2. 3.

$$\frac{0.2440 \text{ moles NaoH}}{1000 \text{ mL}} \times 46.10 \text{ mL} \times \frac{1 \text{ mole } H_2C_2O_4}{2 \text{ moles NaOH}} \times \frac{1}{0.02500 \text{ L}} = 0.2250 \text{ M}$$

1. Start with standard added 2. 3.

$$46.10 \text{ mL} \times \frac{0.2440 \text{ moles NaoH}}{1000 \text{ mL}} \times \frac{1 \text{ mole } H_2C_2O_4}{2 \text{ moles NaOH}} \times \frac{1}{0.02500 \text{ L}} = 0.2250 \text{ M}$$

A student finds that 15.00 mL of 0.1860 M H_2SO_4 are required to neutralize a 26.30 mL sample of a certain NaOH solution. What is the molarity of the NaOH solution? $H_2SO_4 + 2\ NaOH \rightarrow Na_2SO_4 + 2\ H_2O$

1. Start with standard molarity 2. 3.

$$\frac{0.1860 \text{ moles}}{1000 \text{ mL}} \times 15.00 \text{ mL} \times \frac{2 \text{ mole NaOH}}{1 \text{ mole } H_2SO_4} \times \frac{1}{0.02630 \text{ L}} = 0.2122 \text{ M}$$

1. Start with standard added 2. 3.

$$15.00 \text{ mL} \times \frac{0.1860 \text{ moles}}{1000 \text{ mL}} \times \frac{2 \text{ mole NaOH}}{1 \text{ mole } H_2SO_4} \times \frac{1}{0.02630 \text{ L}} = 0.2122 \text{ M}$$

Assignment

Continue Taking Unit 10 Practice Test
The Practice Quiz is very similar to the Unit Exam
Success on Unit exam is directly related to practice exam experience