

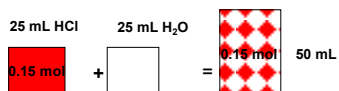
## Dilutions

## Dilutions

- Many laboratory chemicals such as acids are purchased as **concentrated** solutions (stock solutions).  
e.g. 12 M HCl  
12 M H<sub>2</sub>SO<sub>4</sub>
- **More dilute** solutions are prepared by taking a certain quantity of the stock solution and diluting it with water.

## Dilutions

- A given volume of a stock solution contains a specific number of moles of solute.  
e.g.: 25 mL of 6.0 M HCl contains 0.15 mol HCl  
(How do you know this???)



- If 25 mL of 6.0 M HCl is diluted with 25 mL of water, the number of moles of HCl present does not change.  
Still contains 0.15 mol HCl

## Dilutions

$$\begin{array}{ccc} \text{moles solute} & = & \text{moles solute} \\ \text{before dilution} & & \text{after dilution} \end{array}$$

- Although the number of moles of solute does not change, the volume of solution does change.
- The concentration of the solution will change since

$$\text{Molarity} = \frac{\text{moles solute}}{\text{Volume of solution}}$$

## Dilution Calculation

- When a solution is diluted, the concentration of the new solution can be found using:

$$M_c \times V_c = M_d \times V_d$$

where  $M_c$  = initial concentration (mol/L) = more concentrated

$V_c$  = initial volume of more conc. solution

$M_d$  = final concentration (mol/L) in dilution

$V_d$  = final volume of diluted solution

## Dilution Calculation

What is the concentration of a solution prepared by diluting 25.0 mL of 6.00 M HCl to a total volume of 50.0 mL?

Given:  $V_c = 25.0$  mL

$M_c = 6.00$  M

$V_d = 50.0$  mL

**Note:  $V_c$  and  $V_d$  do not have to be in liters, but they must be in the same units.**

Find:  $M_d$

Use  $V_c \times M_c = V_d \times M_d$  Solve for  $M_d$

## Dilution

- Make a diluted solution once you know  $V_c$  and  $V_d$ 
  - Use a pipet to deliver a volume of the concentrated solution to a new volumetric flask.
  - Add solvent to the line on the neck of the new flask.
  - Mix well.



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## Practice

- How many mL of 5.0 M  $K_2Cr_2O_7$  solution must be diluted to prepare 250 mL of 0.10 M solution?

$V_c = ?$     $M_c = 5.0M$     $V_d = 250 \text{ mL}$     $M_d = 0.10M$

- If 10.0 mL of a 10.0 M stock solution of NaOH is diluted to 250 mL, what is the concentration of the resulting solution?

$M_d = ?$     $V_c = 10.0 \text{ mL}$     $M_c = 10.0M$     $V_d = 250 \text{ mL}$

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