

## Making Molar Solutions



## From Liquids

(More accurately, from stock solutions)

## Making molar solutions from liquids

Not all compounds are in a solid form

Acids are purchased as liquids ("stock solutions"). Yet, we still need a way to make molar solutions of these compounds.

The Procedure is similar:

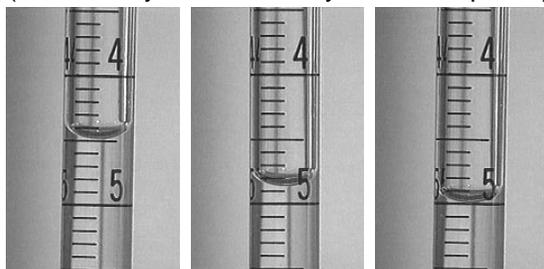
- Use pipette to measure moles (via volume)
- Use volumetric flask to measure volume

Now we use the equation  $M_1V_1 = M_2V_2$

- 1 is starting (concentrated conditions)
- 2 is ending (dilute conditions)

## Reading a pipette

Identify each volume to two decimal places (values tell you how much you have expelled)



## Practice using a pipette



- Always keep pipette vertical
- To rinse: take up water, remove green filler, rotate pipette, replace filler, expel water
- If filler can not take up or expel enough liquid, remove, place finger over pipette, turn knob, replace filler.
- Take up water to 0 mark. Measure 3.2 mL into 10 mL cylinder. (one per person)
- If drop is hanging off, touch to cylinder
- Repeat with 1.7 mL and 5.1 mL

## The Dilution formula

E.g. if we have 1 L of 3 M HCl, what is M if we dilute acid to 6 L?

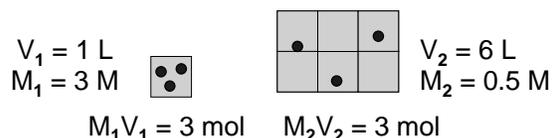
$$M_1 = 3 \text{ mol/L}, V_1 = 1 \text{ L}, V_2 = 6 \text{ L}$$

$$M_1V_1 = M_2V_2, M_1V_1/V_2 = M_2$$

$$M_2 = (3 \text{ mol/L} \times 1 \text{ L}) / (6 \text{ L}) = 0.5 \text{ M}$$

Why does the formula work?

Because we are equating mol to mol:



## Practice problems

Q – What volume of 0.5 M HCl can be prepared from 1 L of 12 M HCl?

Q – 1 L of a 3 M HCl solution is added to 0.5 L of a 2 M HCl solution. What is the final concentration of HCl? (hint: first calculate total number of moles and total number of L)

- How many mL of a 14 M stock solution must be used to make 250 mL of a 1.75 M solution?
- You have 200 mL of 6.0 M HF. What concentration results if this is diluted to a total volume of 1 L?
- 100 mL of 6.0 M  $\text{CuSO}_4$  must be diluted to what final volume so that the resulting solution is 1.5 M?
- What concentration results from mixing 400 mL of 2.0 M HCl with 600 mL of 3.0 M HCl?
- What is the concentration of NaCl when 3 L of 0.5 M NaCl are mixed with 2 L of 0.2 M NaCl?
- What is the concentration of NaCl when 3 L of 0.5 M NaCl are mixed with 2 L of water?
- Water is added to 4 L of 6 M antifreeze until it is 1.5 M. What is the total volume of the new solution?
- There are 3 L of 0.2 M HF. 1.7 L of this is poured out, what is the concentration of the remaining HF?