

## Square 1: Concentration Units and Measurements

Things to do:

Review SI units

Review metric prefixes:

Know *at least* **mega-** down to **atto-**

A word to the wise when doing calculations:

**KEEP TRACK OF UNITS!!**

Remember *dimensional analysis*

If your units don't work, there's no way the result can be correct!

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## Concentration Units Based on Moles

Molarity, M

Molarity vs Formality

Molality, m

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## Molar Concentrations

*Example:* How many grams of  $\text{MgF}_2$  are needed to make 250.0 mL of a 0.150 M  $\text{MgF}_2$  solution?

How about 250.0 mL of 0.150 M  $\text{F}^-$  solution?

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## Concentrations Based on Mass or Volume Ratios

### Percents

- weight %, (% w/w)
- volume %, (% v/v)
- % weight per volume, (% w/v)

### For very dilute samples:

- parts per million (ppm)
- parts per billion (ppb)

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### Concentrations Based on Mass or Volume Ratios

*Example:* What is the mercury concentration in ppm of a 12.0  $\mu\text{M}$  mercury solution?

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### One More Example

*Example:* Most contact lens saline solutions are 5.0% sodium chloride. Calculate the molarity of these sodium chloride solutions. The density of the solution is 1.4 g/mL.

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## Dilution

Often you will start with a solution of a given concentration and need to prepare a solution of lesser concentration. How do you determine the volume that must be diluted to prepare this solution?

$$M_{\text{conc}} V_{\text{conc}} = M_{\text{dil}} V_{\text{dil}}$$

Look at the units:

**“Dilution by mass”** works and may be more convenient!

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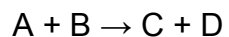
## Dilution

*Example:* How many milliliters of concentrated (18.0 M) sulfuric acid must be diluted to 500.0 mL to make a 0.100 M solution?

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### **Taking Advantage of Stoichiometry:**

Use stoichiometric relations to calculate an unknown quantity based on the quantity of a product produced or reactant consumed on a reaction.



- Gravimetric Methods
- Titrimetric (Volumetric) Methods