Chemistry 20

Unit C: Solutions and acid-base chemistry

Dilution and ion concentration

A strong bottle and a milder target

- The stock is 2.00 $\mathrm{mol \cdot L^{-1}}$ and the target is 0.200 $\mathrm{mol \cdot L^{-1}}$ in 500.0 mL.
- The solute that ends in the flask is a measured portion of that stock, then water fills the flask to the mark.

The amount of solute stays the same

- Symbol c_1 is the stock concentration and V_1 is the stock volume.
- The product of concentration and volume is the amount of solute, and dilution leaves that amount unchanged.
- Symbol c_2 is the diluted concentration and V_2 is the final volume.

Key terms

dilution

Adding solvent so the solution volume rises, the concentration falls, and the amount of solute stays the same. ($c_1 V_1 = c_2 V_2$)

dissociation

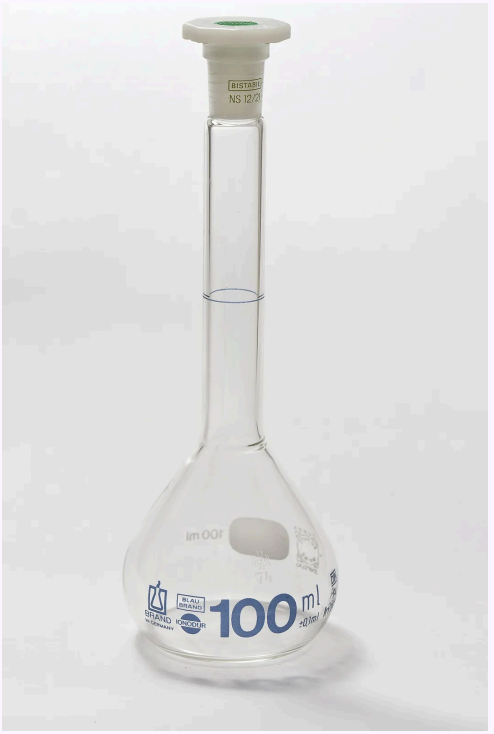
The separation of a dissolved ionic compound into positive ions and negative ions. ($CaCl_2(aq)$)

volumetric flask

A flask with one calibration mark used to hold a stated final volume of solution. (500.0 mL mark)

The volumetric flask mark

- Calculate the mass, dissolve the solid in some water already in the volumetric flask, then fill to the mark.
- Read the label and wear goggles before the solid is transferred.



Diluting 50.0 mL of stock

- Solve $c_1 V_1 = c_2 V_2$ for the stock volume that supplies the solute.
- Add water until the final volume is the flask mark. The volume difference only estimates the water.

Two chloride ions for each formula

- Calcium chloride dissociates as $CaCl_2(aq)$ to $Ca^{2+}(aq)$ plus 2 $Cl^-(aq)$.
- The coefficient of each ion multiplies the compound concentration.

Volume and ions

- Find the stock volume of 3.00 $\text{mol}\cdot\text{L}^{-1}$ solution that prepares 250.0 mL of 0.150 $\text{mol}\cdot\text{L}^{-1}$ solution.
- Find $[\text{Na}^+]$ and $[\text{SO}_4^{2-}]$ in 0.200 $\text{mol}\cdot\text{L}^{-1}$ Na_2SO_4.

Image credits

Lucasbosch, Brand volumetric flask 100ml, CC BY-SA 3.0