

# 7.1 Solutions

Name: \_\_\_\_\_

## What are solutions?

- a solution is a homogeneous mixture
- a homogeneous mixture is one where the particles are evenly mixed
- there are two components to a solution

## What are the two components of a solution?

- a solution is made up of a solvent and a solute
- a solute is the component in a solution which exists in the smaller quantity
- a solvent is the component in a solution which exist in the greater quantity
- in general, in solution chemistry, the solid (solute) is dissolved in a liquid (solvent)

## Can we combine an infinite amount of solute with solvent?

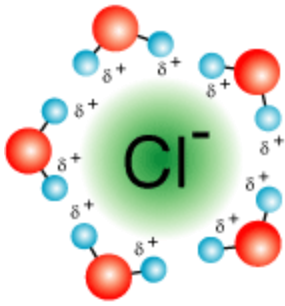
- the amount of one substance that will dissolve in a certain amount of another at a specific temperature refers to the solubility of a substance
- solubility varies with temperature → why?
- when no more solute will dissolve, the solution is saturated

## Can liquids dissolve in a solution?

- yes → we refer to how liquids mix with one another as being miscible (soluble) or being immiscible (insoluble)
- polar liquids will be miscible with another polar liquid e.g. water and alcohol will mix in any proportions
- non-polar liquids will be miscible with another non-polar liquid e.g. salad oil and motor oil will mix
- a non-polar liquid will not be miscible with a polar liquid e.g. oil and water will not mix
- “like dissolves like”

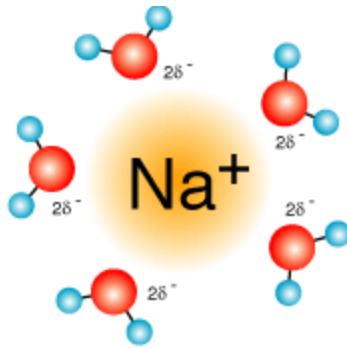
## What happens when an ionic solid is placed in water?

- ionic solids will dissociate when placed in water → why?



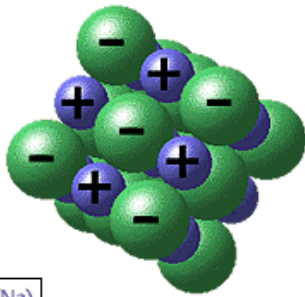
Slightly positive hydrogen are attracted to chlorine anions

NaCl crystal structure

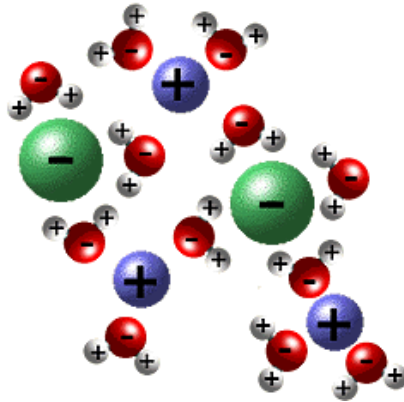


Slightly negative oxygen are attracted to sodium cations

NaCl in water



sodium (Na)  
chlorine (Cl)



- water molecules can attach themselves to a surface ion and remove it from the lattice
  - when surrounded by attached water molecules, the ion is said to be hydrated
  - a general term for this interaction between the solute and the solvent particles is called solvation
  - a typical dissociation equation:
- 
- solvation can also happen to polar molecules (as opposed to ions) in water e.g. MeOH/H<sub>2</sub>O
  - solvation does not occur between polar and non-polar substances
  - if both solvent and solute are non-polar, solvation may occur (through weaker “Van der Waals” forces which are momentary dipoles caused by the nucleus of one atom briefly attracting the electrons of another)
  - e.g. benzene will dissolve moth balls (p-dichlorobenzene)

### **Converting between units of Solubility**

- The solubility of Kbr is  $1.3 \times 10^{-5}$  M (mol/L). What is this solubility in g/ml?
  - Kbr = 119.00g/mol
  
- Complete problems on p. 366!
- Look at chart on p. 367 and complete problems on p. 368
- 7.1 Review questions: 1-3, 6-8, 12 13

