Calculate the molar solubility of $CuCl_2$ if 500.0 mL of a saturated solution contain 43.5 g.

$0.647 \frac{mol}{L}$

Predicting the Solubility of Salts

- the **Solubility Table** in the Chem12 Data Booklet is used to predict the solubility of various salts (ionic compounds) in water at 25°C
- nothing is INSOLUBLE in water
- BUT if the amount that dissolves is so small that we can ignore it, we say that the substance has NEGLIGIBLE SOLUBILITY in water (ex. glass)
- some substances dissolve only slightly, but in an amount that can not be ignored; they have LOW SOLUBILITY

A substance with LOW SOLUBILITY requires less than 0.1 M to make a saturated solution

Consider the following section from the Solubility Table:

NEGATIVE IONS (Anions)	POSITIVE IONS (Cations)	SOLUBILITY OF COMPOUNDS
Phosphate, PO_4^{3-} or Carbonate, CO_3^{2-} or Sulphite, SO_3^{2-}	Alkali ions, H^+, NH_4^+	Soluble
	All others	LOW SOLUBILITY

- alkali ions are the ions of Group 1 and include Li^+, Na^+, K^+, Rb^+, Cs^+, Fr^+.
- the table indicates that any compound that contains the anion PO_4^{3-}, CO_3^{2-} or SO_3^{2-} and the cations alkali ions, H^+ or NH_4^+ are soluble but any other cation will form a compound of low solubility (precipitate forms) ppt
- although the cations are not explicitly listed, they fall under the "all others" category"

When two ions form a compound having LOW SOLUBILITY, the mixing of solutions of these two ions will form a PRECIPITATE.

Q. Which of the following compounds have low solubility?

Na_3PO_4, $MgSO_3$, $ZnCO_3$, $(NH_4)_2CO_3$

Soluble

Na_3PO_4

$(NH_4)_2CO_3$

low solubility (ppt)

$MgSO_3$

$ZnCO_3$

Q. Will a precipitate form when equal volumes of 0.2 M CaS and 0.2 M Na_2SO_4 are mixed? (Note - equal volumes of 0.2 M solutions make 0.1 M solutions, our threshold for low solubility.)

$CaS_{(aq)} + Na_2SO_{4(aq)} \rightarrow CaSO_{4(s)} + Na_2S_{(aq)}$

low sol. ppt

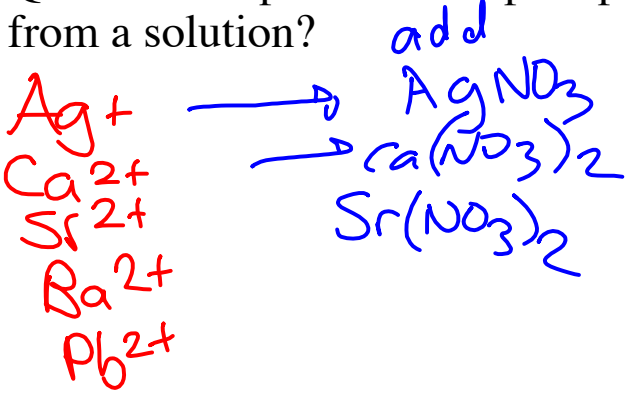
soluble

It is useful to remember that compounds containing alkali ions, H^+, NH_4^+ or NO_3^- are soluble in water.

- in some problems you will be asked to find a compound that will precipitate a particular ion
- ions do not exist on their own but rather are always associated with ions of the opposite charge
- ions are usually added as compound of **soluble salts**

ANIONS are added as sodium salts.
CATIONS are added as nitrate salts.

Q. What compound could precipitate $SO_4^{2-}(aq)$ from a solution?



Q. What compound could precipitate $Sr^{2+}(aq)$ from a solution?