Solubility
Solubility = the max amount of solute that can be dissolved in a solvent

- Many solids and gases dissolve in water
- As you increase the temperature, you can dissolve more solid

- Does this work the same with gas?
  - NO – as you increase temp, gas molecules KE ↑!
- Where can you go to find if something is soluble or insoluble in water?
  - Table F
Solubility curves show the relationship between solubility and temperature.

- Can you guess which of these compounds are gases?! How do you know?!
Reading a solubility curve?!

Table G tells you the max amount of solute you can dissolve in 100 g of H₂O at a given temperature.
Problem:

How much KCl will dissolve in 100g of water at 50°C?

\[ X = 42 \text{g KCl} \]
Problem:

How much KCl will dissolve in 300g of water at 50°C?

Hint: Use the graph to set up a proportion

\[
\frac{42 \text{ g KCl}}{100 \text{ g H}_2\text{O}} = \frac{X \text{ g KCl}}{300 \text{ g H}_2\text{O}}
\]

\[X = 126\text{g KCl}\]
How much H$_2$O is required to just dissolve 200 g NaNO$_3$ at 20°C?

\[ \frac{88 \text{ g NaNO}_3}{100 \text{ g H}_2\text{O}} = \frac{200 \text{ g NaNO}_3}{X \text{ g of H}_2\text{O}} \]

\[ X = 227.3 \text{ g H}_2\text{O} \]
- On the line – **saturated** (full, cannot hold any more solute)
- Below the line – unsaturated (can hold more solute)
- Above the line – supersaturated (holding more solute then it should – very unstable)
Unsaturated solution

30.0 g NaCl + 100 mL H₂O = 
Saturated Solution

40.0 g NaCl + 100 mL H₂O = Saturated solution containing 100 mL H₂O and 36.0 g NaCl

The additional 4.0 g NaCl remains undissolved.
Supersaturated Solution

(this picture is showing the addition of 100 g of glucose to 100ml of water at 25\(^{\circ}\)C) Note: at 25\(^{\circ}\)C, only 91g of glucose will dissolve in 100 ml of water

Let’s see what happens
Precipitation problems

• A saturated solution of KNO₃ is prepared in 100 g of water at 50°C and then cooled down to 10°C. How much KNO₃ will precipitate?
88 g KNO₃ in 100 g H₂O at 50°C

20 g KNO₃ in 100 g H₂O at 10°C

88 g – 20 g = 68 g KNO₃ precipitates