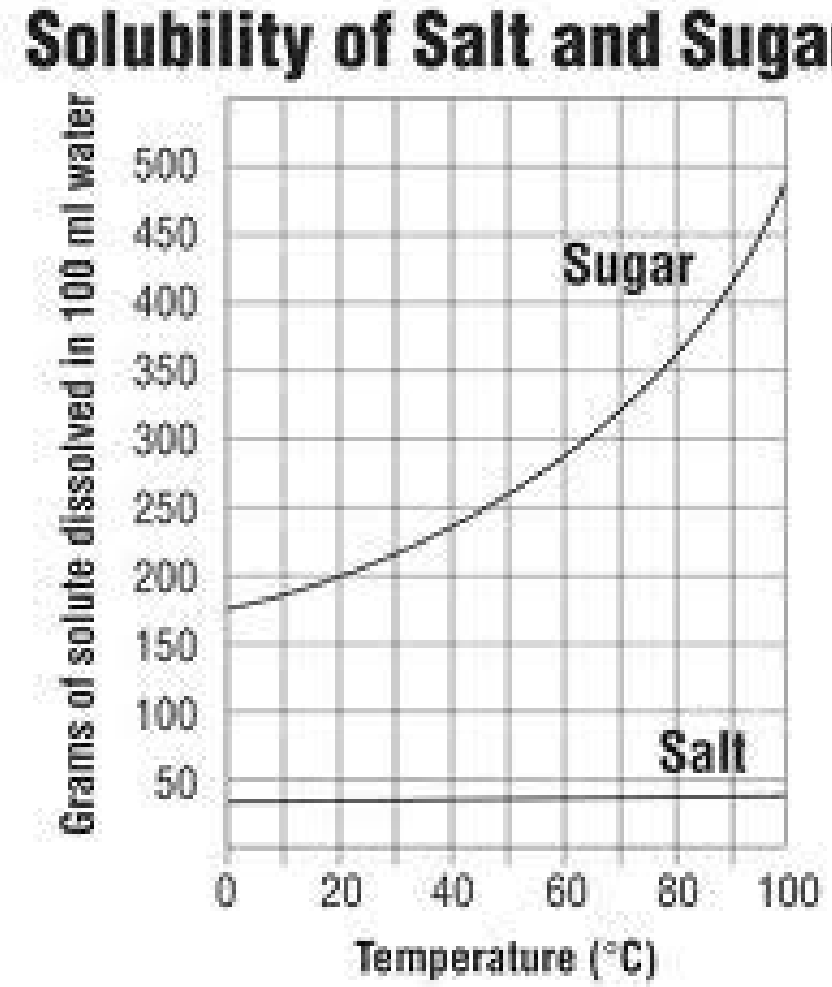
Solubility Curves

Solvent – H_2O

Solute – H.C.



Outcomes:

- Construct, from experimental data, a solubility curve of a pure substance in water.
- use a graph of solubility data to solve problems.

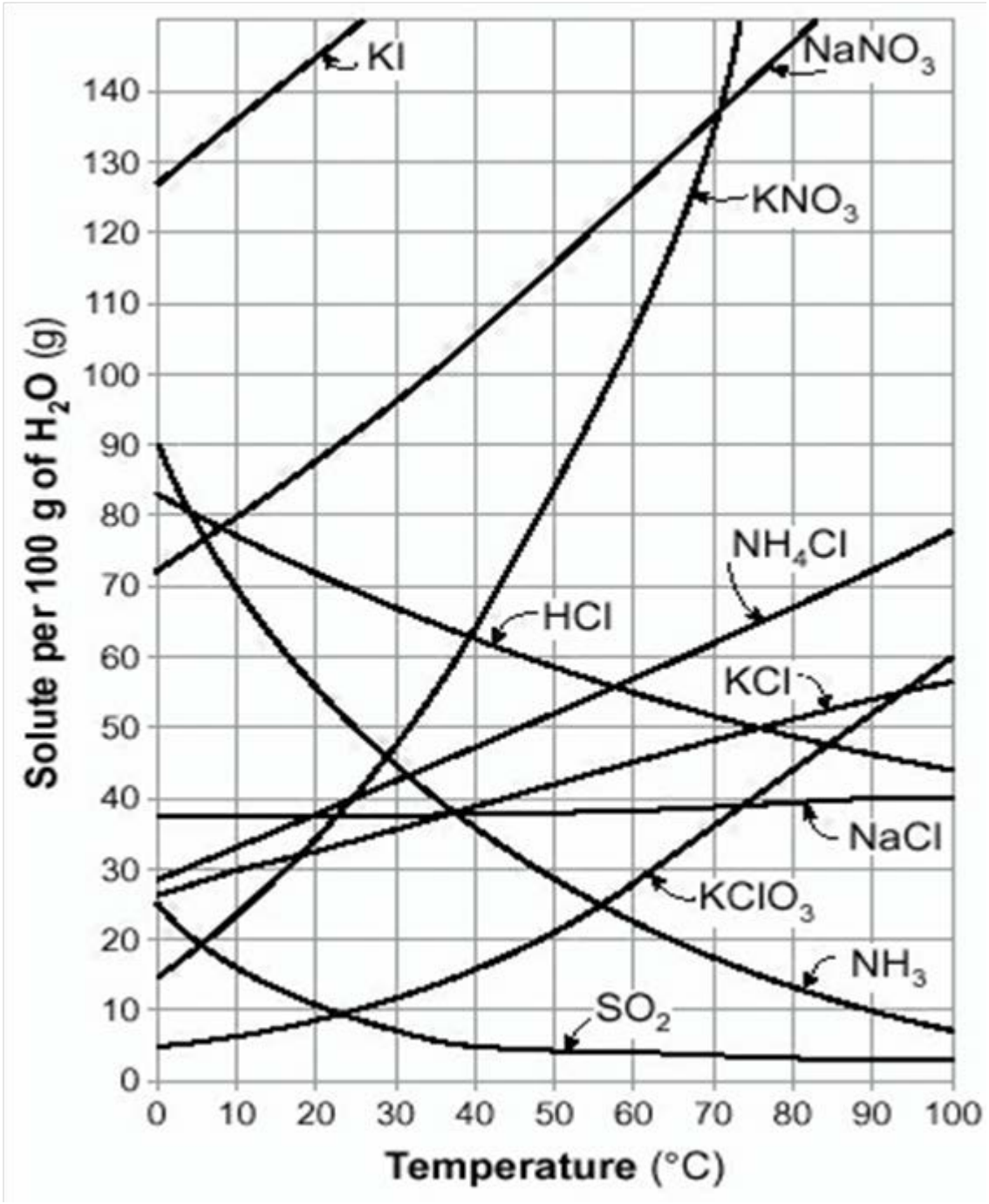
Solubility Curves:

Solubility (how much)

Remember that temperature has an effect on the **AMOUNT** of a solid or gas that can be dissolved in a liquid…

- A **SOLUBILITY CURVE** is a graph that reflects the **DEGREE** (amount) to which **SOLVENTS** are **ABLE** to **DISSOLVE SOLUTES**. All data is considered to be **SATURATED SOLUTIONS** only.

- Most solubility tables are considered in **g/100ml**, not litres.


KI
NaNO3
KNO3
NH4Cl
HCl
KCl
NaCl
KClO3
NH3
SO2
Solute per 100 g of H2O (g)
Temperature (°C)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140

Reading Solubility Curves:

1. The curve shows **# GRAMS SOLUTE** in a **SATURATED** solution containing **100ml** (100g) of **WATER** at various **TEMPERATURES**

2. Any **AMOUNT** of solute **BELOW** the line indicates an **UNSATURATED** solution at that **TEMP**.

3. Any **AMOUNT** of solute **ABOVE** the line indicates a **SUPERSATURATED** solution at that **TEMP**.

4. If the **AMOUNT** of solute is **ABOVE** the line, but has **NOT** all **DISSOLVED**, the solution is **SATURATED**, and the **# GRAMS SOLUTE** on the **BOTTOM** of the **CONTAINER** is the **DIFFERENCE** between the **TOTAL GRAMS** of **SOLUTE** and the **GRAMS** in a **SATURATED** solution.

5. Solutes whose curves move **UPWARD** are typically **SOLIDS** (solubility **INCREASES** as temp increases).

6. Solutes whose curves move **DOWNWARD** are typically **GASES** (solubility **DECREASES** as temp increases).

Example Questions:

"solubility"

1. At 80°C, what is the concentration of NaCl, $KClO_3$, and KCl?

NaCl = 39 g/100g H_2O

$KClO_3$ = 42g/100g H_2O

KCl = 51g/100g H_2O

2. If KCl is saturated at 0°C, how much more solute could 1L hold at 50°C?

At 0°C

28g/100g H_2O

At 50°C

42g/100g H_2O

$42g - 28g = \frac{14g}{100g\ H_2O} = \frac{x}{1000g\ H_2O}$

$x = 140g/1000g\ H_2O$ more

1L

Example Questions:

3. Find the amount of $NaNO_3$ needed to saturate 60ml of water at 10°C.

@ 10°C = $\frac{79\text{ g}}{100\text{ g } H_2O} = \frac{x}{60\text{ g } H_2O}$

$x = 47.4\text{ g}/60\text{ g } H_2O$

4. $NaNO_3$ drops in temp from 15° to 0°C. How much solute would precipitate out of a saturated solution.

@ 15°C $83\text{ g}/100\text{ g } H_2O$

@ 0°C $72\text{ g}/100\text{ g } H_2O$

$83\text{ g} - 72\text{ g} = 11\text{ g}$ would ppt.