

Types of Solutions

On a solubility curve, the lines indicate the concentration of a **saturated** solution - the maximum amount of solute that will dissolve at that specific temperature.

Values on the graph **below** a curve represent **unsaturated solutions** - more solute could be dissolved at that temperature.

Label the following solutions as saturated or unsaturated. If unsaturated, write how much more solute can be dissolved in the solution.

Solution	Saturated or Unsaturated?	If unsaturated: How much more solute can dissolve in the solution?
a solution that contains 70g of NaNO ₃ at 30°C (in 100 mL H ₂ O)	Unsaturated	25 g
a solution that contains 50g of NH ₄ Cl at 50°C (in 100 mL H ₂ O)	Saturated	XXXXXXXX
a solution that contains 20g of KClO ₃ at 50°C (in 100 mL H ₂ O)	Saturated	XXXXXXXX
a solution that contains 70g of KI at 0°C (in 100 mL H ₂ O)	Unsaturated	60 g

Use the Solubility Graphs on Page 1

- What is the solubility of KCl at 5°C? 28g KCl / 100 g H₂O
 - What is the solubility of KCl at 25°C? 34 g KCl / 100 g H₂O
 - What is the solubility of Ce₂(SO₄)₃ at 10°C? 14 g Ce₂(SO₄)₃ / 100 g H₂O
 - What is the solubility of Ce₂(SO₄)₃ at 50°C? 5 g Ce₂(SO₄)₃ / 100 g H₂O
- At 90°C, you dissolved 10 g of KCl in 100. g of water. Is this solution saturated or **unsaturated**?
 - How do you know? **That point falls below the curve for KCl on the graph.**
- A mass of 100 g of NaNO₃ is dissolved in 100 g of water at 80°C.
 - Is the solution saturated or unsaturated? unsaturated
 - As the solution is cooled, at what temperature should solid first appear in the solution? Explain.
35 °C
That temperature marks the point on the graph that falls on the curve for NaNO₃ when 100 g of NaNO₃ is dissolved in 100 g of water.

4. Use the graph to answer the following two questions:

Which compound is most soluble at 20 °C? KI

Which is the least soluble at 40 °C? Ce₂(SO₄)₃

5. Which substance on the graph is **least** soluble at 10°C? KClO₃

6. A mass of 80 g of KNO₃ is dissolved in 100 g of water at 50 °C. The solution is heated to 70°C. How many more grams of potassium nitrate must be added to make the solution saturated? Explain your reasoning (See question #2 on the other side for a hint) **50 g KNO₃**

According to graph, the saturation point for KNO₃ at 70 °C 130 g, which is 50 g more than 80 g.

Elements review: Fill in the chart below for some of the compounds on the graph:

Formula	# of atoms in formula	If the following amounts of solute are dissolved in 100 mL of water: Is the solution <u>SATURATED</u> OR <u>UNSATURATED</u>
Example: NaCl	Na = 1 Cl = 1	3 grams dissolved at 0°C unsaturated
Formula	# of atoms in formula	If the following amounts of solute are dissolved in 100 mL of water: Is the solution <u>SATURATED</u> OR <u>UNSATURATED</u>
KI	K = 1 I = 1	120 grams dissolved at 0°C unsaturated
Ce ₂ (SO ₄) ₃	Ce = 2 S = 3 O = 12	7.2 grams dissolved at 70°C saturated
NH ₄ Cl	N = 1 H = 4 Cl = 1	11 grams dissolved at 46.7°C unsaturated

1. How many grams of potassium chlorate will dissolve in 300 grams of water at 65°C?

90 grams of potassium chlorate

2. If a solution is made using 400 grams of water at 20°C and 40 grams of potassium chlorate, would the solution be saturated?

Saturated

3. To what temperature Celsius must you raise the 100 grams of water in order for all 80 grams of the potassium nitrate to dissolve?

50 °C