Solubility Curves

Essential Question

How much solute can dissolve?

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What Is Solubility?

- Solubility: max solute that dissolves
- Units: g per 100 g H_2O
- Depends on temperature

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Unsaturated, Saturated, Supersaturated

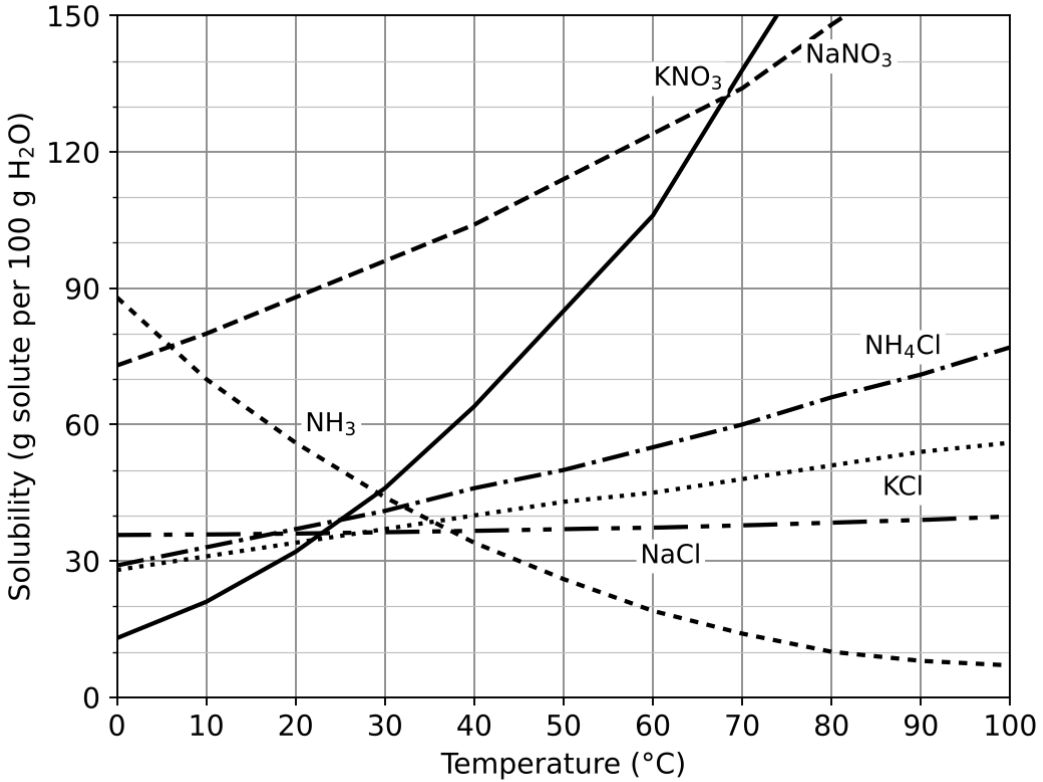
- Unsaturated: less than the max; a crystal dissolves
- Saturated: at the max; a crystal sits on the bottom
- Supersaturated: more than the max; crystals form fast

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Solubility Curves

Reading a Solubility Curve

- Find the temperature
- Go up to the curve
- Go left, read the grams
- $NaNO_3$ at 10 °C: 80 g



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Above, On, or Below the Line

- Above the curve: supersaturated
- On the curve: saturated
- Below the curve: unsaturated

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Temperature and Solids

- Solid curves slope up
- Hotter = more dissolves
- KNO_3: steep, big change
- NaCl: nearly flat

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Temperature and Gases

- Gas curves slope down
- NH_3: 88 g at 0 °C, 7 g at 100 °C
- Warm soda goes flat

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Cooling a Saturated Solution

- Cooling: less dissolves
- Extra solute crystallizes
- Crystals = high reading − low reading

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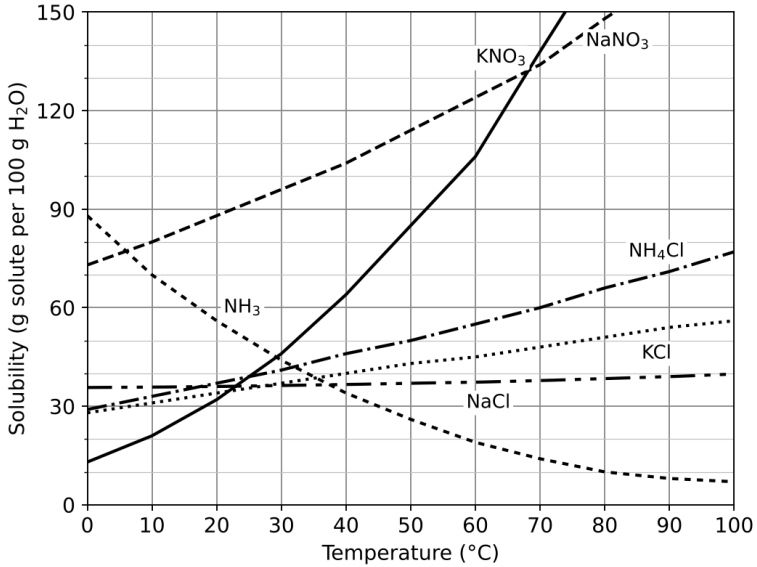
Solute or Water Needed

- More solute to saturate = curve reading − grams dissolved
- Water needed: g solute × (100 g H_2O / curve reading)
- Scale every reading from 100 g of water

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Example: Reading Solubility

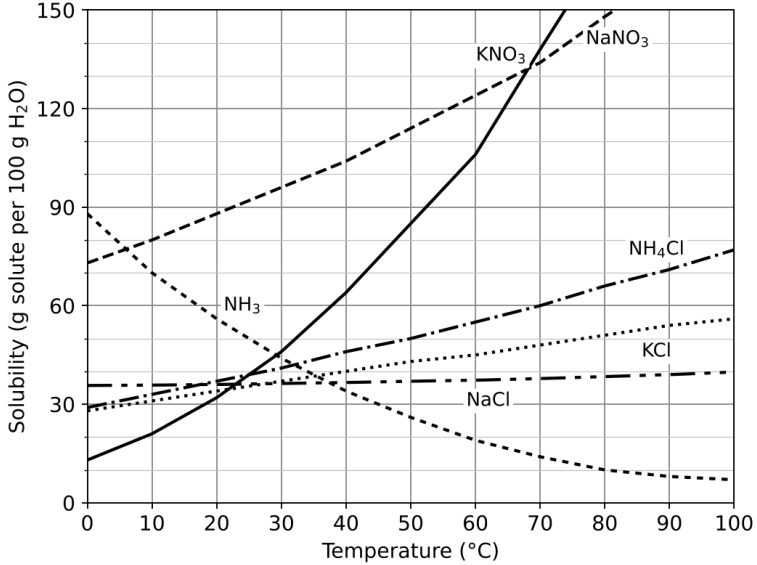
What is the maximum mass of KNO_3 that can dissolve in 100 g of water at 60 °C?



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Example: Saturated or Not?

A solution has 50 g of NH_4Cl dissolved in 100 g of water at 70 °C. Is it unsaturated, saturated, or supersaturated?

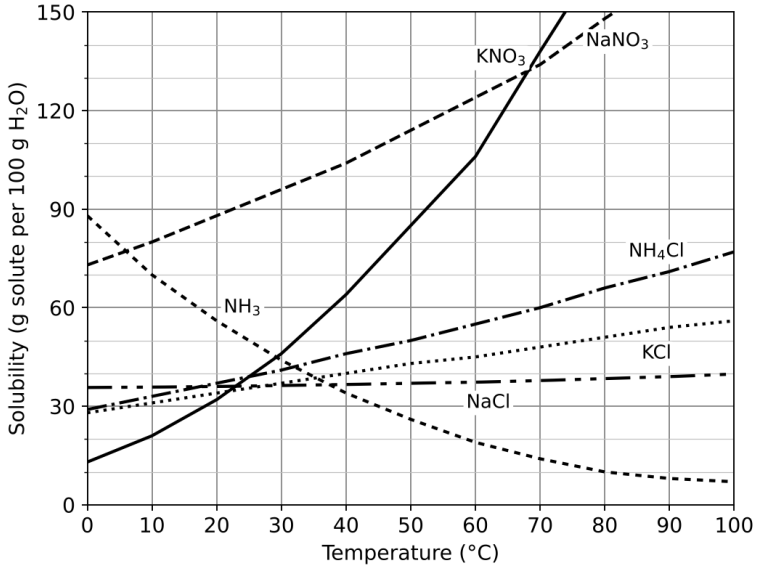


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Example: Cooling a Solution

A saturated solution of KNO_3 in 100 g of water is cooled from 70 °C to 30 °C.

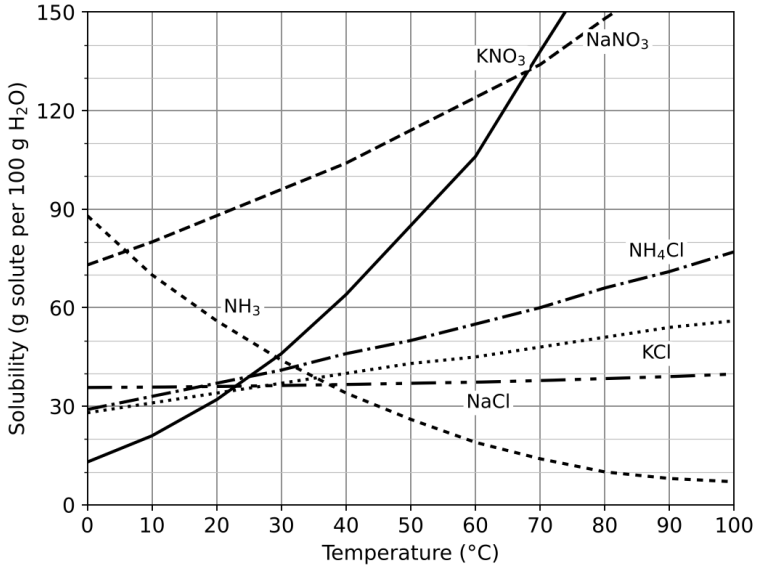
What mass of KNO_3 crystallizes out?



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Example: Scaling Up the Water

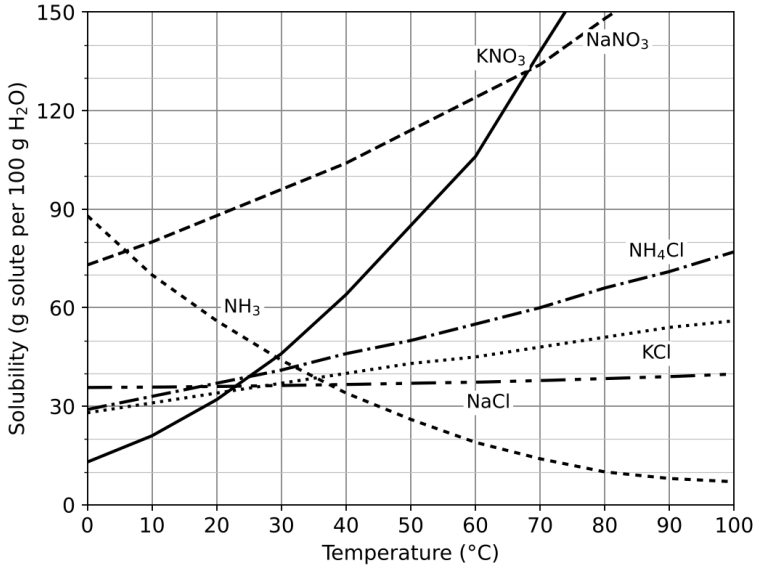
What is the maximum mass of NH_4Cl that can dissolve in 200 g of water at 50 °C?



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Example: Comparing Curves

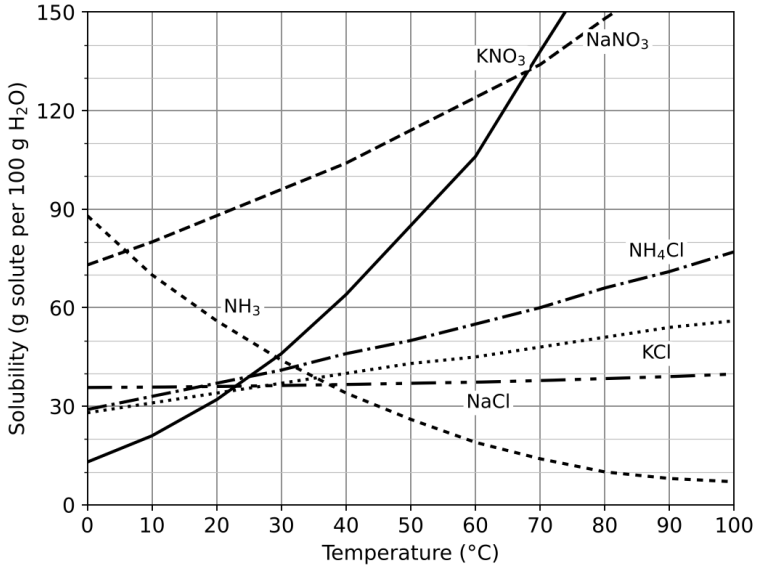
Which substance on the graph has a solubility that changes the least from 0 °C to 100 °C?



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Example: How Much Water?

How many grams of water are needed to dissolve 75 g of NH_4Cl at 50 °C and make a saturated solution?



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Solubility Curves

Big Ideas

- Solubility: max g per 100 g H_2O
- On the curve = saturated; above = supersaturated; below = unsaturated
- Solids: more soluble when hot; gases: less
- Cooling a saturated solution makes crystals
- Water needed: flip the ratio

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