ANSWER KEY.

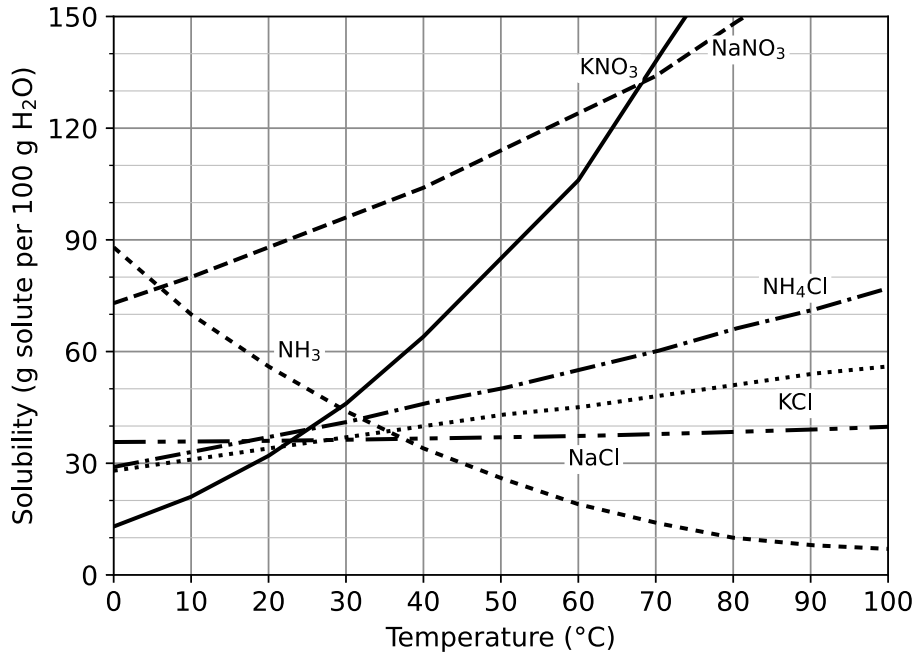
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Solubility Curves

Chemistry | ANSWER KEY

Use the solubility curves in problem 1 for every question. Solubility is in grams of solute per 100 g of water. Show the readings you take from the graph.

1. Read the graph. The first row is done for you.



Solute and temperature	**Grams per 100 g H_2O**
NH_4Cl at 70 °C	60 g
KNO_3 at 40 °C	**64 g**
$NaNO_3$ at 10 °C	**80 g**
NH_3 at 20 °C	**56 g**

2. Label each solution unsaturated, saturated, or supersaturated. The first row is done for you.

Dissolved in 100 g of water	**Curve reading**	**Label**
60 g KNO_3 at 40 °C	64 g	unsaturated
85 g KNO_3 at 50 °C	**85 g**	**saturated**
90 g $NaNO_3$ at 10 °C	**80 g**	**supersaturated**
30 g KCl at 60 °C	**45 g**	**unsaturated**

Below the curve = unsaturated, on it = saturated, above it = supersaturated.

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3. (a) Which solute is a gas? How can you tell from its curve? (b) Which solute is most soluble at 10 °C? (c) Which solute's solubility changes the least from 0 °C to 100 °C?

(a) **NH_3: its curve slopes down, because gases dissolve less in warmer water.**
(b) **$NaNO_3$** (about 80 g) (c) **NaCl** (35.7 g to 39.8 g, a change of only 4.1 g)

4. A saturated solution of KNO_3 in 100 g of water is cooled from 60 °C to 20 °C. What mass of KNO_3 crystallizes? Is the solution at 20 °C saturated?

106 g − 32 g = **74 g KNO_3 crystallizes**. **Yes, it is saturated**: the water still holds the maximum, 32 g, at 20 °C.

5. At what temperature do 50 g of NH_4Cl just saturate 100 g of water?

The NH_4Cl curve crosses 50 g at **about 50 °C**.

6. What mass of NH_4Cl dissolves in **50 g** of water at 70 °C to make a saturated solution?

60 g per 100 g H_2O at 70 °C; 50 g H_2O × (60 g / 100 g H_2O) = **30 g NH_4Cl**

7. A solution has 40 g of KNO_3 dissolved in 100 g of water at 50 °C. How many more grams of KNO_3 must dissolve to saturate it?

Saturated at 50 °C = 85 g; 85 g − 40 g = **45 g more KNO_3**

8. How many grams of water are needed to make a saturated solution with 36 g of KCl at 40 °C?

Hint: put grams of water on top of the ratio.

KCl at 40 °C = 40 g per 100 g H_2O; 36 g KCl × (100 g H_2O / 40 g KCl) = **90 g of water**

9. Explain why an open soda goes flat faster on a hot day than in the refrigerator.

CO_2 is a gas, and gases are less soluble in warmer water, so the warm soda can hold less CO_2 and it escapes faster.

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