

4.4 - Solubility Curves and Tables ANSWER KEY

4.4 – Solubility Curves and Tables - Worksheet KEY

1. Use a solubility curve to determine the solubility of the following compounds at the temperatures given.

compound	temperature	solubility
NH ₃	10°C	68g/100mL
Ce ₂ (SO ₄) ₃	50°C	6g/100mL
KCl	90°C	53g/100mL

2. For each of the following solutions, classify the solution as unsaturated, saturated, or supersaturated.

compound	temperature	mass solute in 100 mL water	solution
NH ₃	90°C	10g	saturated
NH ₄ Cl	80°C	70g	supersaturated
NaNO ₃	30°C	80g	unsaturated

3. What is the solubility of ammonium chloride, NH₄Cl, at 100°C? Express this both as g/100mL of water and as mol/L of water. Round your answer to the nearest molarity.

from graph: 75g/100mL

$$\frac{75\cancel{\text{g}}}{100\cancel{\text{mL}}} \times \frac{1000\cancel{\text{mL}}}{1\text{L}} \times \frac{1\text{ mol}}{53.5\cancel{\text{g}}} = 14\text{ M}$$

4. What mass of potassium chlorate, KClO₃ could be dissolved in 100mL of water at 70°C?

from graph: approximately 32 g

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5. A **saturated solution** of potassium chloride at 80.0 °C is cooled to 40.0 °C. Initially, no solid was present in the beaker. Once cooled, there appeared to be solid at the bottom of the beaker. Explain the difference in the presence of solid at the bottom of each solution assuming there is 100 g of water. How much solid (in grams) will there be once the solution has cooled.

Saturated at 80°C means there is about 50g of solid dissociated in the solution. As the solution cools, the solubility of KCl goes down, which means all of the excess solute will be removed from solution and become a solid (the solubility of KCl at 40°C is only about 37g). Therefore, about 13g of KCl will be found at the bottom of the beaker (50-37 = 13g).

6. Use a Table of Solubility of Common Compounds to predict whether or not the following compounds will be soluble in water at 25°C.

Mg(NO ₃) ₂	soluble	CaSO ₄	insoluble
CaCl ₂	soluble	K ₂ SO ₄	soluble
Al ₂ S ₃	insoluble	Ba(OH) ₂	soluble
(NH ₄) ₃ PO ₄	soluble	Mg(OH) ₂	insoluble
SrCO ₃	insoluble	BeS	soluble
BaSO ₄	insoluble	CuCl ₂	soluble
Mg(CH ₃ COO) ₂	soluble	CuCl	insoluble
SrI ₂	soluble	H ₂ CO ₃	soluble

Cu⁺ vs. Cu²⁺

7. A glass of cold cola is left to stand 5 minutes at room temperature. How does temperature affect the solubility of the CO₂(g)?

Being that carbon dioxide is a gas, an increase in temperature decreases the solubility of carbon dioxide.

8. At room temperature, the solubility of which solute in water would most be affected by a change in pressure? Explain your answer.

a. methanol (l)

b. sugar (s)

c. carbon dioxide (g)

d. sodium nitrate (s)

Carbon dioxide is the only gas; therefore the answer is c. Only gas solubility is affected by pressure changes (see Henry's Law).

9. Calculate the solubility of oxygen gas in water at 0 °C and a pressure of 3.00 atm. The solubility of oxygen is 0.348 g/100 mL water at 0 °C and 1.00 atm.

$$\frac{S_1}{P_1} = \frac{S_2}{P_2} \longrightarrow \frac{0.348\text{g}/100\text{mL}}{1.00\text{ atm}} = \frac{S_2}{3.00\text{ atm}} \longrightarrow S_2 = 1.04\text{ g}/100\text{mL}$$