General Chemistry
Mr. MacGillivray
Worksheet:
Solubility and Ionic Equations

The solubility graph may be useful in answering some of the following questions.

1. **Solubility** is a measure of how _____ of a substance can be dissolved in a given amount of solvent, whereas the **rate of solvation** is a measure of how _____ the substance can be dissolved.
2. In general, the solubility of solids (increases / decreases) as the temperature of a solid-in-liquid solution is increased.
3. In general, the solubility of gases (increases / decreases) as the temperature of a gas-in-liquid solution is increased.
4. What is "the bends"? Explain it in terms of solubility.
5. What happens to a bottle of Coke after you open it? Explain this in terms of solubility.
6. Fill in the following table.

Substance	**Solubility (g/100 g H_2O) at this temperature:**			
	0°C	20°C	50°C	70°C
KNO_3				
NH_3				
NaCl				

7. A solution of KNO_3 at 10 °C, in which 40 g of solute has been dissolved in 100 g of H_2O would be considered (saturated/unsaturated/supersaturated).

8. A solution of KNO_3 at 25 °C, in which 40 g of solute has been dissolved in 100 g of H_2O would be considered (saturated/unsaturated/supersaturated).

9. A solution of KNO_3 at 50 °C, in which 40 g of solute has been dissolved in 100 g of H_2O would be considered (saturated/unsaturated/supersaturated).

10. A solution of KNO_3 at 50 °C, in which 100 g of solute has been dissolved in **250 g of H_2O** would be considered (saturated/unsaturated/supersaturated).

11. Write the chemical equation, the complete ionic equation, and the net ionic equation for the following aqueous phase reactions :

    a. barium chloride + sodium sulfate

    b. potassium sulfate + calcium nitrate

    c. lithium carbonate + calcium chloride

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The solubility graph may be useful in answering some of the following questions.

1. **Solubility** is a measure of how much of a substance can be dissolved in a given amount of solvent, whereas the **rate of solvation** is a measure of how fast the substance can be dissolved.
2. In general, the solubility of solids (increases / decreases) as the temperature of a solid-in-liquid solution is increased.
3. In general, the solubility of gases (increases / decreases) as the temperature of a gas-in-liquid solution is increased.
4. What is "the bends"? Explain it in terms of solubility. See next page.
5. What happens to a bottle of Coke after you open it? Explain this in terms of solubility. See next page
6. Fill in the following table.

Substance	Solubility (g/100 g H_2O) at this temperature:			
	0°C	20°C	50°C	70°C
KNO_3	12 grams	32	85 g	139
NH_3	91	56	30	19
NaCl	36	37	38	39

7. A solution of KNO_3 at 10 °C, in which 40 g of solute has been dissolved in 100 g of H_2O would be considered (saturated/unsaturated/supersaturated).

8. A solution of KNO_3 at 25 °C, in which 40 g of solute has been dissolved in 100 g of H_2O would be considered (saturated/unsaturated/supersaturated).

9. A solution of KNO_3 at 50 °C, in which 40 g of solute has been dissolved in 100 g of H_2O would be considered (saturated/unsaturated/supersaturated).

10. A solution of KNO_3 at 50 °C, in which 100 g of solute has been dissolved in **250 g of H_2O** would be considered (saturated/unsaturated/supersaturated).

11. Write the chemical equation, the complete ionic equation, and the net ionic equation for the following aqueous phase reactions :

See next page

   a. barium chloride + sodium sulfate
   b. potassium sulfate + calcium nitrate
   c. lithium carbonate + calcium chloride

10. → 100g of KNO_3 dissolved in 250g H_2O is the same as how many grams of KNO_3 in 100g of H_2O?

$$\frac{100g\ KNO_3}{250g\ H_2O} = \frac{x\ g\ KNO_3}{100g\ H_2O}$$

$$10000 = 250x$$

$$\frac{10000}{250} = x$$

$$40g = x = 40g\ KNO_3 \text{ per } 100g\ H_2O$$

(4) If a deep-sea diver is decompressed too quickly, dissolved nitrogen leaves the bloodstream as bubbles. These bubbles in the body are painful and dangerous. Lower pressure = lower solubility of gas.

(5) Lower pressure = lower solubility. As the coke is opened, the pressure decreases, and the solubility of carbon dioxide in the solution decreases. The CO_2 leaves the solution as bubbles.

(11) (a)

i. $BaCl_{2(aq)} + Na_2SO_{4(aq)} \rightarrow BaSO_{4(s)} + 2NaCl_{(aq)}$

ii. $Ba^{2+}_{(aq)} + 2Cl^-_{(aq)} + 2Na^+_{(aq)} + SO_4^{2-}{}_{(aq)} \rightarrow BaSO_{4(s)} + 2Na^+_{(aq)} + 2Cl^-_{(aq)}$

iii. $Ba^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)} \rightarrow BaSO_{4(s)}$

(b)

i. $K_2SO_{4(aq)} + Ca(NO_3)_{2(aq)} \rightarrow 2KNO_{3(aq)} + CaSO_{4(s)}$

ii. $2K^+_{(aq)} + SO_4^{2-}{}_{(aq)} + Ca^{2+}_{(aq)} + 2NO_3^-{}_{(aq)} \rightarrow 2K^+_{(aq)} + 2NO_3^-{}_{(aq)} + CaSO_{4(s)}$

iii. $SO_4^{2-}{}_{(aq)} + Ca^{2+}_{(aq)} \rightarrow CaSO_{4(s)}$

(c)

i. $Li_2CO_{3(aq)} + CaCl_{2(aq)} \rightarrow 2LiCl_{(aq)} + CaCO_{3(s)}$

ii. $2Li^+_{(aq)} + CO_3^{2-}{}_{(aq)} + Ca^{2+}_{(aq)} + 2Cl^-_{(aq)} \rightarrow 2Li^+_{(aq)} + 2Cl^-_{(aq)} + CaCO_{3(s)}$

iii. $CO_3^{2-}{}_{(aq)} + Ca^{2+}_{(aq)} \rightarrow CaCO_{3(s)}$