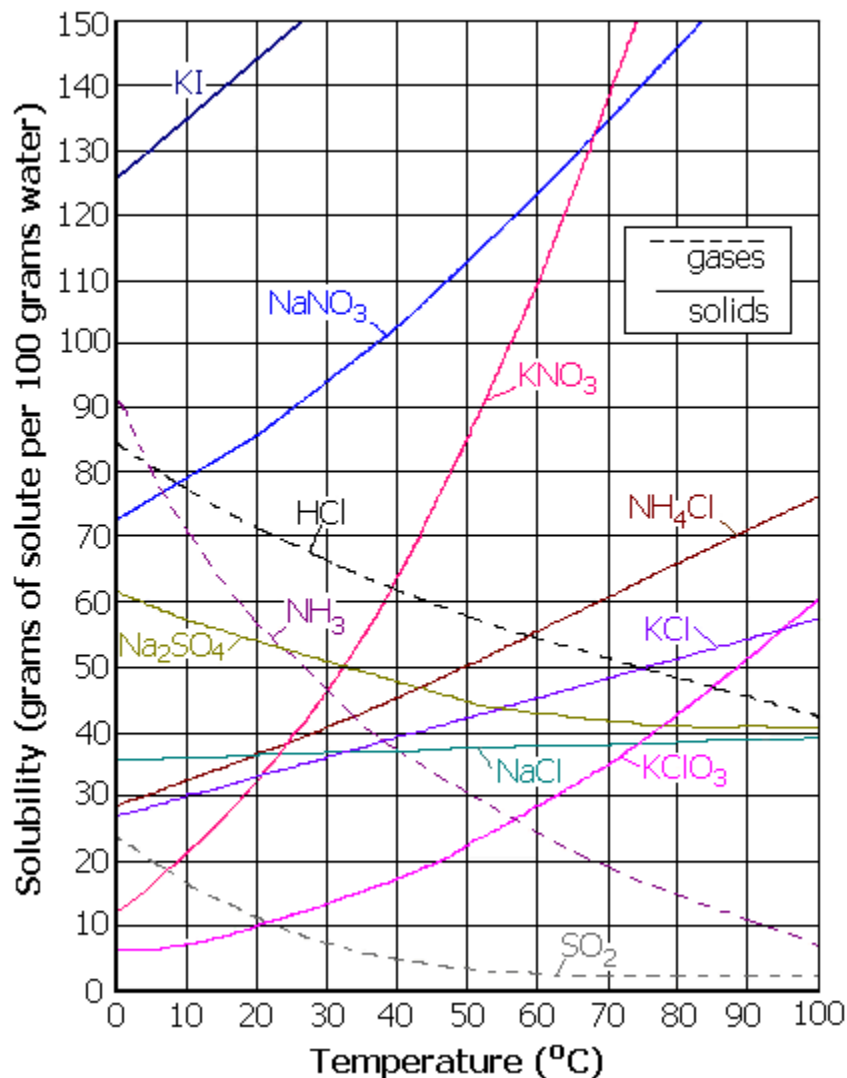


SOLUBILITY CURVES WORKSHEET



- Which compound is *least* soluble at: (A) 20°C? (B) 80°C?
- Which substance is the *most* soluble at: (A) 10°C? (B) 50°C? (C) 90 °C?
- The solubility of which substance is *most* affected by changes in temperature?
- The solubility of which substance is *least* affected by changes in temperature?
- Are the following solutions saturated, unsaturated, or supersaturated?
(Assume all are dissolved in 100 grams of water.)
 - 50 grams of NH₄Cl at 50°C
 - 100 grams of NaNO₃ at 80°C
 - 30 grams of KNO₃ at 25°C
 - 51 grams of KCl at 80°C
 - 65 grams of NH₄Cl at 70°C
 - 30 grams of NH₃ at 50°C
 - 10 grams of KClO₃ at 20°C

- 6.) NH_3 is a gas. Describe what happens to its solubility as the temperature goes from 20°C to 80°C .
- 7.) Which two substances have the same solubility at 68°C ? What is the solubility?
- 8.) Which two substances have the same solubility at 94°C ? What is the solubility?
- 9.) For each of the following, indicate the temperature at which the solution described would be saturated. (Assume all are dissolved in 100 grams of water.)
 - (A) 30 grams of NH_4Cl
 - (B) 130 grams of NaNO_3
 - (C) 50 grams of Na_2SO_4
 - (D) 20 grams of KNO_3
 - (E) 40 grams of KCl
 - (F) 60 grams of NH_3
- 10.) For each of these, indicate how many grams of solute (per 100 grams of water) will dissolve.
 - (A) NaNO_3 at 70°C
 - (B) NH_4Cl at 50°C
 - (C) KI at 20°C
 - (D) KClO_3 at 90°C
- 11.) At 40°C , how many grams of NaNO_3 will make a saturated solution if the NaNO_3 is added to 100 grams of water?
- 12.) At 80°C , how many grams of KCl can be dissolved in 200 grams of water?
- 13.) At what temperature will 10 grams of NH_3 dissolve completely in 100 grams of water to make a saturated solution?
- 14.) At 40°C , how many grams of KNO_3 can be dissolved in 300 grams of water?
- 15.) At 55°C , how many grams of NaNO_3 can be dissolved in 50 grams of water?
- 16.) At 80°C , you have a saturated solution of KClO_3 . How many grams of solid precipitate will form if the solution is cooled to 50°C ?
- 17.) How many grams of NaNO_3 precipitate will form if a saturated solution at 70°C is cooled to 10°C ?
- 18.) A solution contains 20 g of NH_4Cl at 50°C . How many more grams of NH_4Cl need to be added to the 100 grams of water for the solution to be saturated?

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Molarity, Molality, & Dilutions Worksheet

- 1.) What is the molarity of a solution in which 58.5 grams of NaCl are dissolved in 1.0 L of solution?
- 2.) What is the molarity of a solution in which 10.0 grams of AgNO_3 is dissolved in 500. mL of solution?
- 3.) How many grams of KNO_3 should be used to prepare 2.00 L or a 0.500 M solution?
- 4.) What volume of a 0.25 M solution could be made from 5.0 grams of KCl ?

- 5.) How many grams of CuSO_4 are needed to prepare 100. mL of a 0.10 M solution?
- 6.) What is the molality of a solution in which 3.0 moles of NaCl are dissolved in 1.5 kg of water?
- 7.) What is the molality of a solution in which 25 grams of NaCl is dissolved in 2.0 kilograms of water?
- 8.) What is the molality of a solution in which 15 grams of I_2 is dissolved in 500. grams of alcohol?
- 9.) How many grams of I_2 should be added to 750 grams of CCl_4 to prepare a 0.020 m solution?
- 10.) To how much water should 5.00 grams of KCl be added to prepare a 0.500 m solution?
- 11.) How much 18 M sulfuric acid (H_2SO_4) is needed to prepare 250 mL of a 6.0 M solution?
- 12.) 17 mL of 12 M hydrochloric acid (HCl) is diluted to 100. mL. What is the concentration of the new solution?
- 13.) To what volume should 25 mL of 15 M nitric acid (HNO_3) be diluted to prepare a 3.0 M solution?
- 14.) To what volume should 50. mL of 12 M hydrochloric acid be diluted to produce a 4.0 M solution?
- 15.) If 25.0 mL of 18 M sulfuric acid is diluted to 550. mL, what is the concentration of the diluted solution?

Answers: 1.) 1.0 M; 2.) 0.118 M; 3.) 101 g; 4.) 0.27 L or 270 mL; 5.) 1.6 g; 6.) 2.0 m; 7.) 0.22 m; 8.) 0.12 m; 9.) 3.8 g; 10.) 0.135 kg; 11.) 83 mL; 12.) 2.0 M; 13.) 130 mL; 14.) 150 mL; 15.) 0.82 M

BOILING POINT & FREEZING POINT PROBLEMS WORKSHEET

Solvent	Normal Boiling Point ($^{\circ}\text{C}$)	K_b ($^{\circ}\text{C}/m$)	Normal Freezing Point ($^{\circ}\text{C}$)	K_f ($^{\circ}\text{C}/m$)
water, H_2O	100.0	0.52	0.0	1.86
benzene, C_6H_6	80.1	2.53	5.5	5.12
carbon tetrachloride, CCl_4	76.8	5.02	-22.3	29.8
ethanol, $\text{C}_2\text{H}_5\text{OH}$	78.4	1.22	-114.6	1.99
chloroform, HCCl_3	61.2	3.63	-63.5	4.68

* Give your answers to the hundredths place (two places to the right of the decimal point). *

- 1.) Calculate the freezing and boiling points of a solution made from 100. grams of ethylene glycol ($\text{C}_2\text{H}_6\text{O}_2$) antifreeze in 900. grams of water.
- 2.) Calculate the freezing point of a solution containing 600. grams of chloroform and 42.0 grams of eucalyptol, $\text{C}_{10}\text{H}_{18}\text{O}$, a fragrant substance found in the leaves of eucalyptus trees.
- 3.) Calculate the boiling point of 25.5 grams of $\text{C}_7\text{H}_{11}\text{NO}_7\text{S}$ (4-nitro-2-toluenesulfonic acid dihydrate) in 1.00×10^2 grams of water.
- 4.) Calculate the freezing and boiling points of a solution of 21.6 grams of nickel (II) sulfate (NiSO_4) in 100. grams of water.

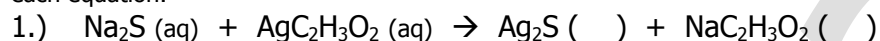
- 5.) Calculate the freezing and boiling points of a solution of 77.0 grams of magnesium perchlorate, $Mg(ClO_4)_2$, in 200. grams of water.
- 6.) Calculate the freezing and boiling points of 94.0 grams of sucrose ($C_{12}H_{22}O_{11}$) dissolved in 300. grams of ethanol.

Answers:

- 1.) $100.93\text{ }^\circ\text{C} = \text{BP}$, $-3.33\text{ }^\circ\text{C} = \text{FP}$
2.) $-65.63\text{ }^\circ\text{C}$
3.) $100.52\text{ }^\circ\text{C}$
4.) $-5.19\text{ }^\circ\text{C} = \text{FP}$, $101.45\text{ }^\circ\text{C} = \text{BP}$
5.) $-9.63\text{ }^\circ\text{C} = \text{FP}$, $102.69\text{ }^\circ\text{C} = \text{BP}$
6.) $-116.42\text{ }^\circ\text{C} = \text{FP}$, $79.52\text{ }^\circ\text{C} = \text{BP}$

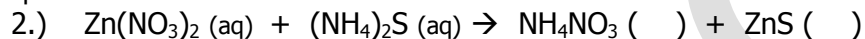
NET IONIC EQUATIONS WORKSHEET

Determine the solubility of the products ((aq) or (s)). Then, write the net ionic equation. Also indicate the spectator ions for each equation.



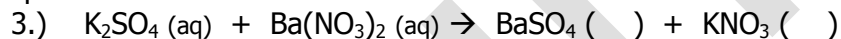
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spectator ions:



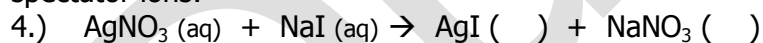
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spectator ions:



net ionic eqn:

spectator ions:



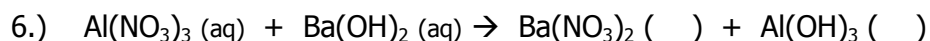
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spectator ions:



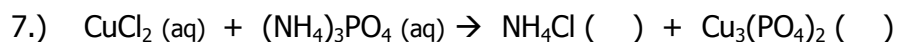
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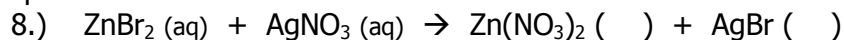
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spectator ions:



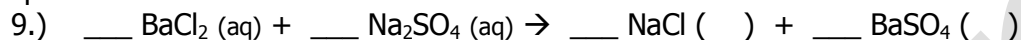
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spectator ions:



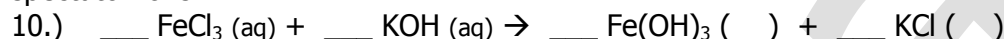
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spectator ions:



net ionic eqn:

spectator ions:



net ionic eqn:

spectator ions:

UNIT 12 REVIEW WORKSHEET

Part 1 – Solubility Curves - USE YOUR SOLUBILITY CURVE GRAPH TO ANSWER #1-4.

1. At what temp does 135 grams of KI dissolved in 100 grams of water form a saturated solution?
2. How many grams of KNO_3 will dissolve in 400 grams of water at 60°C ?
3. If 10 grams of KClO_3 are dissolved in 100 grams of water at 30°C , is the solution saturated, unsaturated, or supersaturated?
4. How many grams of solid precipitate will form if a saturated NaNO_3 solution is cooled from 80°C to 20°C ?

Part 2 – Concentration of Solutions/Boiling & Freezing Point Calculations

5. How many grams of $\text{Fe}(\text{C}_2\text{H}_3\text{O}_2)_3$ are needed to dissolve to make 350. mL of a 2.50 M solution?
6. What is the molarity of a solution made by diluting 17.3 mL of 12 M hydrochloric acid to 550. mL?
7. What is the molality of a solution made by adding 56.3 grams of $\text{Mg}(\text{NO}_3)_2$ to 750. grams of water?
8. What is the molality of a solution made by dissolving 45.67 grams of hexane (C_6H_{14}) in 550. grams of carbon tetrachloride? What is the boiling point of this solution?

Part 3 – Solubility – Write (s) or (aq) next to each product. Then, write the net ionic equation.

