

Solutions, Solvation and Reading a Solubility Curve

For Questions 1-15, use the solubility chart:

1. Which of the salts shown on the graph is the *least soluble* in water at 10°C? _____
2. Which of the salts shown on the graph has the *greatest increase in solubility* as the temperature increases from 30 degrees to 60 degrees? _____
3. Which of the salts has its solubility affected the *least* by a change in temperature? _____
4. At 20°C, a saturated solution of sodium nitrate contains 88 grams of solute in 100 ml of water. How many grams of sodium nitrate must be added to saturate the solution at 50°C? _____
5. At what temperature do saturated solutions of potassium nitrate and sodium nitrate contain the *same weight of solute* per 100 mL of water? _____
6. What two salts have the *same degree of solubility* at approximately 19°C? _____
7. How many grams of potassium chlorate must be added to 1 liter (1,000 mL) of water to produce a saturated solution at 50°C? _____
8. A saturated solution of potassium nitrate is prepared at 60°C using 100 mL of water. How many grams of solute will precipitate out of solution if the temperature is suddenly cooled to 30°C? _____
9. What is the *average rate of increase for the solubility* of KNO₃ in grams per 100 mL per degree Celsius in the temperature range of 60°C to 70°C? _____
10. If 50 mL of water that is saturated with KClO₃ at 25°C is slowly evaporated to dryness, how many grams of the dry salt would be recovered? _____
11. Thirty grams of KCl are dissolved in 100 mL of water at 45°C. How many *additional grams* of KCl are needed to make the solution saturated at 80°C? _____
12. What is the *smallest volume* of water, in mL, required to *completely dissolve* 39 grams of KNO₃ at 10°C? _____
13. What is the *lowest temperature* at which 30 grams of KCl can be dissolved in 100 mL of water? _____
14. Are the following solutions **saturated**, **unsaturated** or **supersaturated** (assume that all three could form supersaturated solutions)
 - a. 40. g of KCl in 100 mL of water at 80°C _____
 - b. 120. g of KNO₃ in 100 mL of water at 60°C _____
 - c. 80. g of NaNO₃ in 100 mL of water at 10°C _____
15. Assume that a solubility curve for a gas such as Oxygen, at one atmosphere of pressure, was plotted on the solubility curve graph. Reading from left to right, would this curve would *slope upwards, slope downwards* or *remain constant*: _____

For the rest of the questions, use your textbook notes on solutions:

16. Draw a picture of a water molecule (H₂O). Label the H's and O. Label the positive end and the negative end.

Name _____ Date _____ Period _____

17. From each pair below, select the water source more likely to contain the greater amount of dissolved nutrients (solids). **Give a reason for each choice.**

a. A river with rapids **or** a quiet lake.

b. A lake in spring **or** the same lake in summer.

18. From each pair below, select the water source more likely to contain the greater amount of dissolved oxygen (gas). **Give a reason for each choice.**

a. A river with rapids **or** a quiet lake.

b. A lake in spring **or** the same lake in summer.

19. Draw a picture showing how a crystal of LiBr would look when dissolved in water. Include:

- The ions and label them with their symbol and charge (ie. NaCl breaks into Na^+ and Cl^-).
- Around each ion, draw at least three water molecules. Label the ends of the water molecule (+ and -) and make sure they are oriented correctly.

20. Draw a picture of what is happening to the molecules in a **sugar cube** as it dissolves. Include in your diagram a representation of the water molecules as well as the sugar molecules.

21. For each solution below, tell what is the solvent and what are the solutes.

Solution	Solvent	Solute
Sugar water		
Salt water		
10 ml alcohol in 100 ml water		
10 ml CCl_4 in 100 ml oil		
A scuba tank with 2 parts nitrogen to 1 part oxygen		
14 carat gold (60% gold, 20% copper, 20% silver)		

22. Is the substance in the picture to the right dissolving? Explain.



23.



24. On the back of this paper **draw the final frame** for the following comic strip. You will not be graded on artistic ability, but rather the science involved. Your drawing should be **neat**. If you do not believe that someone could look at the frame and understand the science, you should label or add captions as needed.

<p>Captain I. Onic of the molecular submarine the BHS is thinking, "What a nice day to float around with these lazy water molecules, they aren't even dissolving the salt very quickly, which is good for me, those Na⁺ ions do some real damage to the sub..."</p>	