

1 Write a summary paragraph on the article: "Oceans Found to Absorb Half of All Man-Made Carbon Dioxide"

2 *Solutes and solvents*

- Water is mixed with sugar, resulting in a transparent, colorless liquid.
- What evidence will there be that this is a mixture rather than a new compound?
- What evidence shows it is a solution rather than a mixture?
- Which is the solute, and which is the solvent? How do you know?
- Why does table salt dissolve in water, while oil and water don't mix?

3 Based on Table F indicate which of the following compounds is water soluble and which is insoluble?

- | | |
|--------------------------------|--------------------------------|
| a Li_2CO_3 | f. $\text{Al}(\text{ClO}_3)_3$ |
| b $\text{Fe}(\text{OH})_3$ | g. PbSO_4 |
| c CaCrO_4 | h. NaOH |
| d BaS | i. CuSO_4 |
| e $(\text{NH}_4)_3\text{PO}_4$ | j. KNO_3 |

4 *Solubility Curves*

- What is the compound which is the most soluble at 20°C?
- What is the compound which is the least soluble at 10°C?
- What is the compound which is the least soluble at 80°C?
- How many grams of potassium nitrate needed to saturate 100 mL of water at 70°C?
- What are the formulas of the compounds that vary inversely with temperature?
- One hundred mL of a sodium nitrate solution is saturated at 10°C. How many additional grams are needed to saturate the solution at 50°C?
- One hundred mL of a saturated KCl solution at 80°C will precipitate 10 grams of salt when cooled to what temperature?
- What are the two salts that have the same degree of solubility at 70°C?
- What is the salt with a solubility that's least affected by a change in temperature?
- What is the salt that has the greatest increase in solubility in the temperature range between 30°C and 50°C?
- What is the number of grams of sodium nitrate that must be added to 50 mL of water to produce a saturated solution at 50°C?
- A saturated solution of potassium chlorate is made at 10°C by dissolving the correct mass of salt in 100 mL of water. When the solution is heated to 90°C, how many grams must be added to saturate the solution?
- At what temperature do saturated solutions of sodium chloride and potassium chloride contain the same mass of solute per 100 mL of water?
- A saturated solution of potassium nitrate is prepared at 60°C using 200 mL of water. If the solution is cooled to 30°C, how many grams will precipitate out of the solution?
- How many more grams of ammonia can be dissolved in 100 mL of water at 10°C than at 90°C?
- A saturated solution of sodium nitrate in 100 mL of water at 40°C is heated to 50°C. What is the rate of increase in solubility grams per degree?
- Thirty grams of KCl is dissolved in 100 mL of water at 45°C. What is the number of additional grams of KCl that would be needed to make the solution saturated at 80°C?

5 *Dissolving solids and gases*

A warm can of soda is dropped and bounces down a flight of stairs.

When it is opened, carbon dioxide gas coming out of solution causes it to spray all over. Explain the affect of each of the following:

- The fact that the soda was warm.
 - The fact that the soda was dropped and bounced down a flight of stairs.
 - The fact that the can was opened.
- Sugar is added to a hot cup of coffee and stirred. The sugar dissolves. Explain the affect of each of the following:
- The fact that the coffee was hot.
 - The fact that the coffee was stirred.
 - Which dissolves faster, a teaspoon of sugar or a sugar cube? Why?
 - The table at the end of this problem set lists four factors that may effect the rate at which solids and gases dissolve. Fill in the table by indicating if the rate of dissolving increases, decreases, or is not effected. Then explain why.

6 *Finding Concentrations - For calculations with water, assume the density of water to be 1 g/mL*

- What is the concentration of 45 mL of a solution containing 9.0 g of KClO_3 ?
- A solution is prepared by mixing 20.0 g of NaNO_3 with 100. mL of water. What is the percentage mass of the solution?
- A 250. mL sample of air at STP contains approximately 52.5 mL of $\text{O}_{2(g)}$. What is the percentage of oxygen in air?
- A polar solvent is prepared by mixing 27.5 mL of propanone with 222.5 mL of water. What is the percentage by volume of propanone in the mixture?
- How many parts per million of sulfur dioxide are there in a solution containing 0.065 g of sulfur dioxide in 5,000 mL of water?
- If 19 mL of alcohol are dissolved in 31 mL of water, what is the percentage by volume of alcohol?
- If 0.002 g of PbCl_2 are dissolved in 2.0 L of water, how many parts per million are dissolved?
- If 15 g of KNO_3 are dissolved in 235 g of water, what is the percentage of solute by mass?
- What is the percentage by mass of a solution prepared with 34 g of KI and 126 g of water?
- What is the concentration of a solution made with 0.056 g of $\text{CO}_{2(g)}$ and 200 mL of water?

7 *Molarity*

- a Determine the molarity of 500. mL of a solution with 0.35 mol of dissolved solute.
- b A 200. mL sample of a solution contains 4.0 g of NaOH. What is its molarity?
- c How many grams of KNO_3 are needed to prepare 25 mL of a 2.0 M solution?
- d How many moles of MgSO_4 are contained in 50. mL of a 3.0 M solution?
- e How many grams of CaCl_2 are dissolved in 80.0 mL of a 0.75 M solution?
- f What is the molarity of 300 mL of a solution that contains 0.60 mol of dissolved ammonia?
- g What is the molarity of 5.0 L of a solution containing 200. g of dissolved CaCO_3 ?
- h How many grams of NaCl are needed to prepare 500. mL of a 0.400 M solution?
- i How many moles of solute are contained in 3.0 L of a 1.5 M solution?
- j What is the molarity of 750 mL of a solution that contains 40.0 g of dissolved CuSO_4 ?

8 *Colligative properties*

- a Why is salt put on icy roads and sidewalks in the winter?
- b How will the boiling points of pure water and sea water compare? Why?
- c How does adding salt to water affect its boiling point?

* Table for question 5g:

Factor	Affect on Rate of Solution for:	
	Solid Solutes	Gaseous Solutes
<i>Crushing</i>		
<i>Stirring</i>		
<i>Increasing the amount of dissolved solute</i>		
<i>Increasing Temperature</i>		