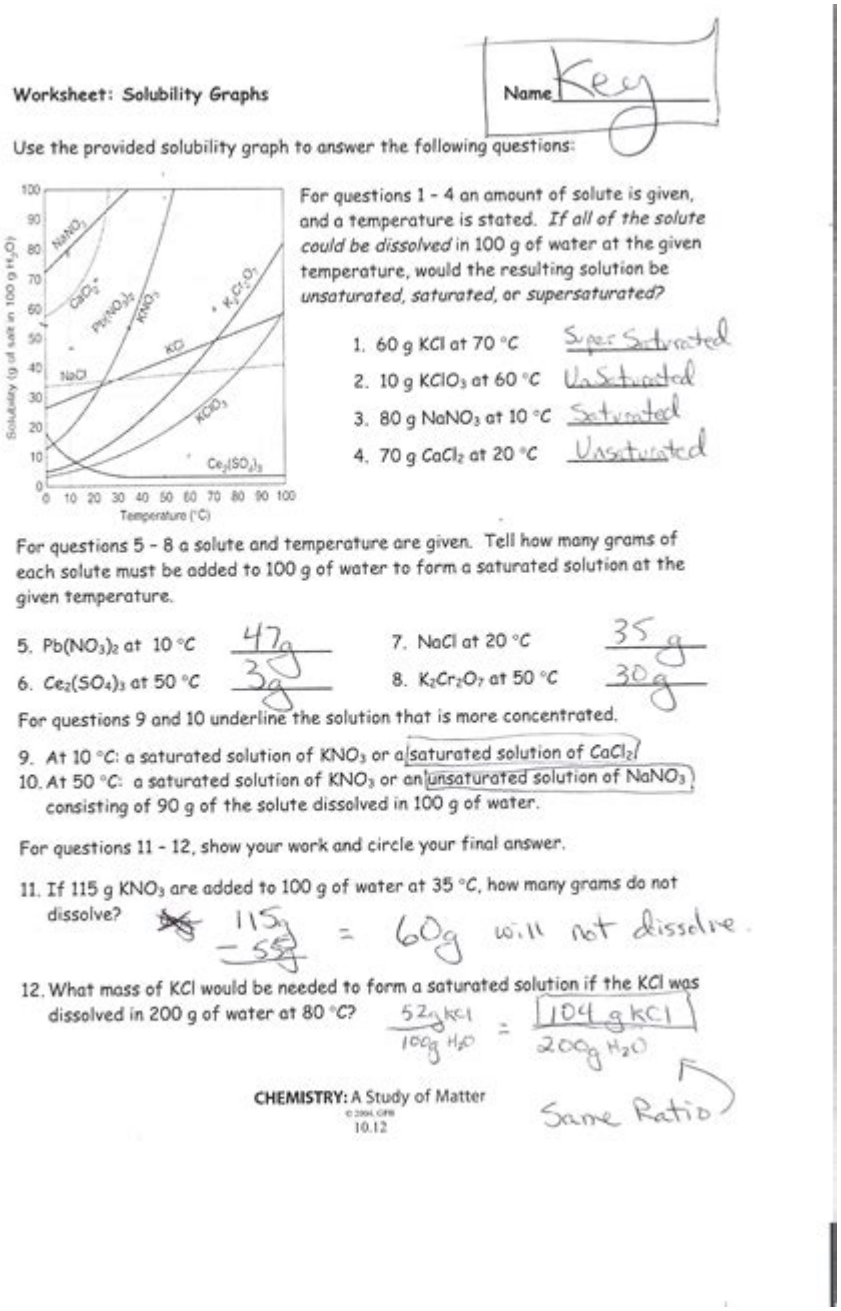
Solubility Curves Answer Key



Worksheet: Solubility Graphs

Name Key

Use the provided solubility graph to answer the following questions:

For questions 1 – 4 an amount of solute is given, and a temperature is stated. *If all of the solute could be dissolved* in 100 g of water at the given temperature, would the resulting solution be *unsaturated, saturated, or supersaturated?*

1. 60 g KCl at 70 °C — Super Saturated
2. 10 g $KClO_3$ at 60 °C — Unsaturated
3. 80 g $NaNO_3$ at 10 °C — Saturated
4. 70 g $CaCl_2$ at 20 °C — Unsaturated

For questions 5 – 8 a solute and temperature are given. Tell how many grams of each solute must be added to 100 g of water to form a saturated solution at the given temperature.

5. $Pb(NO_3)_2$ at 10 °C — 47g
6. $Ce_2(SO_4)_3$ at 50 °C — 3g
7. NaCl at 20 °C — 35 g
8. $K_2Cr_2O_7$ at 50 °C — 30g

For questions 9 and 10 underline the solution that is more concentrated.

9. At 10 °C: a saturated solution of KNO_3 or a saturated solution of $CaCl_2$
10. At 50 °C: a saturated solution of KNO_3 or an unsaturated solution of $NaNO_3$ consisting of 90 g of the solute dissolved in 100 g of water.

For questions 11 – 12, show your work and circle your final answer.

11. If 115 g KNO_3 are added to 100 g of water at 35 °C, how many grams do not dissolve? 115g − 55g = 60g will not dissolve.

12. What mass of KCl would be needed to form a saturated solution if the KCl was dissolved in 200 g of water at 80 °C? $\frac{52\text{g KCl}}{100\text{g } H_2O} = \frac{104\text{ g KCl}}{200\text{g } H_2O}$ Same Ratio

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Solubility curves answer key are essential tools in chemistry that help students and professionals understand the relationship between temperature and the solubility of various substances. These curves provide visual representations that illustrate how the solubility of a solute changes with temperature, helping to predict how much of a substance can dissolve in a solvent at specific temperatures. This article will explore solubility curves in detail, including their significance, how to read them, and common examples, along with an answer key to commonly asked questions about solubility curves.

Understanding Solubility Curves

Solubility curves are graphical representations that show the amount of solute that can dissolve in a solvent at different temperatures. Typically, the x-axis represents temperature (in degrees Celsius), while the y-axis represents the mass of solute that can dissolve in a specific volume of solvent (usually 100 grams of water).

Why Are Solubility Curves Important?

Solubility curves are important for several reasons:

1. Predicting Solubility: They allow chemists to predict how much solute can be dissolved in a solvent at a given temperature, which is crucial in various chemical processes.
2. Understanding Saturation: Solubility curves help distinguish between unsaturated, saturated, and supersaturated solutions.
3. Practical Applications: In industries such as pharmaceuticals, food science, and environmental science, understanding solubility is vital for product formulation and quality control.
4. Educational Tool: For students, solubility curves are a valuable visual aid in understanding the concepts of solubility and the effects of temperature.

How to Read a Solubility Curve

Reading a solubility curve might seem daunting at first, but with practice, it becomes easier. Here are steps to interpret a solubility curve effectively:

1. Identify the Solute: Each curve typically represents a specific solute. Make sure to identify which substance is being represented.
2. Locate the Temperature: Find the temperature on the x-axis that you are interested in.
3. Read the Solubility: Move vertically from the temperature point until you reach the curve. From there, move horizontally to the y-axis to read the solubility in grams per 100 grams of water.
4. Determine Saturation: If the amount of solute you want to dissolve is below the curve, the solution is unsaturated. If it is on the curve, the solution is saturated. If it exceeds the curve, the solution is supersaturated.

Common Examples of Solubility Curves

Several common solutes have well-documented solubility curves. Here are a few examples:

1. Sodium Chloride (NaCl)
- Sodium chloride has a relatively linear solubility curve, indicating that its solubility increases steadily with temperature.

2. Sugar ($C_{12}H_{22}O_{11}$)
- The solubility curve for sugar shows a steep increase in solubility with temperature, indicating that

sugar dissolves much better in hot water than in cold water.

3. Calcium Chloride ($CaCl_2$)
- Calcium chloride exhibits a significant increase in solubility with temperature, surpassing many other common salts at higher temperatures.

Common Questions Regarding Solubility Curves

To help clarify some typical inquiries regarding solubility curves, here is an answer key to frequently asked questions:

1. What does a flat solubility curve indicate?

A flat solubility curve suggests that the solubility of the solute does not change significantly with temperature. This means that temperature has little effect on the solute's ability to dissolve in the solvent.

2. Can solubility curves be different for various solvents?

Yes, solubility curves can vary depending on the solvent used. For example, a solute may have a different solubility in ethanol compared to water.

3. What happens when a saturated solution is cooled?

When a saturated solution is cooled, it may become supersaturated, leading to the precipitation of the solute as it exceeds its solubility limit at the lower temperature.

4. How do you create a solubility curve?

To create a solubility curve, you would:
- Conduct experiments to measure the solubility of a solute at various temperatures.
- Record the mass of solute that dissolves in a fixed volume of solvent at each temperature.
- Plot these values on a graph with temperature on the x-axis and solubility on the y-axis.

Applications of Solubility Curves in Real Life

Solubility curves have practical applications in various fields:

- Pharmaceuticals: Understanding how drugs dissolve at different temperatures can influence drug formulation and delivery methods.
- Food Industry: The solubility of ingredients like sugar and salt affects food preservation and flavor enhancement.
- Environmental Science: Solubility curves aid in predicting the behavior of pollutants in water bodies,

which can inform cleanup strategies.

Conclusion

In summary, **solubility curves answer key** is a vital aspect of chemistry that provides insights into the solubility of substances at varying temperatures. By understanding how to read these curves and their practical applications, students and professionals alike can make informed decisions in laboratory settings and real-world applications. Whether you're studying chemistry in school or working in a related field, mastering solubility curves will enhance your comprehension of solvation processes and their implications.

Frequently Asked Questions

What is a solubility curve?

A solubility curve is a graph that shows the relationship between the solubility of a substance and temperature, indicating how much solute can dissolve in a solvent at various temperatures.

How do you read a solubility curve?

To read a solubility curve, locate the temperature on the x-axis and then find the corresponding point on the curve to determine the solubility of the substance in grams per 100 grams of solvent.

What factors affect solubility as shown on a solubility curve?

The primary factor affecting solubility shown on a solubility curve is temperature, as many substances become more soluble at higher temperatures.

What does a flat line on a solubility curve indicate?

A flat line on a solubility curve indicates that the solubility of the substance remains constant regardless of temperature changes.

How can solubility curves be used in laboratory settings?

Solubility curves can be used in laboratory settings to determine the maximum amount of solute that can be dissolved in a solvent at a given temperature, which is essential for preparing solutions.

Can solubility curves be used for all types of solutes?

No, solubility curves are specific to individual solutes and must be determined experimentally for each substance.

What is the significance of the point of saturation on a solubility curve?

The point of saturation on a solubility curve indicates the maximum concentration of solute that can

dissolve in a solvent at a specific temperature; beyond this point, excess solute will not dissolve.

How can solubility curves aid in predicting precipitation reactions?

Solubility curves can help predict precipitation reactions by showing the solubility limits of compounds, allowing scientists to determine when two solutions will form a precipitate based on their concentrations and the temperature.

Solubility Curves Answer Key

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