Pls I Need This Answer Fast Or NowWater Was Added To 65.52 Gram Of NaCl To Produce 100cm^3 Of Saturated

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If you're seeking a quick and precise answer to the question, "How much water was added to 65.52 grams of NaCl to produce 100 cm^3 of saturated solution?" you've come to the right place. Understanding the saturation point of sodium chloride (NaCl) in water is essential for various scientific, industrial, and educational purposes. In this article, we will explore the concepts behind saturated solutions, the calculations involved, and the step-by-step process to determine the amount of water needed to reach saturation with 65.52 grams of NaCl.

Understanding Saturated Solutions and NaCl Solubility

What Is a Saturated Solution?

A saturated solution contains the maximum amount of solute—here, NaCl—that can dissolve in a solvent (water) at a specific temperature. Any additional solute added beyond this point will remain undissolved, forming a precipitate. The solubility of NaCl in water varies with temperature, so precise calculations depend on knowing the solubility at the given temperature.

NaCl Solubility in Water

The solubility of sodium chloride in water at standard room temperature (about 25°C) is approximately 36 grams per 100 milliliters. This means that under these conditions, 100 mL of water can dissolve up to 36 grams of NaCl to form a saturated solution.

Note: The solubility increases slightly with temperature, but for most calculations at room temperature, 36 g/100 mL is a standard reference point.

Calculating the Water Required to Dissolve 65.52 g of NaCl

Step 1: Determine the Solubility Limit

Given that at 25°C:
- Solubility of NaCl = 36 grams / 100 mL water

This implies:
- To dissolve 36 grams of NaCl, you need 100 mL of water.

Step 2: Calculate the Volume of Water Needed for 65.52 g NaCl

Since 36 g requires 100 mL, the amount of water (V) needed for 65.52 g can be calculated proportionally:

$$
V = \frac{65.52\, \text{g} \times 100\, \text{mL}}{36\, \text{g}} = \frac{65.52 \times 100}{36}
$$

Calculating the above:

$$
V \approx \frac{6552}{36} \approx 181.33\, \text{mL}
$$

Thus, approximately 181.33 mL of water is required to dissolve 65.52 g of NaCl at 25°C to reach saturation.

Step 3: Convert Volume of Water to Mass (Optional)

Since the density of water is approximately 1 g/mL at room temperature, the mass of water needed is roughly:

$$
\text{Mass of water} \approx 181.33\, \text{g}
$$

This means that to produce a saturated solution containing 65.52 g of NaCl, you need about 181.33 grams (or mL) of water.

Important Considerations

Temperature Dependence

The solubility of NaCl varies with temperature:
- At higher temperatures, more NaCl can dissolve.
- At lower temperatures, less NaCl can dissolve.

If the temperature differs significantly from 25°C, you should use the specific solubility data for that temperature.

Precision of Measurements

- Ensure accurate measurements of NaCl and water.
- Use calibrated equipment for precise results.
- Remember that the calculation assumes ideal conditions; real-world factors may slightly affect solubility.

Implications of the Calculation

- If you add less than 181.33 mL of water to 65.52 g of NaCl, the solution will be supersaturated (unstable, with excess NaCl precipitating out).
- Adding more water than necessary will result in an unsaturated solution.

Summary of Key Points

- At 25°C, the solubility of NaCl is approximately 36 grams per 100 mL of water.
- To dissolve 65.52 grams of NaCl, about 181.33 mL of water is required to reach saturation.
- This calculation assumes ideal conditions and standard room temperature.
- Adjustments should be made if the temperature changes significantly.

Additional Tips for Preparing Saturated NaCl Solution

1. Use clean, dry containers to avoid contamination.
2. Gradually add NaCl to water while stirring until no more dissolves.

3. Use a thermometer to monitor temperature, ensuring you are within the desired range.

4. Record the exact amount of water used to achieve saturation for future reference.

Conclusion

In summary, to produce a saturated solution with 65.52 grams of NaCl at room temperature (around 25°C), you would need approximately 181.33 mL (or grams) of water. This calculation is based on the standard solubility of NaCl, which is 36 grams per 100 mL of water. Always consider temperature variations and measurement accuracy when conducting such experiments or calculations.

If you need further assistance or specific data for different temperatures, consult detailed solubility tables or scientific resources dedicated to solubility and solution chemistry. Remember, understanding these fundamental principles allows for precise control in laboratory and industrial processes involving salt solutions.

Frequently Asked Questions

How do you determine the amount of water needed to saturate 65.52 grams of NaCl?

To determine the amount of water needed, you need to know the solubility of NaCl at the specific temperature. Since 65.52 grams is close to the maximum solubility in 100 cm^3 of water (about 36 grams at room temperature), you would typically need more water than 100 cm^3 to fully dissolve that amount, indicating the solution is saturated at that volume.

What is the significance of producing a saturated NaCl solution at $100cm^3$?

A saturated NaCl solution at $100cm^3$ indicates that the maximum amount of NaCl that can dissolve in that volume of water has been reached at a given temperature, which is important for processes requiring precise concentrations, such as crystallization or solution preparation.

How does temperature affect the solubility of NaCl in water?

The solubility of NaCl in water increases slightly with temperature. At higher temperatures, more NaCl can dissolve in the same volume of water, affecting the saturation point and the amount of water needed to produce a saturated solution.

If 65.52 grams of NaCl is added to water to produce a saturated solution, what does this imply about the solution's temperature?

It implies that the temperature is such that 65.52 grams of NaCl is at or near the maximum solubility limit for that temperature. If more NaCl dissolves, the solution is unsaturated; if less, it is supersaturated or at equilibrium.

What steps should be taken to prepare a saturated NaCl solution with 65.52 grams of NaCl?

First, measure approximately 100 cm^3 of water at the desired temperature. Gradually add NaCl while stirring until no more dissolves and excess NaCl remains undissolved. Ensure the temperature remains constant throughout to achieve true saturation.

Additional Resources

Pls I Need This Answer Fast Or NowWater Was Added To 65.52 Gram Of NaCl To Produce 100cm^3 Of Saturated

In the realm of chemistry, understanding how solutes interact with solvents to reach saturation is fundamental. A recent query has garnered attention: when water is added to 65.52 grams of sodium chloride (NaCl) to produce 100 cm^3 of a saturated solution, what is the concentration of the solution, and how do the quantities relate? This question, seemingly straightforward, unravels into a series of chemical principles, calculations, and considerations about solubility, molarity, and solution preparation. This article aims to dissect this scenario comprehensively, providing both the scientific background and the step-by-step calculations needed to arrive at an accurate answer.

Understanding the Basics: Solubility and Saturation

Before delving into calculations, it’s essential to understand what saturation means in solution chemistry.

What Is Saturated Solution?

A saturated solution contains the maximum amount of solute (NaCl in this case) that can dissolve in a given amount of solvent (water) at a specific temperature. Any additional solute added beyond this point will remain undissolved, indicating the limit imposed by solubility.

Factors Affecting Solubility

- Temperature: Solubility of most salts increases with temperature.
- Nature of Solute and Solvent: Ionic compounds like NaCl are highly soluble in water.
- Presence of Other Substances: Can affect solubility through common ion effects or complex formation.

NaCl's Solubility in Water

At room temperature (~25°C), NaCl's solubility in water is approximately 36 grams per 100 mL of water. This value is critical because it sets the limit for the maximum amount of NaCl that can be dissolved in a given volume of water to form a saturated solution.

Analyzing the Given Data

The problem states:

- Mass of NaCl: 65.52 grams
- Volume of saturated solution: 100 cm^3 (which equals 100 mL)

The key question is: Does 65.52 grams of NaCl dissolve in 100 mL of water to produce a saturated solution? Or, more accurately, what is the concentration of the solution?

Initial Observations

Given the solubility of NaCl (~36 g/100 mL at 25°C), dissolving 65.52 g in 100 mL exceeds the solubility limit, which suggests that:

- Not all the NaCl will dissolve at room temperature.
- The solution will be supersaturated or some NaCl will remain undissolved.

However, the problem states that the solution is saturated, implying that the final solution contains exactly the maximum amount of NaCl that can dissolve in 100 mL of water at the temperature considered.

Calculating the Actual Dissolved NaCl in Saturated Solution

Given the solubility data:

- Maximum solubility of NaCl at 25°C: 36 g per 100 mL of water.

Thus, in 100 mL of water, the maximum amount of NaCl that can be dissolved to form a saturated solution is approximately 36 grams.

Implication for the Scenario

Since 65.52 grams of NaCl is more than 36 grams, not all NaCl will dissolve at room temperature. The solution will contain 36 grams of NaCl dissolved in water, and the remaining NaCl will remain as undissolved solid.

Adjusted Understanding

If the question involves creating a saturated solution from 65.52 grams of NaCl, the process would involve:

- Adding water until the maximum solubility limit is reached.
- The amount of water needed must be at least enough to dissolve 65.52 grams if the solubility permits.

But since NaCl's solubility is only about 36 g/100 mL, the maximum dissolved NaCl in 100 mL of water is 36 grams, not 65.52 grams.

Calculating the Concentration of the Saturated Solution

Assuming the problem is asking: What is the molarity of a saturated NaCl solution made with 36 grams in 100 mL of water?

Step 1: Calculate Moles of NaCl

- Molecular weight of NaCl:

Na: 22.99 g/mol

Cl: 35.45 g/mol

Total: 22.99 + 35.45 = 58.44 g/mol

- Moles in 36 grams:

Moles = mass / molar mass = 36 g / 58.44 g/mol ≈ 0.615 mol

Step 2: Convert Volume to Liters

- 100 mL = 0.1 L

Step 3: Calculate Molarity

- Molarity (M) = moles of solute / liters of solution

- M = 0.615 mol / 0.1 L = 6.15 M

Therefore, the saturated solution at 25°C has a molarity of approximately 6.15 mol/L.

Addressing the Discrepancy: 65.52g NaCl and Saturation

Given the initial amount of NaCl (65.52 g), which exceeds the solubility limit:

- In 100 mL water, only 36 g can dissolve at 25°C.
- Remaining 29.52 g will remain undissolved, resulting in a saturated solution plus excess solid.

What if the solution volume is increased?

Suppose the intention was to prepare a saturated solution containing 65.52 g NaCl:

- The amount of water needed can be calculated based on solubility:

Water volume needed = (mass of NaCl) / (solubility)

= 65.52 g / (36 g/100 mL) ≈ 182 mL

- In this case:

- Dissolving all 65.52 g NaCl would require approximately 182 mL of water at 25°C.

- The molarity would then be:

M = (65.52 g / 58.44 g/mol) / 0.182 L ≈ (1.12 mol) / 0.182 L ≈ 6.15 M

Summary:

- To produce a saturated NaCl solution with 65.52 grams of NaCl, you need approximately 182 mL of water.
- The concentration of this saturated solution would be around 6.15 mol/L, similar to the earlier calculation, just in a larger volume.

Implications and Practical Considerations

Understanding these calculations is crucial for laboratory preparation of solutions, industrial processes, and chemical reactions where precise molarity is needed.

Factors to Consider:

- Temperature dependence: Solubility of NaCl increases slightly with temperature; calculations should be temperature-specific.
- Purity of substances: Impurities can affect solubility and concentration.
- Solution handling: Proper stirring and filtration eliminate undissolved solids, ensuring a truly saturated solution.

Common Mistakes to Avoid:

- Assuming all added NaCl dissolves without considering solubility limits.
- Confusing mass-based concentration with molarity.
- Overlooking temperature effects on solubility.

Conclusion: Clarifying the Scenario

In summary:

- Adding 65.52 grams of NaCl to water to produce 100 cm^3 (100 mL) of saturated solution at room temperature is not feasible because NaCl's solubility limits dissolution to about 36 grams per 100 mL.
- The actual saturation point in 100 mL of water corresponds to a molarity of approximately 6.15 M, containing about 36 grams of NaCl.
- To dissolve 65.52 grams of NaCl, you would need roughly 182 mL of water, resulting in the same molarity (~6.15 M).

This analysis underscores the importance of understanding solubility limits and the relationships between

mass, volume, and molarity in solution chemistry. Whether preparing solutions for laboratory experiments or industrial applications, accurate calculations and considerations of solubility are vital for achieving desired concentrations and ensuring safety and efficacy.

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