Sodium Acetate Saturation Lab

Pre-Lab Questions

1. **4 marks**
   Explain how you would determine the amount of solute needed to make a saturated solution of sodium acetate in the lab.
   Your answer should clearly outline the laboratory procedure as well as give the mathematical details of the calculations required to achieve this. Also, in your answer, be sure to clearly explain how you would know if the solution in your beaker is saturated.
   There are several correct ways to answer this question, so be sure to thoroughly explain your thinking and method to back up your answer.

2. **4 marks**
   a) Write the balanced chemical equation for the reaction between baking soda and vinegar to make sodium acetate and other products. Be sure to balance your equation and write the phase (l, g, aq, s) for each reactant / product.
   b) Show the stoichiometry necessary (the amounts of each reactant required) to mix baking soda with 5% vinegar solution (that has molarity of 0.833 M) to make the amount of sodium acetate you would have needed for question 1.

   TOTAL: **8 marks.**
Sodium Acetate SUPERSSaturation Lab

Laboratory Procedure
Caution: Sodium Acetate is a skin and eye irritant!

1. Obtain a clean, dry 125 ml (or smaller) Erlenmeyer flask. Label it with your groups’ name(s). Measure 12.3 g of sodium acetate crystals into the flask.
2. Measure out 10.0 ml of distilled water into a graduated cylinder. Add 8.0 ml of this distilled water to the sodium acetate in the flask and swirl gently until the crystals have been completely wetted. (It will not yet look like a “solution.”)
3. Place the flask on a hot plate and heat gently for 1 to 2 minutes. Then, rinse any crystals down the sides of the flask by adding the remainder of the original 10.0 ml but not exceeding 11.0 ml total water added. You may use a CLEAN dropper for this.
4. Continue to gently heat the flask until a completely clear solution forms. Try to gently swirl the solution while heating. (Be careful! It will be hot!)
5. Remove the (hot) flask from the hot plate and gently set aside (inside the cupboard or in a designated spot) to cool. Cover the flask with a small watch glass or other effective cover. The flask must not be disturbed while cooling. Likely you will leave the flask in place where it will remain undisturbed, and covered, until next class.

6. After the flask is cool, observe the solution closely. “Feel” the flask GENTLY and record temperature observations (do not use a thermometer!).

**read alternative procedure, below
7. Carefully carry your solution to your lab table without disturbing it. Drop one or two crystals of sodium acetate into the flask and record your observations.
8. Again, feel the flask without disturbing the solution, and record your observations.

** As an alternative to steps 7 and 8:
You may instead put one or two crystals of sodium acetate onto a watch glass and then gently and slowly pour your sodium acetate solution onto the crystals in a steady stream. Note the crystal tower that you have created. If crystals do not form immediately, stop pouring your solution out.

Before you clean up any of your materials or equipment, you will want to read over the rest of this lab handout, in case you need to reverse or repeat any of the steps # 6 to 8 to adequately answer the lab questions.

9. Add 1 or 2 drops of distilled water to your crystallized sodium acetate in a beaker. Heat gently on a hot plate for 1 to 2 minutes. The teacher needs to see your final saturated solution before you pour this re-dissolved solution into the Teacher’s collection flask at the front. Rinse out your flask and watch glass thoroughly with warm water and put them away.
Sodium Acetate SUPERSaturation Lab

HAND IN:                      TOTAL 27
Purpose                      MARKS
Observations – in a TABLE    (1)
Data – in a TABLE            (4)
Calculations:
  1) State the amount of sodium acetate present in your solution in grams / L. (1)
  2) Calculate the amount of sodium acetate present in your saturated solution in terms of solubility in moles / L. (2)
  3) Explain the relevance of the Ksp value for sodium acetate. (2)
Questions:
  1. Explain why the supersaturated solution is unstable and why some of the saturated solutions might crystallize prematurely. In your answer, you may need to talk about some extra steps you had to perform in order to achieve a saturated solution, and to witness the crystallization. (Sources of Error and Relevant Theory) (3)
  2. The solubility of sodium acetate is listed in reference books as 123 g/100. ml H₂O @ 20°C. What do these numbers mean in terms of a saturated solution? Be VERY specific in your explanation. Be sure to use the Unit 3 terminology in your answer. (Relevant Theory and Analysis of Accepted Value) (3)
  3. Explain how a saturated solution can become supersaturated (or perhaps you would like to explain how a supersaturated solution can become saturated). Be sure to clearly and thoroughly explain how chemical equilibrium concepts relate here. (Relevant Theory) (3)
  4. Sodium acetate is used in heat packs due to its ability to crystallize and re-dissolve. Explain how enthalpy is a part of this reversible reaction. Be thorough in your explanation, demonstrating your full understanding of equilibrium concepts. Also, include a few statements (or an additional explanation) using terminology that a non-chemist could understand. (Relevant Theory) (2)
CONCLUSION (1)