**Solubility of Solids Lab**

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_

**Materials:**

* ≈25 g of ammonium chloride (NH4Cl)
* distilled water
* five test tubes
* 100-mL beaker
* glass stirring rod
* ice
* thermometer
* scale
* graph paper
* goggles
* non-latex gloves

**Procedure:**

1. Weigh 3.0g, 4.0g, 5.0g, and 6.0g of ammonium chloride (NH4Cl). *Use caution, as NH4Cl is a skin irritant.*
2. Put each sample in a labeled test tube.
3. Pour 10mL of distilled water into each test tube.
4. Fill a beaker half full of tap water and place on a hot plate.
5. Place your first sample (3.0g NH4Cl) in the water bath. Gently heat water bath to a boil. Stir continuously until all of the solute dissolves.
6. Once dissolved, remove the test tube from the beaker and place in an ice bath. Place a thermometer inside the test tube as well. Stir gently. Carefully watch for the formation of crystals. This is the ammonium chloride precipitating out of solution. **As soon as you see the crystals begin to form, record the temperature in Table 1.**
7. Place the test tube back in the hot water bath to re-dissolve. You do not need to weigh out new NH4Cl.
8. Repeat steps 5 and 6 for the 3.0g sample. Record data in Tables 1 and 2 below.
9. Repeat all the steps for the 4.0, 5.0, and 6.0 g samples. Do two trials for each mass.

**Table 1: Solubility of NH4Cl (g/10mL of H20)**

**TRIAL 1**

|  |  |
| --- | --- |
| Mass of NH4Cl (g) | Temperature °C |
|  |  |
|  |  |
|  |  |
|  |  |

**Table 2: Solubility of NH4Cl (g/10 mL of H20)**

**TRIAL 2**

|  |  |
| --- | --- |
| Mass of NH4Cl (g) | Temperature °C |
|  |  |
|  |  |
|  |  |
|  |  |

**Table 3: Solubility of NH4Cl (g/10 mL of H20)**

**AVERAGES**

|  |  |
| --- | --- |
| Mass of NH4Cl (g) | Average Temperature °C |
|  |  |
|  |  |
|  |  |
|  |  |

**Analysis:**

1. Convert your g/10mL values from your table to g/100mL, by multiplying each value by ten. Example: If you used 7.16g of NH4Cl per 10mL, you would have 71.6g of NH4Cl per 100mL.

**Table 4: Solubility of NH4Cl (g/100 mL of H20)**

 **NEW AVERAGES**

|  |  |
| --- | --- |
| Mass of NH4Cl (g) | Temperature °C |
|  |  |
|  |  |
|  |  |
|  |  |

1. Using graph paper, plot the solubility curve for ammonium chloride using the values from Data Table 4. Along the *x*-axis, plot the temperature scale using 10 degree intervals. Plot the masses on the *y*-axis. Label that axis “Grams of Solute per 100mL of Water”. DO NOT CONNECT THE DOTS.
2. Here are the theoretical values for solubility of ammonium chloride per 100g of water:

30°C, 41.4g

50°C, 50.4g

70°C, 60.2g

90°C, 71.3g

 Plot these points on your graph using a different color. Identify the lines as “experimental” and “theoretical.”

**Questions:**

1. From your solubility curve determine the solubility of ammonium chloride in g/100mL of water at 60°C. The theoretical value is 55.0g.
2. Name the solute and the solvent in this experiment.
3. Attach your graph to this lab.

**Solubility of Solids Lab KEY**

**Data Tables:**

Student data tables will vary depending on their experimental procedures. Use the chart below to check the temperature values in Tables 1–3.

**Solubility of NH4Cl (g/10 mL of H20)**

|  |  |
| --- | --- |
| Mass of NH4Cl (g) | Temperature °C |
| 3.0 g | 0–6 °C |
| 4.0 g | 22–28 °C |
| 5.0 g | 48–52 °C |
| 6.0 g | 58–62 °C |

**Analysis:**

1. Convert your g/10mL values from your table to g/100mL, by multiplying each value by ten. Example: If you used 7.16g of NH4Cl per 10mL, you would have 71.6g of NH4Cl per 100mL.

**Table 4: Solubility of NH4Cl (g/100mL of H20)**

 **NEW AVERAGES**

|  |  |
| --- | --- |
| Mass of NH4Cl (g) | Temperature °C |
| 30 g | 0-6 °C |
| 40 g | 22-28 °C |
| 50 g | 48-52 °C |
| 60 g | 58-62 °C |

1. Using graph paper, plot the solubility curve for ammonium chloride using the values from Data Table 4. Along the *x*-axis, plot the temperature scale using 10 degree intervals. Plot the masses on the *y*-axis. Label that graph “Grams of Solute per 100mL of Water.” DO NOT CONNECT THE DOTS.
2. Here are the theoretical values for solubility of ammonium chloride per 100g of water:

30°C, 41.4g

50°C, 50.4g

70°C, 60.2g

90°C, 71.3g

Plot these points on your graph using a different color. Identify the lines as “experimental” and “theoretical” then connect the dots.

**Questions:** *Student answers will vary.*

1. From your solubility curve determine the solubility of ammonium chloride in g/100mL of water at 60°C. The theoretical value is 55.0g.

60 g

1. Name the solute and the solvent in this experiment.

Solute: ammonium chloride (NH4Cl)

Solvent: water

1. Attach your graph to this lab.