Student Investigation Sheet

Investigating the Solubility of a Salt

In this lab you will investigate how temperature affects the solubility of sodium nitrate. You will construct a hypothesis concerning the relationship between solubility and temperature, and then test it by observing the temperatures at which different samples of sodium nitrate crystallize out of solution. This will allow you to construct a graph to describe the relationship between solubility and temperature, and to determine whether your data support your hypothesis.

Safety Precautions:

- Wear closed-toed shoes, safety goggles, and lab aprons.
- Do not eat or drink anything in the lab.
- Report any broken glass. Do not try to clean it up yourself.

Objective(s):

In this activity, you will investigate the relationship between the solubility of sodium nitrate and temperature.

Materials:

Per pair of students:

- beaker (250 mL)
- clock or watch
- graduated cylinder, 10 mL
- ice
- iron ring
- ring stand
- (optional) if using probeware, a separate stand with a clamp to hold the temperature probe
- sodium nitrate (50 g)
- spatula
- stirring rod

- test tubes (5)
- test tube holder
- test tube rack
- thermometer (0°C –100°C) or probeware with temperature probe
- (optional) graphing calculator or computer graphing program with interface needed to connect to probe
- water, deionized or distilled
- wax pencil (or other marker for labeling test tubes)
- wire gauze
- goggles
- lab apron

Per class:

- electronic balance

Key Question

What is the question you want to answer?	
	Directions: Write the question for the investigation. The question should be specific and investigable.
	Key Components • Specific (one general thought, does not combine two or more questions) • Is able to be investigated

Hypothesis

What do you predict will be the result of the investigation?	
	Directions: Develop a claim about what you think is going to happen.
	Key Components • Expresses a cause-and-effect relationship • Is testable • Incorporates prior knowledge

Plan

How will you investigate the question?	
	Directions: Describe the plan that you will use to study your question and analyze your hypothesis.
	Key Components • Plan is easily repeatable by others • Plan describes the use of materials • Plan is in a logical order

Data

What evidence was gathered during the investigation?	
	Directions: Record all of the evidence that has been collected. Use graphic organizers, tables, and graphs when appropriate.
	Key Components • Data (from an investigation and/or other sources, such as observations, reading material, archived date, etc.) • Appropriate (data applies directly to the question) • Sufficient (uses enough data to completely answer the question and determine a finding on the hypothesis)

Conclusion

What did you learn from this investigation?	
	Directions: Develop a conclusion for your investigation. The conclusion should contain clear thoughts and proper vocabulary. This section focuses on the answer to your question. It should prove or refute the hypothesis by using logical reasoning to link the hypothesis to the data.
	Key Components • Use precise and accurate language • Use scientific vocabulary • Provide clear logical thoughts • Use evidence and reasoning to support or refute the hypothesis

Analysis and Conclusions

1. What question were you investigating, and what was your hypothesis?

2. Do your results support your hypothesis? Explain.

3. What equipment and technology did you choose to use for your investigation, and why did you choose it? (If you did not choose your own equipment, explain whether you would use the same equipment again, or try something different next time.)

4. Compare your graph with graphs generated by other student groups. Are they the same or do they differ? Would you expect the graphs to be the same? Explain.

5. If you investigated a different ionic solid such as potassium nitrate, KNO_3, would you expect the same results? Explain.

Additional Question

1. You have had some practice by now in planning and carrying out investigations. Imagine you are telling a younger student how to plan an investigation. Write one suggestion for how to do each step successfully:

- Asking a question:

- Formulating a testable hypothesis:

- Selecting equipment and technology:

- Writing a procedure:

- Carrying out your plan and recording data: