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Moth Flakes or Moth Nuggets

Jeff McKinney
The College at Brockport

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Jeff McKinney
CMST Institute
Level 1 Lesson Plan
July 28,2003

A) Topics and Standards the lesson is intended to address.

There are several topics being covered in this lesson (lab). The students will receive either moth flakes or moth nuggets. They will chart the freezing of these substances and compare their data with other groups.

By creating a graph, students will learn that while a substance is going through a phase change, the temperature of that substance will not change. That is the primary goal of the lesson. Secondary to that is the fact that different substances freeze/melt and vaporize/condense at different temperatures. This illustrates that phase changes are characteristic properties and can help to identify substances as being different from each other. All of the moth flake people will discover that they freeze at the same temperature and the moth nugget people will discover that they freeze at the same temperature. When the students graph the data they will see that while the substances are freezing, the temperature is remaining constant.

B) Comprehensive description of the activity itself and what is to be done during the activity (including what computational tools/material will be required)

Twelve Corners Middle School
IPS
Prelab 3.2

Name _____
Date _____
Period _____

Prelab for Experiment 3.2
Freezing And Melting

Problem:

What is the freezing point of the material you used in this experiment?

Materials:

4g of moth flakes or nuggets	Burner Stand
2 Celsius Thermometers	Two Small Clamps
2 Slit Corks	Water
IPS Pegboard	Matches
Alcohol Burner	Safety Glasses
250 mL Beaker	Computer
Computer Projector	Microsoft Excel

Procedure:

1. Select one of the test tubes in the rack on the supply desk.
2. Set up the apparatus as shown on page 41 in your textbook.
3. Do not place the thermometer in the test tube until the solid is completely melted.
4. Heat the beaker until the solid is completely melted.
5. Place the thermometer in the liquid so the bulb is covered.
6. Remove the alcohol burner and let the substances begin to cool.
7. Wait until both thermometers level off (are approximately the same temperature) before taking readings.
8. Take readings for BOTH thermometers every 30 seconds until the flakes or nuggets have completely solidified.
9. Each member of the group should have a list of these temperatures.
10. Follow the instructions given by your teacher for constructing a graph. You will be going to the computer lab to graph and using Microsoft Excel to graph both the nuggets and the flakes on the same axis.
11. Place the test tube with the flakes or nuggets back in the rack on the supply desk. **DO NOT REMOVE THE THERMOMETER!**
12. Clean up and put all other equipment away in the proper location.
13. Answer Questions #1-#4.

Questions:

1. In your Data Table of temperatures, do you note any difference in the way the substance and the water cooled?
2. (Compare with several other groups before answering these questions) Do all the graphs appear to have a flat (horizontal) section?
3. Does the temperature of the flat section (if it exists) depend on the mass of the cooling material?
4. Do you think all the samples used in the class were made of the same material?

Data Table:

Time (Min)	Temp (Material)	Temp (Water)	Time (Min)	Temp (Material)	Temp (Water)
0.5			10.5		
1			11		
1.5			11.5		
2			12		
2.5			12.5		
3			13		
3.5			13.5		
4			14		
4.5			14.5		
5			15		
5.5			15.5		
6			16		
6.5			16.5		
7			17		
7.5			17.5		
8			18		
8.5			18.5		
9			19		
9.5			19.5		
10			20		

C) A set of questions to be answered by the activity participants.

This is included at the end of my lab report in Section B.

D) An assessment rubric.

Questions - 16 Total Points (4 Points Each)

#1) 4 Points - Describing the relationship between water and the substance cooling. (They cool at the same rate, then the substance stops dropping in temperature, as the water continues to drop)

3 Points - Describes the relationship between water and the substance cooling, but doesn't notice the substance stops cooling

2 Points - Describes the relationship, doesn't necessarily see the relationship as both cooling.

1 Point - Describes the substances and their opinion of what happens.

0 Points - Doesn't describe the relationship, even if wrong.

#2) 4 Points - Describe the fact that all graphs have a horizontal point at some point in the cooling of the substance and the water goes down continuously.

2 Points - Describes that all graphs are the same, but does not explain how they are the same.

0 Points - Describes that the graphs are not the same.

#3) 4 Points - Deduces that not all test tubes had the exact same amount of substance and describes the fact that the temperature at which something freezes is not influenced by the mass. Water, no matter how much will always freeze at 0 Celsius.

3 Points - Thinks that all test tubes have the exact same amount of substance, but still describes that they all froze at the same temperature.

2 Points - Explains that substances are close in freezing points, but doesn't associate give any scientific reasoning for it.

1 Point - Explains that substances have different freezing points but explains they should have the same freezing point.

#4) 4 Points - Explains that the substances could not be the same because the flakes and nuggets did not freeze at the same temperature.

1 Point - Explains that the substances might be the same because the freezing points are only off by XX degrees.

List of Materials (10 Points Total)

5 Points - Lists all materials used in the experiment.

5 Points - Draws pictures of the materials Used

Summary (15 Points)

- 15 points - Accurately describes the experiment that takes place.
- 10 Points - Gives a shortened explanation of the experiment.
- 5 Points - Gives an insufficient explanation of the experiment.
- 0 Points - Leaves the summary out of the lab report.

Graph (15 Points)

- 15 Points - Graph enclosed, everything labeled, accurate scale.
- 10 Points - Labels Missing
- 10 Points - Inaccurate Scale
- 0 Points - Left Graph Out

Data Table (10 Points)

- 10 Points - Data Chart Included
- 0 Points - Data Chart Excluded

Conclusion (15 Points)

15 Points - Accurately answers the question posed in the problem. Explains what the freezing point is and why it is significant that the 2 substances have different points. It means that they are different substances.

10 Points - Accurately answers the question about the freezing point, but has an incorrect explanation for the different temperatures.

5 Points - Writes the temperature at which the substance freezes and nothing else.

0 Points - Leaves the conclusion out of the lab report

Remaining 19 Points - Completing the Lab in class

(100 Points Total)