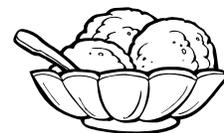


KINETIC MOLECULAR THEORY

Activity #2--Homemade Ice Cream Lab



Questions to be investigated:

Is freezing an exothermic or endothermic reaction?

Objectives:

C2.2B Describe the various states of matter in terms of the motion and arrangement of the molecules (atoms) making up the substance.

C4.3B Recognize that solids have a more ordered, regular arrangement of their particles than liquids and that liquids are more ordered than gases.

C5.4d Explain why freezing is an exothermic change of state.

Teacher Notes:

Ice Cream is simply a tasty way to observe scientific principles. The first concept is a phase change or the movement from one state of matter to another. The three primary states of matter we study are solids, liquids, and gases. Solids are tightly packed atoms that have rigid bonds that do not flow. Solids have a fixed volume and shape. Liquids are bound together, but not as tightly packed and their bonds are more flexible allowing them to flow. Liquids have a fixed volume, but their shape is the same as their container. Gases are loosely packed molecules that flow freely. Gases have an indefinite volume and shape because they take the volume and shape of their container.

The second principle observed in the ice cream lab is the transfer of heat in a system. The two types of heat transfer are endothermic and exothermic reactions. Endothermic reactions remove heat from the surrounding environment into the primary system.

Exothermic reactions remove heat from the primary system and transfer it to the surrounding environment. In either case, the Law of Conservation of Energy is applied. Heat is a form of energy and it is neither created nor destroyed in a reaction, it merely changes form or location.

Materials: (per group):

1-gal Ziploc bag or plastic container	(4) 1-qt Ziploc bags
5 cups ice	1 cup rock salt
3 cups milk (3/4 cup/person)	16 tsp sugar (4 tsp/person)
4 tsp vanilla (1 tsp/person)	4 spoons (1/person)

Source: Chemistry: Chapter 16--Homemade Ice Cream Lab:

http://www.mvhs.fuhd.org/mia_onodera/chemistry%20documents/labs%202007-2008/lab%2028%20chapter%2016-%20Ice%20Cream%20Lab%2008.doc



Ice Cream Lab, Adapted from UVA Physics Department:

<http://www.school.cdfarmsite.com/labs/icecreamlab0506.doc>

Procedure:

1. Wash your hands.
2. Obtain a small Ziploc bag and write your name on it.
3. Fill your small Ziploc bag with 3/4 cup of milk and 4 tsp sugar and 1 tsp vanilla. Add milk last.
4. Carefully "zip" your bag with the ice cream mixture. Check the seal, or you will end up with salty ice cream!
5. For your group, obtain a 1-gal Ziploc bag. Put five cups of ice and one cup of salt in the bag.
6. Place the small bags of the ice cream mixture in the salt-ice mixture.
7. Gently shake the large container until the contents of the small bags freeze.
8. Before opening your small Ziploc bag, rinse it in the sink so the salt does not go inside.
9. Enjoy!

Assessment:

Answer the following in the conclusion of your lab report:

1. What state of matter was the milk when you began?
2. What state of matter was the milk when you were done?
3. In order to change the phase of the milk, what had to be removed?
4. What happened to the heat energy that left the milk?
5. Why was the salt added to the ice?
6. If you did not add sugar would the ice cream have frozen faster? Why?
7. Why did the outside of the bag get wet? (Assume that your bag did not spring a leak.) What states of matter were involved in this process?