

BAKED ICE-CREAM

PROBLEM PRESENTATION / EXPLORATION

- A. What happens if you leave ice cream at room temperature? What would happen to ice cream if you put it in the oven?
- B. The CHALLENGE in this experiment will be to make **baked ice cream**.
- C. The materials needed are 3 egg whites; spoon or egg beater; 125 mL sugar; a big, thick, hard, cookie (such as a Chinese almond cookie); 250 mL ice cream, any flavor; a cookie sheet; aluminum foil; and an oven. (Depending upon school facilities, you may want to make this a homework assignment.)
- D. Heat the oven to 500°F (260°C). Cover the cookie sheet with aluminum foil. Beat the egg whites until they form soft peaks. Add the sugar to the egg whites, 15 mL at a time, beating after each addition. Continue to beat until the mixture is thick and glossy. Next, place the cookie on the cookie sheet and place the ice cream on top of the cookie, taking care to insure that the ice cream does not spill over the edge of the cookie. Next, spread the egg white and sugar mixture over the ice cream, covering it completely. Bake on the bottom rack of the oven for 3 to 5 minutes until the mixture is light brown. Stick a thermometer into the middle of the baked ice cream and record the temperature at the center. Remove and taste the results.

CLASS RESPONSE / CONCEPT INVENTION

- A. What happened? Apparently not enough energy was transmitted through the outside layer of meringue to melt the ice-cream at the center. What caused this to happen?
- B. Many times we want to keep hot things hot and cold things cold. This is accomplished by insulating the substance so that very little energy can travel out (if we want the object to remain hot) or so that very little energy can travel in (if we want the object to remain cold.)
- C. What are some insulating materials.
 1. Styrofoam
 2. Fiberglass
 3. Shredded newspaper
 4. Wool
 5. Feathers
- D. Setup
 1. The day before conducting this activity pour exactly 120 mL of water into each of five clean, half-pint milk cartons. Freeze them overnight.
 2. Obtain different insulating materials to be tested.
 3. Surround the first carton with one insulating material (newspaper, for instance).
 4. Put the second carton into a small ice chest and close the top.
 5. Surround the third carton with Styrofoam peanuts.
 6. Surround the fourth carton with fiberglass.
 7. Set the last carton on a table with no cover or insulation.
- E. Results
 1. Wait three hours.
 2. Measure the amount of water (melted ice) in each container separately by pouring it into a graduated cylinder.
 3. Determine which insulator best prevented the flow of energy into the milk carton of ice.
 4. Obviously some materials are much more effective insulators than others. Most insulating materials are poor conductors of heat themselves, but almost all insulators have another feature or ingredient in common. What is this? [Air itself is a poor conductor and is incorporated into almost all insulators to make them an overall more effective insulator.]
- F. How can we account for the results witnessed in the baked ice-cream? [The purpose of whipping the egg whites was to incorporate a lot of air. These air pockets in the meringue act as barriers to the energy from the oven penetrating the outside

meringue layer around the ice-cream.

CONCEPT EXTENSION

- A. How do Eskimos survive in the winter in an igloo? Why don't they freeze to death? What is the temperature inside an igloo? [Ice is a good insulator. Ice 12 inches thick has an R-value of 9 which is much higher than wood, newspaper, or rigid foam board.]
- B. How do storm windows cut down on heat loss in the winter? [Air is trapped between the regular window and the storm window. Since air is a poor conductor of heat, it does not transfer much heat from in inner window to the outer window.]