Kai Wang **1/13/04**
8th Grade Science
Insulation – Black And White (Adapted from "Active Physics Home")

AGENDA: Students will be able to understand how heat is transferred from particle to particle by means of radiation and convection. They will also be able to interpret how different colors and different materials help to affect the rate of heating/cooling and its relation with temperature.

STANDARD 1: Recognize, interpret, and be able to apply their knowledge of the properties of heat transfer to real life surroundings.

STANDARD 2: Explain the effect of heat on particle motion, how color and building materials affect the rate of heating/cooling – (poorly insulated attics vs. well insulated attics)

STANDARD 3: Present and explain data findings. Record their observations and see the rate of heat flow change between different types of insulated materials

Time Frame: 1 class period (45 min)

Materials: manila folders, black marker, thermometer, tape, lamp, graph paper

1) Activator: Question/Answer session about insulation and how different materials or different colors help to store/release heat.

(No more than 10 minutes)

2) Instruction/Interaction:

a) Form teams. Students should construct 2 model "homes", a square box out of the manila folders. One of the homes should be painted black and should have some cardboard attached to the side so that students can compare between a house that is properly insulated and one that is not properly insulated

b) Place a thermometer in the side of the house, and face the house to a lamp.

c) Record the temperature of thermometer before heating and record this as the temperature at 0 time.

d) Turn on the heat lamp and after each 30 sec interval, record the temperature. Continue the procedure for 10min.

e) Turn off the lamp at the end of the 10 min heating phase.

f) Record the temperature EVERY MINUTE after the lamp is turned off for 10 min

g) Graph the data

(ideally approx 20 min)

3) Discussion/Results: Students should observe that the house painted black with the insulation lost heat slower than the home without any insulation. The heat from the lamp (model of the sun) is more direct on the roof than on the walls. From the inside of the house, the hot air rises, therefore, having insulation in the ceiling will prevent heat loss.

(approx 10min)

4) Wrap Up / Assessment: Complete Worksheet
(approx 5min)

5) Worksheet Questions:

a) What was the total temperature increase in your model home during heating phase?

b) What was the total temperature decrease in your model during the cooling phase?

c) Was the rate of temperature increase constant? How do you know?

d) Was the rate of temperature decrease constant? How do you know?

e) Explain how you think heat traveled from the inside surface of the model dwelling to the thermometer at the center of the model during the heating phase.

Ans: As particles are heated up, they increase their kinetic energy. This causes them to move faster until they bump into other particles. As the bumping increases, the energy is transferred from particle to particle. There is also convection currents which are set up inside the house, in which the heat is moved in "streams" or current around the house.