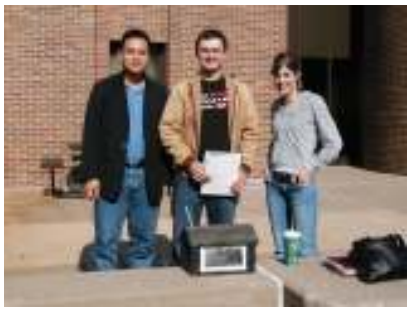
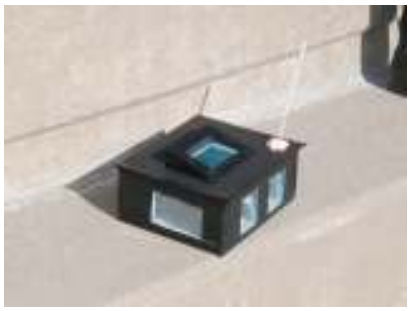
Solar House Activity / Contest


Your group (up to four people) will design and construct a working model solar house. The objective is to attain the highest possible temperature inside the structure during the heating time allotted and to retain the highest possible temperature after removal from the sunlight until the termination of the contest.

House Design/Construction (50 points)

- The house must have a *minimum* of 1,500 cm^3 of interior "living" space. **A house with under this volume will be disqualified.**
- The exterior of the house may be no larger than 40 cm in height, width and length. **A house larger than this will be disqualified.**
- The house must have at least THREE 10cm x 10cm windows. They must be transparent plastic or glass!!!!
- You are limited to the materials listed below.
  - cardboard box
  - balsa wood
  - plywood
  - insulation materials (must not exceed $10.00)
  - sheet metal
  - plastic containers
  - copper piping
  - modeling clay
  - newspaper
  - thin, clear plastic sheets
  - duct tape
  - making tape
  - aluminum foil
  - plastic wrap
  - glue
  - nails/tacks
  - paint
  - rocks/sand/soil
  - floor tile
  - carpet
  - water
  - aluminum cans
  - glass

  You must get permission from the instructor to use other materials. **Failure to get approval will result in disqualification.**
- You must limit yourself to direct solar gain. No other heat or energy source may be introduced to the system.
- A small hole about the diameter of a pencil needs to be created at the top of the house for a Thermometer. This hole needs to extend through the insulation into the interior of the house.
- Be creative in the design using the concepts studied in class (thermal mass, batch collectors, Trombe wall, greenhouse components, thermosiphoning, etc.) *A "Best in Show" prize will be awarded to the house with the most creative/innovative design.* Ten points extra credit to be added to the exam score total of each participating group member.

The Contest (50 points)

- On the day of the contest your house will be placed outside in the sun for 30 minutes. The time of day will be between 12:00 – 1:00pm.

- The temperature of the house will be recorded every 5 minutes during the 30 minute period.
- At the end of 30 minutes, the internal temperature will be recorded and the house moved inside.
- Once inside, the internal temperature will be recorded every 5 minutes for a 30 minute period.
- The house with the highest temperature (after the 30 minute outside warming) will receive 10 points extra credit to be added to the exam score total of each participating group member. All other houses will be awarded points based on the following scale:
    - Within 5% of the highest temperature = 25 points
    - Between 5 and 10% of the highest temperature = 20 points
    - Between 10 and 20% of the highest temperature = 15 points
    - Between 20 and 30% of the highest temperature = 10 points
    - Less than 30% = 5 points
- The house that retains the highest percentage of thermal energy from the start of the cooling period to the end of the cooling period will receive 10 points extra credit to be added to the exam score total of each participating group member. ***Note: a house must increase in temperature by at least 7 degrees C to be eligible for this prize.*** All other houses will be awarded points based on the following scale:
    - Within 5% of the highest percentage = 25 points
    - Between 5 and 10% of the highest percentage = 20 points
    - Between 10 and 20% of the highest percentage = 15 points
    - Between 20 and 30% of the highest percentage = 10 points
    - Less than 30% of the highest percentage = 5 points

Report (50 points) Your group must submit a detailed report containing the following information:

1) A detailed explanation of the design of your house. Explain why you chose this design and how, in theory, it should work. Include information of your aperture, thermal mass, absorber,
2) A labeled illustration(s) of the house including the dimensions in metric units. Include front, top and side views of the house along with a diagram of the interior of the house.
3) A list of materials used to construct the house.
4) The R-value of all the exterior walls and roof of the house. Use Table 5.2 in your book or the Internet to find the R-values of your material. Show you calculations and write the R-vales next to the corresponding walls on your diagram(s)

This report must be typed, double-spaced and printed using Helvetica, Arial or Times Roman font (12 font size). Margins should be 1 inch at the top, bottom, left, and right of the page. Pages must be numbered consecutively in the upper right-hand corner, one-half inch from the top and flush with the right margin. A cover page must also be included with your names.

This project is worth 150 points plus the possibility of extra credit points.

THE SOLAR HOUSE AND REPORT MUST BE SUBMITTED BY 5:00PM THURSDAY, APRIL 16 , TO BE ELIGIBLE FOR THE CONTEST! IN ADDITION, LATE HOUSES AND/OR REPORTS WILL BE PENALIZED 15% PER DAY.