

# Solar Homes

Wood, brick, tile and more! What thermal mass material would you use to effectively heat and cool your home? Create and build a prototype model home that uses passive solar design.

## TEKS:

4.6B Differentiate between conductors and insulators.

5.6A Explore the uses of energy, including mechanical, light, thermal, electrical, and sound energy.

5.7C Identify alternative energy resources such as wind, solar, hydroelectric, geothermal, and bio-fuels.

6.7B Design a logical plan to manage energy resources in the home, school, or community.

6.9A Investigate methods of thermal energy transfer, including conduction, convection, and radiation.

## Materials:

- 100 W bulb or greater
- Aluminum foil
- Cardboard box (small cake boxes work well and can be purchased at most craft supplies stores)
- Clear tape
- Craft sticks
- Dark fabric/carpet pieces
- Foam board
- Heat lamp
- Plastic wrap or clear plastic sheets
- Stone tile (Stone tile can be purchased at any home and garden store. Tile made of smaller squares works best)
- Thermometers (digital ones are most accurate)

## Testing Materials How To

**Testing materials:** In order to decide which materials to use on the solar home, we first need to test which materials will work best keeping in mind which materials got hottest and how fast they cool down.

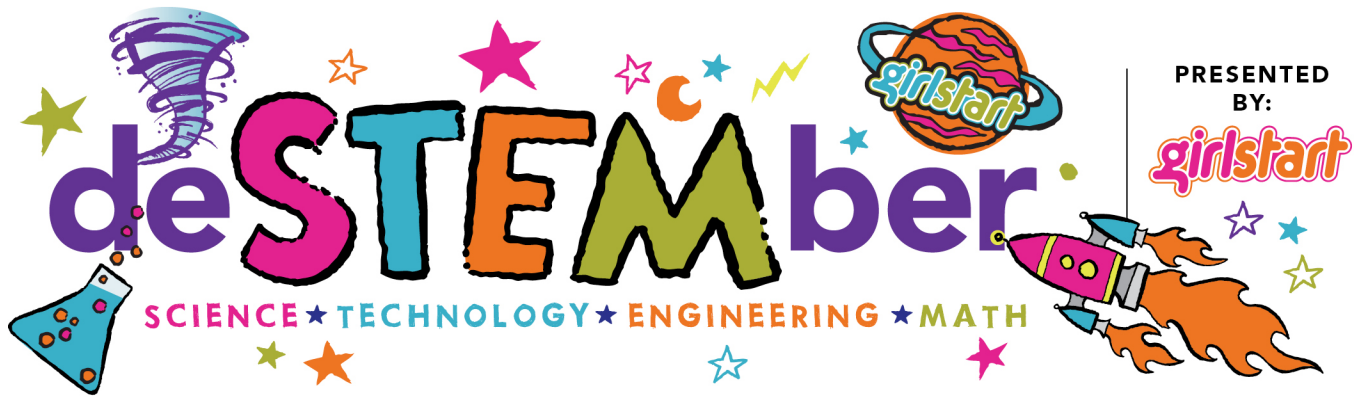
1. Gather carpet/fabric, tile, foil, and foam board.
2. Lay out each material and place a thermometer on top of each one.
3. Lay another piece of material on top of the thermometer so that the thermometer is in between two pieces of each material.
4. Place heat lamp about 8 inches away from each material so that each material is getting an equal amount of heat.
5. Record the temperature of each material at the start and then in 10 minute intervals for 30 minutes. You should have a total of four temperature readings for each.

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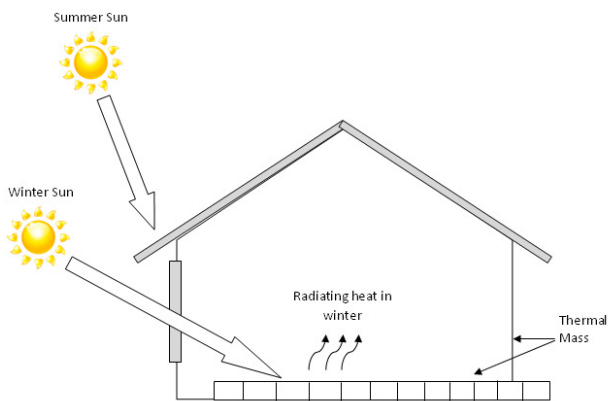




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## Why Does it Work?

During the summer, the sun is much higher in the sky than in the winter. Windows help let light and heat inside during the winter and also help ventilate in the summer. Thermal mass is a material that absorbs heat during the day, like tile or brick, and slowly releases it to keep a comfortable temperature inside as it gets dark outside during the winter. Overhangs block the hot summer sun but don't cover the windows too much during the winter when you want heat from the sun to enter your home. This design allows for the most efficient way to block the sun in the summer and use the sun's heat in the winter.



## Career Connection:

**Solar Engineers** study and design the heating, ventilating and air conditioning systems in existing and newly-constructed buildings. They suggest ways to use more passive solar design techniques to lower costs and energy use, minimize maintenance, reduce greenhouse gas emissions, and provide comfortable indoor environments for people.

Resources: <http://www.consumerenergycenter.org/home/construction/solardesign/>  
<http://www.teacherstryscience.org/lp/passive-solar-design-zero-energy-housing>

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