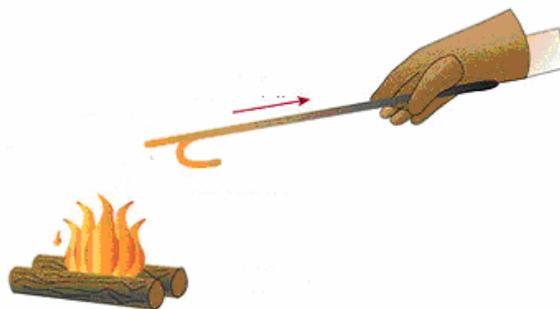


## Problems Concerning Thermal Energy: Transfer Mechanisms and Calculation

Solve the following problems based upon your understanding of thermal energy, its methods of transfer, and its quantification as well as the *Specific Heats of Common Materials* and *Thermal Properties of Water* charts on page 1 of the *Earth Science Reference Tables*.

1. The method by which water molecules are ordinarily transported from the surface of a cup of water and into dry air at room temperature is  
a. convection b. conduction c. evaporation d. radiation
2. The unit of heat energy employed in Earth Science is the  
a. degree Celsius b. joule c. degree Fahrenheit d. gram
3. The specific heat of liquid water [in joules/gram-°C] is  
a. 4.18 b. 2.00 c. 1.01 d. 2.11
4. Which of the following common materials has the lowest specific heat?  
a. iron b. dry air c. granite d. basalt
5. At which temperature does water experience a phase change between the liquid and solid phases?  
a. 100°F b. 0°F c. 21°C d. 0°C
6. A metal bar is placed just above the flames of a fire as shown in the diagram Below:



The method of heat transfer from the end of the bar nearest the flames towards the glove of the holder [in the direction of the arrow] is  
a. radiation b. evaporation c. conduction d. convection

7. How much heat energy must be added to one gram of liquid water in order to increase its temperature by  $10^{\circ}\text{C}$ ?
- 20.0 joules
  - 21.1 joules
  - 19.0 joules
  - 41.8 joules
8. There is no observed change in a body's temperature during which of the following thermal processes?
- melting
  - solidification
  - condensation
  - vaporization
  - all of these
9. How much heat energy must be added to one gram of liquid water in order to vaporize it?
- 2260 joules
  - 4.18 joules
  - 334 joules
  - 2.00 joules
10. Warm water rises from the bottom to the top of an uncovered pot on a functioning stove. This in turn causes cool water at the top of the pot to sink to the bottom of the pot. This convection of water is due to the fact that
- warm water is less dense than cool water.
  - cool water is less dense than warm water.
  - the warm water has a lower specific heat than cool water.
  - the cool water has a higher specific heat than warm water.
11. Beach sand is usually at a higher temperature on a sunny summer day than the nearby ocean water due to the fact that
- the water is farther from the Sun than the beach.
  - the sand has a lower specific heat than the water.
  - the water is boiling.
  - the sand is light in color.
12. Water has a density of  $1.0\text{ g/mL}$  in which phase?
- gas
  - liquid
  - solid
  - none of these
13. The method by which heat energy travels from the Sun to the Earth is
- radiation
  - convection
  - evaporation
  - conduction
14. Which of the following statements concerning heat energy and light energy is true?
- Heat and light are both electromagnetic waves.
  - There are more heat rays than light rays reaching Earth's surface from the Sun.
  - Light colored shiny bodies absorb more light energy and convert it into heat energy more efficiently than dark colored dull bodies.
  - Heat rays and light rays cannot travel through the atmosphere.
15. Ten joules of heat energy are added to one gram of water vapor. Which of the following changes in the water vapor will most likely be observed?
- The mass of the water vapor will increase by 5 grams.
  - The specific heat of the water vapor will increase by  $5\text{ joules/gram-}^{\circ}\text{C}$ .
  - The temperature of the water will increase by  $5^{\circ}\text{C}$ .
  - None of these.