

Answers to Homework Sheet

HW#1

- 1) Average kinetic energy represents air temperature. If the particles have a high kinetic energy, the temperature is high and vice versa.
- 2) A thermometer is used to measure temperature.
- 3) Celsius: 0 degrees- water freezes 100 degrees- water boils
Fahrenheit: 32 degrees- water freezes 212 degrees- water boils
Kelvin
- 4) The rate of heating depends on the difference in temperature. The greater the difference, more heat will be transferred.

HW#2

- 1) Anything that moves has kinetic energy.
- 2) Potential energy is stored in the interactions between objects or particles.
- 3) The greater the particles in an object are from each other, the greater the potential energy will be.
- 4) The air's temperature depends on how fast the air particles move.
- 5) Temperature represents the average kinetic energy of particles.
- 6) Temperature and thermal energy are related, but they are not same.
- 7) A bulb thermometer is a common type of thermometer.
- 8) If a material is at absolute zero, the particles in the material are not moving and do not have kinetic energy.
- 9) The rate at which heating occurs depends on the difference in temperature between the two objects.

HW#3

- 1) 140 degrees Fahrenheit= 60 degrees Celsius
- 2) 25 degrees Celsius= 77 degrees Fahrenheit
- 3) 212 degrees Fahrenheit
- 4) 14 degrees Fahrenheit= -10 degrees Celsius
- 5) -20 degrees Celsius= -4 degrees Fahrenheit
- 6) 158 degrees Fahrenheit= 70 degrees Celsius

HW#4

- 1) Thermal energy is the sum of kinetic and potential energy of the particles in an object.
- 2) Ice and water have different amounts of thermal energy if they have the same temperature because they have different potential energy. Thermal energy is the sum of KE and PE. KE is the same, however, because they are different states of matter they have different PE.
- 3) Mechanical energy is the sum of kinetic and potential energy of the object while thermal energy is the sum of kinetic and potential energy of the particles within the object.
- 4) Heat is used to describe the movement of thermal energy. Thermal energy or heat moves from warmer objects to colder objects to warm up the colder objects.

HW#5

The amount of (thermal energy it takes to increase the temperature of 1 kg of a material by (1°C) is called specific heat. Every material has its own specific heat. It is (easy) to change the temperature of a material that has a low specific heat, but (difficult) to change the temperature of a material that has a high specific heat.

Thermal conductors have a (lower) specific heat than thermal insulators. As a result, it takes (less) thermal energy to increase a thermal conductor's temperature than it takes to increase the temperature of a thermal insulator by the same amount. The specific heat of water is particularly (high). Therefore, it takes a (large) amount of energy to increase or decrease the temperature of water. The (high) specific heat of water has many beneficial effects.

HW #6

- 1) Radiation- The radiation from the fire heats the man and dog. Conduction- By touching the poker, heat has been transferred going from a warmer object to the cooler. Convection- The hotter air is at the top of the room.
- 2) Conduction
- 3) Metal, water, people
- 4) Plastic, rubber, glass
- 5) High; low
- 6) With a decrease in temperature, there is a decrease in the materials volume. In a hot air balloon, the air inside the balloon has become more dense than the air outside making it sink.
- 7) With an increase in temperature, there is an increase in the materials volume. In a hot air balloon, the air inside the balloon is less dense than the outside air making it rise.
- 8) As the temperature of the liquid in the thermometer bulb increases, the liquid expands, increasing its volume, and the liquid rises in the thermometer.
- 9) Convection can take place in liquids and gases because their particles move around easily, but the particles in solids do not move around.
- 10) Red arrows indicate the upward movement of heated, less dense water. The blue arrows indicate the downward movement of cooler, dense water. The cycle will end when all the water is the same temperature.

HW#7

- | | |
|----------------------|----------------------|
| 1) heating appliance | 2) refrigerator |
| 3) thermostat | 4) heating appliance |
| 5) thermostat | 6) thermostat |
| 7) refrigerator | 8) refrigerator |

HW#8

- 1) energy
- 2) thermal energy
- 3) bimetallic
- 4) A heat engine is not efficient
- 5) CPE to TE to ME
- 6) Internal combustion engine

Lesson Reviews

Lesson 1 Review

- 1) Thermal Energy
- 2) Temperature represents the average kinetic energy of the particles in a material.
- 3) Thermal energy is the sum of kinetic and potential energy of the particles in a material. Heat is the movement of thermal energy from an object that is warmer to an object that is cooler.
- 4) C. heating the soup for 1 min on a stove
- 5) The friend has a higher average kinetic energy because his temperature is greater.
- 6) Kinetic energy, potential energy (in any order)
- 7) Raising the temperature of a liquid will increase the liquid's thermal and kinetic energy.
- 8) 219.2 degrees F

Lesson 2 Review

- 1) Radiation
- 2) Convection is thermal energy transferred from one location to another in a fluid because of differences in density of warmer and cooler parts of the fluid.
- 3) Conduction is the transfer of TE between materials in contact with each other. Radiation is the transfer of thermal energy from a warmer material to a cooler material without contact (THINK:SUN, FIRE, MICROWAVE)
- 4) C. thermal expansion
- 5) Even though the sauce and crust have the same temperature, the pizza sauce has a high specific heat and contains more thermal energy.
- 6) Cube A
- 7) Conduction, Convection, Radiation (in any order)
- 8) Pot holders are good thermal insulators. They slow the heat transfer from the hot pan to your hands.

Lesson 3 Review

- 1) heating appliance
- 2) An internal combustion engine converts the chemical energy in fuel into TE and the ME.

- 3) TE moves from the refrigerator compartment into the coolant. The coolant is then pumped to the compressor. Finally, the TE moves from the coolants into the surrounding environment.
- 4) A. Chemical- thermal- mechanical
- 5) TE causes the bimetallic coil to curl or uncurl. ME from the moving bimetallic coil turns an electric switch on or off. EE turns the furnace on or off.
- 6) The coil would unwind, tilt the switch, and turn the heater off.

Chapter Review

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- 1) temperature
- 2) thermal expansion
- 3) thermostat
- 4) conduction
- 5) convection current
- 6) A heating appliance is a device that converts electric energy into thermal energy.
- 7) Thermal insulators
- 8) Thermal conductors
- 9) Specific heat
- 10) Heating appliance
- 11) Heat engine
- 12) Conduction
- 13) Convection
- 14) Radiation

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- 1) d
- 2) d
- 3) a
- 4) a
- 5) c
- 6) d
- 7) b
- 8) b
- 9) b

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- 10) The swimming pool has more thermal energy because many more particles make up the water in a swimming pool than make up the soup in a cup of soup.
- 11) The steel spoon because it takes less thermal energy to change the temperature of a material with a lower specific heat.
- 13) The diagram should look like arrows in a circle with warm air on the top and the cooler air on the bottom because warm air is less dense than the cool air.
- 14) Without expansion joints, a bridge might buckle or separate as a result of thermal expansion in the summer and thermal contraction in the winter.
- 15) Conduction is slower in a gas than in a liquid or solid because particles in a gas are farther apart than the particles in a solid or liquid.

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1. A
2. A
3. A
4. D
5. C
6. A
7. B
8. A
9. B
10. B
11. Transfer of TE from the Sun by radiation warms the containers. Transfer of TE from the containers by conduction melts the ice.
12. The composition of the containers makes the difference. Foam is a thermal insulator while metals are thermal conductors. The foam cooler did not transfer as much energy to the ice by conduction as the metal pot did.