Question(s) 1. What happens to particles when heated?

 2. What is the difference between thermal energy and temperature?

TEMPERATURE AND HEAT

Temperature – a measure of the average value of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the molecules in random motion. (SI Unit for temperature is Kelvin (K)).

Thermal expansion – almost all substances \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_when they are Heated and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_when they are cooled ------- exception water

Thermal energy – sum of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_energy of all the particles in an object; thermal energy of an object **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** as temperature increases

|  |  |  |
| --- | --- | --- |
|  | Temperature Conversion Equations |  |
| °F °C | °C °F |
| °C = (5/9)( °F – 32) | °F = (9/5)( °C) + 32 |
|  |  |

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – thermal energy that flows from something at a

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_temperature to something at a

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ temp.

|  |
| --- |
| Specific Heat of |
| Common Materials |
| Substance | Spec. Heat |
|  | (J/(kgoC)) |
| Water |  4, 184 |
| Wood |  1, 760 |
| Carbon |  710 |
| Glass |  664 |
| Iron |  450 |

Specific heat – amt of heat

Needed to raise the temp of

1 kg of some material by 1oC

Thermal Energy Equation

(Q) Change in thermal energy (J) =

 Mass (kg) x temp (oC) x

 (c) Specific heat (J/kgoC)

 Q = m(Tf – Ti) C

**Matter & Energy**

* **A state of matter is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
	+ **Solids: Definite \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and defined \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; particles are closely packet and ordered.**
	+ **Liquids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and NO \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of its own. Particles are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_packed but not as ridged as a solid**

* + **Gas: can flow, NO \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or volume.**

**Changes of a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in a system are caused by changes in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

Model It-Use page 7 of your textbook to complete the assignment HERE

|  |
| --- |
|  |
|  |
|  |
|  |
|  |

Question(s): How is heat transferred?

 How is energy conserved during transformation?

TRANSFERRING THERMAL ENERGY

Thermal energy is transferred from place to place by:

|  |  |  |
| --- | --- | --- |
| CONDUCTION | CONVECTION | RADIATION |
| transfer of | transfer of thermal | transfer of energy by |
| thermal energy | energy in a fluid | electromagnetic |
| by collisions | by the movement | waves. |
| between particles | of warmer and |  |
| in matter | cooler fluid from |  |
|  | place to place. |  |

Conduction occurs in solids, liquids, and gases. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are the best conductors of heat

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ occurs in fluids. Rising of warmer fluid and sinking of cooler fluid forms a convection current



The transfer of energy by radiation is most important \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Insulator – material in which heat flows slowly



Examples of materials that are insulators are wood, some plastics, fiberglass, and air.

Question: Why can’t heat be converted completely into work?

USING HEAT

All heating systems require some source of energy – common

types include:

Forced – Air Systems – most common type of heating using a furnace to heat air then a fan blows air through ducts to rooms

Radiator Systems – closed metal container that contains hot water or steam which is transferred to surrounding air by conduction; this warm air moves through room by convection

Electric Heating Systems – electrically heated coils placed in floors and in walls heat surrounding air by conduction

Two types of systems that use Sun’s energy:

Positive Solar heating – radiant energy from the sun is transferred to the room through windows

Active Solar heating – systems that use solar collectors that absorb radiant energy from sun

Thermodynamics – study of the relationship among thermal energy, heat and work

 1st Law – the increase in thermal energy of a system equals the work done on the system plus the heat transferred to the system

 2nd Law – it is impossible for heat to flow from cool object to warm object unless work is done