**Thermal energy vs HEAT**

**Conduction, Convention & Radiation**

**ACTIVITY-1 -** Answer the following questions based on the reading passage

1. What is Thermal energy?

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| **Thermal energy** is the energy of the moving particles in an object or material |

1. What is heat?

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| **Heat** is the transfer of thermal energy from one object to another. |

1. Define conduction

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| Conduction is the transfer of the heat through a solid object. Alternative ways to say “solid” would be acceptable. <ark given only of “solid” is used or described accurately, no marks for just transfer of heat/thermal energy |

1. A) You are outside on a cold day and sit down on a metal bench. What does it feel like and why?

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| WTTE = feels “cold” |
| WTTE = Transfer of heat from the body… lowers body thermal energy. |

B) You get up from the bench after sitting for a while. You place your hand where you have just been sitting. Predict what it would feel like and explain your reasoning.

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| WTTE = feels “cold” |
| WTTE = Transfer of heat from the body… lowers body thermal energy. |

1. A person touches a large chunk of ice with their hand and remarks, “This is making me cold.” Explain what this person is feeling. Is the ice transferring “cold” to the person? Is there a heat transfer occurring? Explain.

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| WTTE = no transfer of cold |
| WTTE = transfer of thermal energy from the body to the ice, lowers thermal energy = feels cold |

1. Nate was stirring hot soup on the stove. Why should he use a wooden spoon instead of a metal spoon?

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| WTTE = Wood is a poor conductor, metal is a good conductor |
| WTTE = Heat will conduct/travel through a metal spoon, making too hot to use |

1. Amber bought a coat with goose down (tiny feathers) insulation to keep her warm in the winter in Utah. Explain why a coat filled with goose down is a good choice to keep her warm. *You may need some research on this one – do a good answer, don’t be lazy.*

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| WTTE = Goose down traps layers of air |
| WTTE = Air is a poor conductor of heat, but convects heat well. |
| WTTE = Because the air cannot move, there is little transfer of thermal energy |

1. Define convection

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| WTTE = Convection is the transfer of heat energy by the movement of a liquid or gas. |

1. Define Radiation

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| WTTE = Radiation is the transfer of thermal energy through space and transparent things |

**10**. Decide whether the following statements are True or False. Circle the correct answer.

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| 1. Heat, energy and temperature are all different names for the same thing. | **TRUE OF FALSE** |
| 1. Everything has some thermal energy. | **TRUE OF FALSE** |
| 1. Heat energy is another way of saying thermal energy. | **TRUE OF FALSE** |
| 1. Thermal Energy is stored as conduction, convection, and radiation. | **TRUE OF FALSE** |
| 1. Heat travels from warmer to colder places. | **TRUE OF FALSE** |
| 1. Conduction of heat only occurs in liquids. | **TRUE OF FALSE** |
| 1. When an object is heated, the particles present move slower. | **TRUE OF FALSE** |
| 1. All materials conduct heat. | **TRUE OF FALSE** |
| 1. Materials containing air are usually good insulators. | **TRUE OF FALSE** |
| 1. Convection occurs in fluids due to movement of these fluids. | **TRUE OF FALSE** |
| 1. The Sun is a major source of infrared radiation. | **TRUE OF FALSE** |
| 1. Silver and shiny surface are good absorbers of heat radiation. | **TRUE OF FALSE** |
| 1. Heat transfer occurs only with solids. | **TRUE OF FALSE** |
| 1. Heat can occur as a result of physical and chemical changes. | **TRUE OF FALSE** |
| 1. Infrared rays travel at the speed of light. | **TRUE OF FALSE** |
| 1. Only objects that feel warm to the touch have heat energy. | **TRUE OF FALSE** |

**ACTIVITY-2** (Select the correct options in the following examples)

# Which of the following is an example of heat conduction?

a) An air vent from a furnace sending hot air into the house.

b) A metal cup heating up when hot water is poured into it.

c) The sun melting the ice formed on a frosty lawn.

d) Cool air sinking to the ground on a cold night.

# By what process does heat energy travel from the sun to the earth?

a) Heat is radiated through space.

b) Heat is conducted through air particles.

c) Convection of heat through air currents.

d) Heat travels through the wind.

# In a room in the wintertime, where would you find the warmest air?

a) near the ceiling b) near the floor

c) in the corners d) by a window

# Which of the following is not a method of heat transfer?

a) Conduction b) Convection

c) Condensation d) Radiation

# Heat transfer by conduction

a) is not possible from human beings to their environment.

b) does not occur from light bulbs − they are too bright.

c) None of the above.

d) requires some sort of material to facilitate the heat transfer.

# Which of the following is the best conductor of heat?

a) air b) plastic

c) water d) aluminum

# Which of the following is the worst conductor of heat in the group?

a) air b) plastic

c) a vacuum d) aluminum

# The fact that, in general, liquids and gases expand when heated gives rise to

a) convection currents in fluids due to changing masses.

b) convection currents in fluids due to changing densities.

c) heat transfer by conduction.

d) convection currents in fluids due to constant temperatures.

# In which of the following can convection currents be set up?

a) air b) a vacuum

c) plastic d) aluminum

# The predominant method of heat transfer that causes a pot of water to boil is

a) conduction. b) convection.

c) radiation. d) boiling.

# The process by which a pot of water on your electric stove starts to heat is

a) conduction. b) convection.

c) radiation. d) evaporation.

# The method through which the entire pot of water boils on that hot stove is

a) conduction. b) convection.

c) radiation. d) evaporation.

# 

# This type of heat transfer can occur in a vacuum:

a) Conduction. b) Convection.

c) Radiation. d) Blackbody.

# Heat transfer by radiation

a) is not possible from human beings to their environment.

b) does not occur from light bulbs − they are too bright.

c) does not require any material between the radiator and the object receiving the radiation.

d) none of the above.

# Which one of the following statements concerning the transfer of heat is not correct?

a) Conduction and convection may take place in solids.

b) Convection may take place in liquids and gases.

c) Convection and radiation may take place in gases.

d) Radiation and conduction may take place in solids.

e) Conduction may take place in solids and liquids.

# Which of the following methods of heat transfer involves the actual physical movement of high temperature particles to regions of lower temperature?

a) condensation b) conduction

c) convection d) radiation

# If one's hands are being warmed by holding them to one side of a flame, the dominate form of heat transfer is which of these processes?

a) conduction b) radiation

c) convection d) Vaporization

# The transfer of energy by the movement of fluids or gases with

**different temperatures is called**

a) convection. b) conduction.

c) radiation. d) contact.

**ACTIVITY-3**

**1 Select the correct mode of heat transfer for the following examples (Conduction, convection, or radiation)**

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| Radiation | The heat you feel from a fireplace |
| Convection | This heat transfer causes tectonic plates of the earth to move |
| Radiation | Heat you feel from a hot stove |
| Conduction | Frying a pancake |
| Conduction | Fast particles colliding with slower particles |
| Convection | Air travels this way |
| Conduction | Transfer through solids |
| Radiation | Transfer through space |
| Radiation | Moves as a wave |
| Radiation | Sun rays reaching earth |
| Convection | Occurs with fluids and not in solids |
| Conduction | You burn your tongue drinking hot chocolate. |
| Conduction | A spoon in the hot chocolate becomes warm |
| Radiation | You are warmed standing in front of a fireplace |
| Radiation | On a sunny day, the sand at the beach can get very hot |

**2-Explain each of the following cases – some are very hard.**

1. A saucepan might have a copper bottom but a plastic handle

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| WTTE = Copper conducts heat, so heat travels through the bottom into the food. Plastic is an insulator, so no heat travels through the handle to your hand |

1. The smoke from a bonfire rises upwards

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| WTTE = air (smoke is particles suspended in air) above a fire is hot, the air expands and is less dense, and rises |

1. Why air conditioners always installed near the ceiling of the room

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| WTTE = cold air is dense, so it sinks to the bottom of the room |

1. Why newspaper wrapping keeps hot things hot eg fish and chips, and cold things cold eg ice cream

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| WTTE = the newspaper stops the movement of air. This stops convection of heat. |

1. If you put your hand above a burning match, your hand feels hot. However your hand does not feel particularly hot when it is underneath the burning match

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| WTTE = heat is radiated equally in all directions, but hot air is less dense and rises. So more heat is experienced above the flame than below it. |

**Concept Map -** Construct a concept map using the terms heat, conduction, convection, and radiation.

The main concept (heat) should be at the top. Place the other 3 terms in ovals and connect the ovals with lines on which linking words are placed. For each of the 3 terms, a further link to a brief description and some examples should be put in.