C6 Heat and Heat technology Study Guide

Name: _____

The temperature of a substance is determined by the average kinetic energy of its particles.

Water freezes at 32 degrees F, 0 degrees C, and 273 K. Absolute Zero, 0 K, is the lowest possible temperature.

Water boils at 212 degrees F, 100 degrees C, and 373 K.

The amount of a substance does not affect its temperature.

The amount of heat, or energy (Q), a substance absorbs or emits is proportional to its specific heat. For instance, if one substance has a specific heat 5 times that of a second substance, the first substance will absorb or emit 5 times the energy as the second substance assuming equal masses and temperature differences.

Thermal energy added to a substance that is not changing state, will cause the temperature to increase. This corresponds to the upward slope on a Temperature vs. Energy graph.

Thermal energy added to a substance during a change of state, will not cause a change in temperature, since the energy is going into rearranging the particles.

A calorimeter measures the heat given up by a substance to known amount of water based on the increase in temperature of the water. The energy is typically given in Calories.

In all heat engines, fuel is used to produce thermal energy which ultimately produces work. Note, not all of the thermal energy goes into producing useful work; much of the thermal energy is wasted exhaust heat to the environment.

Insulation is typically used to prevent unwanted transfer of thermal energy into or out of a building (or person).

The inside of a refrigerator is cooled by the evaporation of a refrigerant which absorbs thermal energy from the inside and exchanges it to the outside of the refrigerator through condenser coils. This is why the back of the refrigerator may feel warm.

An increase in temperature can cause thermal expansion, which can cause railroad tracks, roads, bridges and other structures to deform from the expansion. One way to minimize this deformation is to place gaps, or expansion joints, at key locations.

The three common sates of matter on Earth are solid, liquid and gas. The average kinetic energy per particle increases from solid to liquid to gas. In other words, the particles in a gas move faster overall than a liquid, which has faster particles overall than a solid.

The three general modes to transfer thermal energy are: conduction, convection and radiation.

Conduction: The transfer of thermal energy by direct contact.

Convection: The transfer of thermal energy by currents in a fluid (liquid or gas).

Radiation: The transfer of thermal energy in the form of an electromagnetic wave, which can travel through vacuum of space at 300,000,000 meters per second.

The 4 basic steps of an internal combustion engine:

1) Intake stroke 2) compression stroke 3) power stroke 4) Exhaust stoke

An active solar-heating system involves pumps to circulate warm water heated by sunlight.

A passive solar-heating system does not utilize a pump.

Specific heat: The energy needed to change the temperature of 1 kg of a substance by 1 degree Celsius.

Write equations here:

Heat loss/gain:

Celsius to Kelvin: