Name _____ Date _____ Class _____

6 Note-taking Worksheet Thermal Energy

Section 1 Temperature and Heat

A. _____—related to the average kinetic energy of an object's atoms or molecules

B. _____—the sum of the kinetic and potential energy of all the atoms in an object

1. Thermal energy _____ as temperature increases.
2. At constant temperature, thermal energy increases if _____ increases.

C. Thermal energy that flows from something at a higher temperature to something at a lower temperature is called _____.

D. _____—amount of heat needed to raise the temperature of 1 kg of a material by 1 degree C or K

E. Changes in thermal energy can be calculated as *change in thermal energy equals* _____ *times change in temperature times specific heat.*

1. When heat flows into an object and its temperature rises, the change in temperature is _____.
2. When heat flows out of an object and its temperature decreases, the change in temperature is _____.
3. A _____ is used to measure specific heat.

Section 2 Transferring Thermal Energy

A. _____—transfer of thermal energy through matter by direct contact of particles

1. Kinetic energy is transferred as particles _____.
2. _____, particularly metals, are good heat conductors.

B. The transfer of energy by the motion of heated particles in a fluid is called _____.

1. Convection _____ transfer heat from warmer to cooler parts of a fluid.
2. Convection currents create _____ and _____ over different regions of Earth.

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Note-taking Worksheet (continued)

C. _____—energy transfer by electromagnetic waves

1. Some radiation is _____ and some is _____ when it strikes a material.
2. Heat transfer by radiation is _____ in a gas than in a liquid or solid.

D. Most living things control the flow of heat by using special features such as fur, _____, or scales.

E. _____—material that does not let heat flow through it easily

1. Gases such as _____ usually make better insulators than liquids or solids.
2. A _____ layer in a thermos is a good insulator because it contains almost no matter to allow conduction or convection to occur.

Section 3 Using Heat

A. _____ systems—warm homes and buildings

1. _____ system—fuel heats air, which is blown through ducts and vents; cool air is returned to the furnace to be reheated
2. _____ system—hot water or steam in a radiator transfers thermal energy to the air
3. _____ heating system—electrically heated coils in ceilings or floors heat air by conduction

B. _____—energy from the Sun

1. _____ solar heating does not use mechanical devices to move heat.
2. Active solar heating systems use _____ to absorb radiant energy, which is circulated through the building.

C. _____—an engine that converts thermal energy into mechanical energy

1. An _____ **engine** burns fuel inside the engine in chambers or cylinders.
2. Internal combustion engines convert only about _____% of the fuel's chemical energy to mechanical energy.

Note-taking Worksheet (continued)

D. _____—device that removes thermal energy from one location and transfers it to another location at a different temperature

1. A _____ contains a coolant that absorbs heat from the inside of the refrigerator and releases it on the outside as heat.
2. _____ cool warm air.
3. _____ can both cool and warm air.
4. The human body stays cool by _____ of sweat.

Name _____ Date _____ Class _____

Note-taking Worksheet

Electricity

Section 1 Electric Charge

A. Protons have _____ electric charge; electrons have _____ electric charge.

1. In most atoms, the charges of the protons and electrons cancel each other out and the atom has no _____.
2. Atoms become charged by gaining or losing _____.
3. **Static electricity**—the accumulation of excess _____ on an object

B. Electrically charged objects obey the following rules:

1. **Law of conservation of charge**—charge may be transferred from object to object, but it cannot be _____ or _____
2. Opposite charges _____, and like charges _____.
3. Charges can act on each other even at a _____, because any charge that is placed in an **electric field** will be pushed or pulled by the field.
4. Electrons move more easily through **conductors**, like _____.
5. Electrons do not move easily through _____, such as plastic, wood, rubber, and glass.

C. Transferring electric charge

1. Charging by _____
   a. The process of transferring charge by _____ or _____
   b. Example: static electricity from your feet _____ the carpet
2. Charging by _____
   a. The rearrangement of electrons on a neutral object caused by a nearby_____ object
   b. Example: a negatively charged balloon near your sleeve causes an area of your sleeve to become _____ charged
3. Static _____
   a. A transfer of charge through the _____ between two objects because of a buildup of static electricity
   b. Example: _____
4. **Grounding**—using a _____ to direct an electric charge into the ground

D. The presence of electric charges can be detected by an _____.

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Note-taking Worksheet (continued)

Section 2 Electric Current

A. The flow of charges through a wire or conductor is called **electric** _____.

1. Current is usually the flow of _____
2. Electric current is measured in _____ (A).
3. Charges flow from _____ voltage to _____ voltage.
   a. A **voltage difference** is the _____ that causes charges to move.
   b. Voltage difference is measured in _____ (V).
4. For charges to flow, the wire must always be connected in a closed path, or _____.

B. Sources of electricity:

1. A _____ battery produces a voltage difference between its zinc container and its carbon suspension rod, causing current to flow between them.
2. A _____ battery contains two connected plates made of different metals in a conducting solution.
3. _____ have a voltage difference across the two holes of an electrical outlet, and a generator at a power plant provides this voltage difference.

C. **Resistance**—the tendency for a material to oppose the flow of electrons, changing electrical energy into _____ energy and _____

1. All materials have some electrical _____.
2. Resistance is measured in _____ (Ω).
3. Making wires thinner, longer, or hotter _____ the resistance.

D. **Ohm's law**—the current in a circuit equals the voltage difference divided by the _____

Section 3 Electrical Circuits

A. Circuits rely on generators at power plants to produce a voltage difference across the outlet, causing the charge to _____ when the circuit is complete.

1. **Series circuit**—the current has only one _____ to flow through
   a. The parts of a series circuit are wired one after another, so the amount of current is the _____ through every part.
   b. _____—if any part of a series circuit is disconnected, no current flows through the circuit
   c. Example: strings of _____

Note-taking Worksheet (continued)

2. **Parallel circuit**—contains two or more _____ for current to move through
   a. Individual parts can be _____ without affecting the entire circuit.
   b. Example: the electrical system in a _____

B. Household circuits use _____ circuits connected in a logical network.

1. Each branch receives the standard _____ from the electric company.
2. Electrical energy enters your home at the _____ breaker or _____ box and branches out to wall sockets, major appliances, and lights.
3. Guards against overheating electric wires:
   a. _____—contains a small piece of metal that melts if the current becomes too high, opening the circuit and stopping the flow of current
   b. _____—contains a small piece of metal that bends when it gets hot, opening the circuit and stopping the flow of current

C. Electrical energy is easily converted to mechanical, thermal, or _____ energy.

1. **Electrical power**—the rate at which _____ energy is converted to another form of energy
   a. Electrical power is expressed in _____(W).
   b. Power = current × _____
   c. P (watts) = I (amperes) × _____
2. To calculate the amount of energy an appliance uses:
   a. The unit of electrical energy is the _____, which equals 1000 watts of power used for one hour.
   b. Energy = power × _____
   c. E (kWh) = P (kW) × _____

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