Chapter Ten Science: Interactions of Matter and Energy
Study Guide

Lesson Four

Energy's Relation to Motion
- -Solids-molecules vibrate back and forth
- -Gases-molecules move in straight lines between collisions
- -Liquids-a mixed type of motion

Kinetic Energy-energy of any moving object
- -roller coaster has its greatest kinetic energy as it reaches the bottom of the first hill

Energy can not be created or destroyed. Energy can only change forms.

Potential Energy-energy stored in an object or material
- -most potential energy at the to of the hill on the roller coaster

Temperature-how hot or cold the material is (determined by kinetic energy)
- -Thermometers-used to measure temperature; usually contain a material the expands when warmer

Energy always flows from the hotter object to the cooler one; never in reverse
- -energy will continue to flow until the two objects reach the same temperature

Heat-when energy flows between two objects because they have different temperatures

Radiation-transfer of energy by electromagnetic waves (example-sun)
- -comes in forms of infrared, visible, and ultraviolet waves; strength of these depends on temperature of the object
  - -objects with temperatures near or below room temperature give off mainly infrared radiation
  - -objects with extremely high temperatures give off visible light

Conduction-the movement of energy through direct contact; only way heat can travel through solids

Convection-transfer of energy by the flow of liquid or gas

Insulation-preventing heat from flowing in or out of a material
- -to insulate something you wrap it securely with a material that is not a good conductor of heat

Lesson Five

Thermal Expansion-when temperature is raised most matter tends to expand
- -as temperature of a solid, liquid, or gas is raised its particles move around faster; each particle moves over a larger region and tends to keep neighboring molecules out of its space. Result is an increase in volume.

Pressure-the force on each unit of area of a surface

Cause of Changes of State
- -solid-particles are "locked" into organized positions. Particles can only vibrate back and forth from their individual positions. When heat is supplied particles vibrate faster as the temperature rises. Particles will get to a point that they move fast enough to break free of the forces holding them in place. The particles begin sliding past each other which is known as melting.
- -liquid-particles still vibrate but move freely past each other; if heat is steadily supplied the particles will again move faster and at some point will again move fast enough to escape to a gas-known as vaporization.
- -in a gaseous state the particles have great freedom of motion and are very spread out

Melting-changing of a solid to a liquid

Vaporization-changing of a liquid to a gas

Condensation-gas turning back into a liquid

Freezing-changing from a liquid to a solid

Temperature of a substance does not change while a change of state occurs; rather temperature changes when all of the substance has changed state.

Boiling-when bubbles of vapor escape from a liquid as a result of heating.

Evaporate-when a liquid turns to a gas at a lower temperature causing the particles to vaporize at the surface

Steam Heat

1)water releases stored heat by condensing from steam into liquid
2)water stores heat from the flame by vaporizing into steam
3)hot pipes give off heat to the room by conduction and radiation
4)air heated by conduction circulates through the room by convection

Forced-Air Heat

1)the air blower forces air through the furnace, where it is heated by a flame
2)hot air is blown out of vents into the room, where it cools as it transfers energy to the living space
3)convection helps to circulate air in the room
4)cooler air is led back to the blower by the air duct

Four-Stroke Engine Cycle

1)Intake Stroke-low pressure in cylinder pulls in mixture of air and gasoline vapor through open valves. Pistons move down, causing low pressure in cylinder.
2)Compression Stroke-Intake valve closes. Piston moves up and compresses fuel and air
3)Power Stroke-spark plug ignites fuel. Hot gases push piston down. Moving piston turns crankshaft, which drives car ahead.
4)Exhaust Stroke-exhaust valve opens. Piston moves up and pushes burned gases out of cylinder.

Lesson Six

Solar Cells-generate an electric current from sunlight. Can be used to charge batteries or run motors. They can also power electric vehicles and provide buildings with electricity.

Coal, oil, and natural gas all give off large amounts of heat when burned which are called fossil fuels. They are formed from ancient plants and animals.

-Fossil fuels take millions of years to form so the are nonrenewable resources or resources that we can't get back after they are gone.

Biomass Conversion-method of turning both plant and animal materials into high-quality fuels.

-These are examples of renewable resources which means that we can make more of the resources and use them again.

Nuclear Fission-the splitting of a nucleus into two pieces. The nucleus can be split when struck with a slow-moving neutron.

Chain Reaction-products of the reaction keep the reaction going.
Nuclear Fusion-energy released when nuclei of smaller masses merges to make a nucleus with a larger

mass.

-only occur at very high temperatures

Which is better-Fission or Fusion

-Nuclear Fission-today produces electricity across US and Europe.

-Reactors are quiet, don't pollute the atmosphere, and they conserve fossil fuels

-Produce chain reactions that are controlled

-Problems include the release of radioactive material for thousands of years

-Nuclear Fusion-produces far less radioactive waste

-Problem is that a working fusion reactor has not been developed because temperatures of 100 million degrees are needed to keep the fusion going

Wind Energy

-Early wind energy was collected using windmills

-Manufactures have developed large wind turbines that convert wind into electricity

-California has the most in the US

-Some people object to wind power because of the noise and appearance of turbines; the positives are that wind power will never be used up and is clean

Hydroelectricity-energy produced by flowing water

-15% of electricity from hydroelectricity

-causes little pollution and is always available

-There are few sites where more large dams can be built and dams can harm the environment

Fossil Fuels-produce energy by being burned

1)coal is burned under boiler

2)water is changed into steam

3)steam spins fanlike blades of a turbine

4)turbine shaft spins electric generator

5)electricity is sent from a transformer to homes, factories, and businesses