

TYPES OF ENERGY

Energy can be in many different _____. Students should know sources and properties of the following forms of energy: _____ is the transfer of _____ energy (energy that is



State of Matter: _____

Temperature: _____

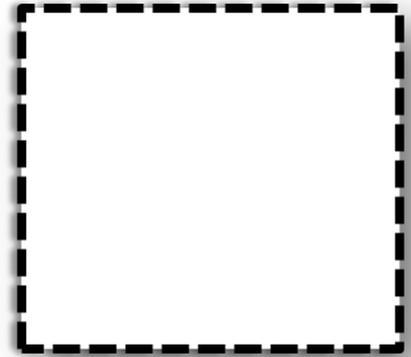
Particle Motion: _____



State of Matter: _____

Temperature: _____

Particle Motion: _____



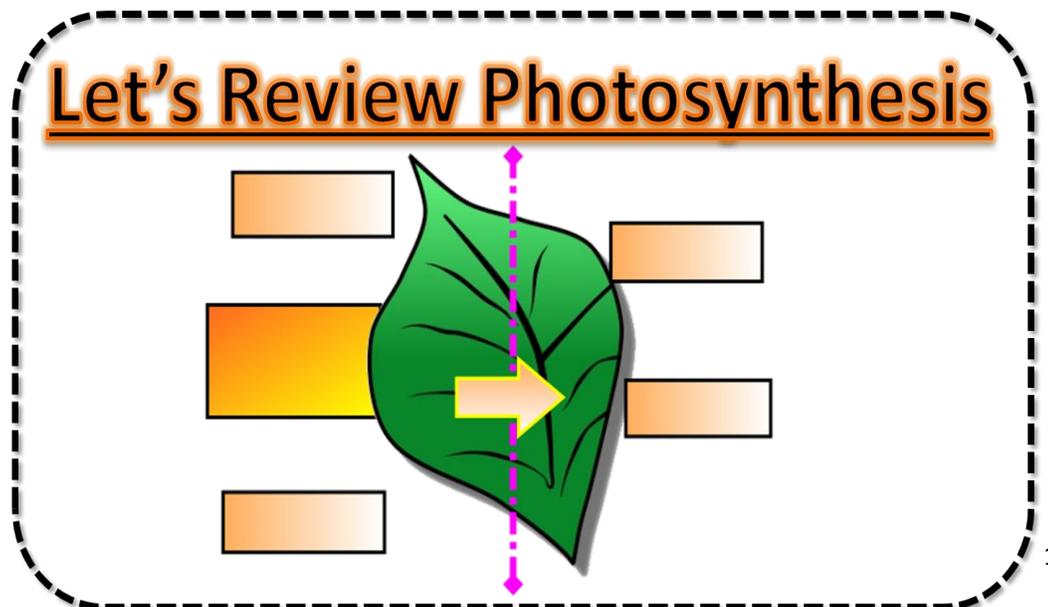
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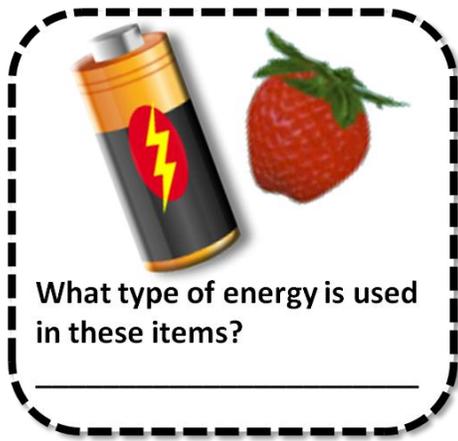
Temperature: _____

Particle Motion: _____

associated with the _____ of the particles of a substance).

- Remember that all _____ is made up of _____ too small to be seen (5th grade).
- As heat energy is added to a substance, the _____ goes _____ indicating that the particles are _____. The faster the particles move, the higher the temperature.
- Material (wood, candle wax) that is burning, the Sun, and electricity are sources of heat energy. _____ is the energy from the _____, which provides heat and light energy for Earth.
- _____ can be used to convert solar energy to _____ energy.
- Green _____ use solar energy during _____ to produce sugar, which contains stored _____.
- Most of the energy that we use on Earth originally came from the Sun.





_____ is energy _____ in particles of matter.

• Chemical energy can be released, for example in _____ or _____, when these particles react to form new substances.

_____ is the energy flowing in an _____.

• Sources of electrical energy include: stored chemical energy in batteries; solar energy in solar cells; fuels or

hydroelectric energy in generators.

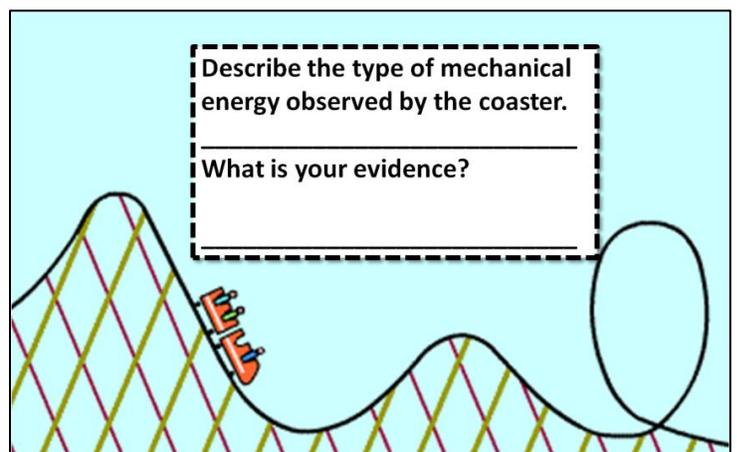
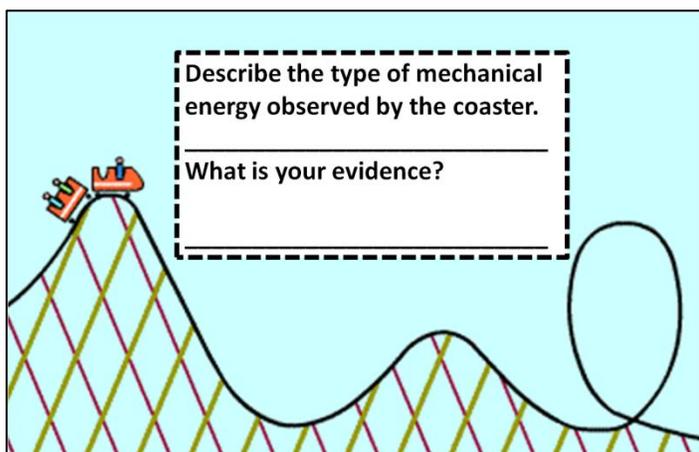
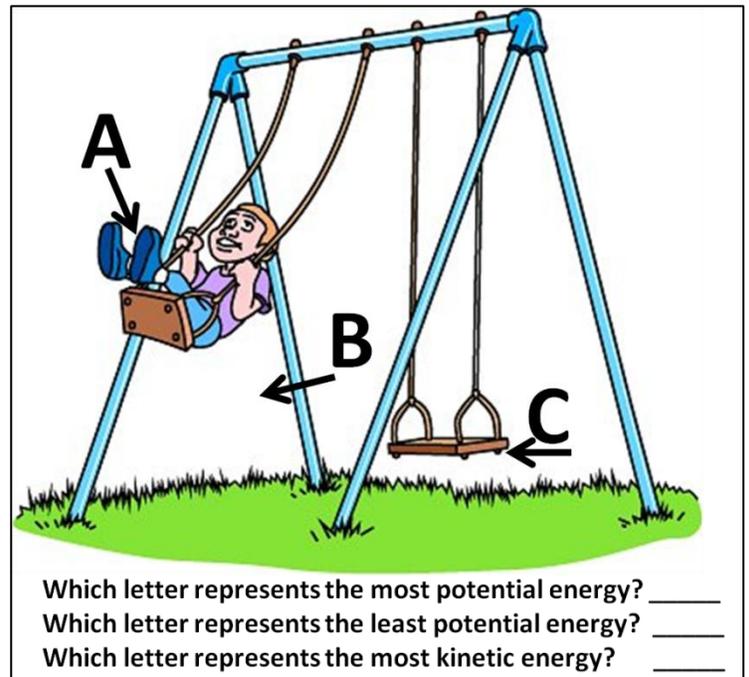
_____ is the energy due to the motion _____ and position _____ of an object.

• When objects are set in motion or are in a position where they can be set in motion, they have mechanical energy.

• _____: Potential energy is _____ energy. Mechanical potential energy is related to the _____ of an object. A stretched rubber band has potential energy. Water behind a dam has potential energy because it can fall down the dam.

• _____: Kinetic energy is the energy an object has due to its _____.

• Mechanical kinetic energy _____ as an object moves _____. A moving car has kinetic energy. If the car moves faster, it has more kinetic energy.



The Law of _____ of _____ - states that energy cannot be _____ or _____. It may be _____ from one form into another, but the _____ amount of energy _____.

Examples of potential and kinetic mechanical transformations might include:

- When water is behind a dam, it has _____ energy. The potential energy of the water changes to _____ energy in the _____ of the water as it flows over the dam.
- When a rubber band is stretched, kinetic energy is transformed into potential energy. When a stretched rubber band is released its _____ energy is transformed into _____ energy as the rubber band moves.
- When a book is lifted to a shelf, _____ energy is transformed into _____ energy.

Example	Energy Transformations
Book falling	Kinetic → sound, heat
Water moving over dam	Kinetic → electrical (via generator)
Green plants	Solar → stored chemical
Respiration (eating food)	Chemical → kinetic (moving)
Burning carbon-based fuel	Chemical → heat energy, electrical
Electrical circuit (using an outlet)	Electrical → mechanical, heat, sound and light

Circle all of the forms of energy you can observe in the picture.

**CHEMICAL
ELECTRICAL
POTENTIAL
HEAT
KINETIC
LIGHT
NUCLEAR
SOUND**



Explain one energy transformation seen above.

_____ → _____ → _____

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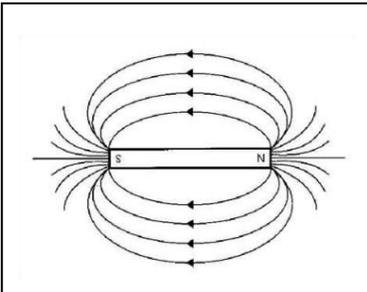


Select answers from the perspective of the man.

Explain one energy transformation seen above.

_____ → _____ → _____

_____ is the force of _____ or _____ of magnetic materials.



Surrounding a magnet is a _____ that applies a force, a push or pull, without actually touching an object.

An _____ flowing through a wire wrapped around an _____ forms a _____.

A coil of wire _____ around a _____ or a magnet

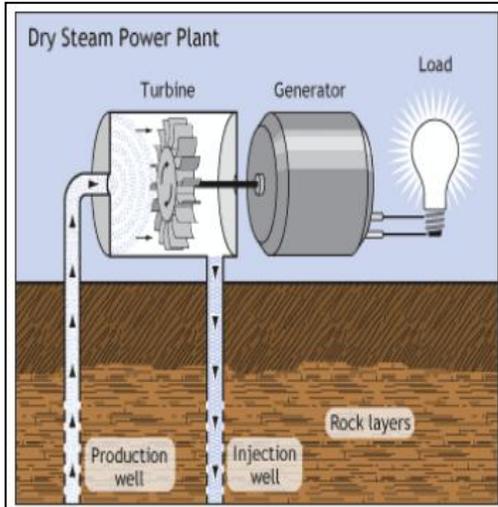
spinning around a coil of wire can form an _____.

Examples of how magnetism and electricity are interrelated can be demonstrated by the following devices:

- An _____ is formed when a _____ in an electric circuit is wrapped around an _____ producing a magnetic field. The _____ that results loses its _____ if the electric current stops flowing.



- A _____ an _____ when a coil of wire wrapped around an iron core is _____ near a _____. Generators at



power plants produce electric energy for our homes.

- A generator contains coils of wire that are stationary, and rotating magnets are rotated by _____.
- Turbines are huge _____ that rotate when pushed by _____, _____, or _____.

- Thus _____ energy is changed to _____ energy by a _____. Smaller generators may be powered by _____.

- An _____ changes _____ energy to _____ energy. It

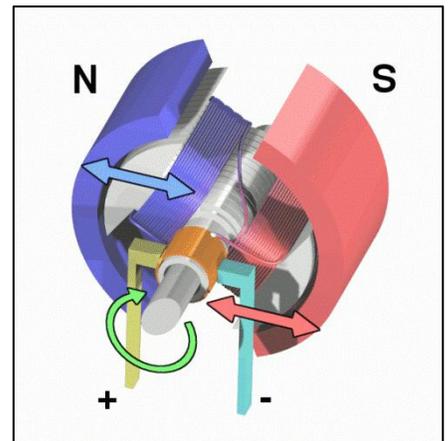
contains an _____ that rotates between the poles of a magnet.

- The coil of the electromagnet is connected to a _____ or other source of _____.

- When an electric current flows through the wire in the electromagnet, a _____ is produced in the coil.

- Like poles of the magnets _____ and unlike poles of the magnets _____.

- This causes the coil to _____ and thus changes _____ energy to _____ energy.



- This rotating coil of wire can be attached to a shaft and a blade in an electric fan.

_____ energy can be transformed to light, sound, heat, and mechanical motion in an electric circuit.

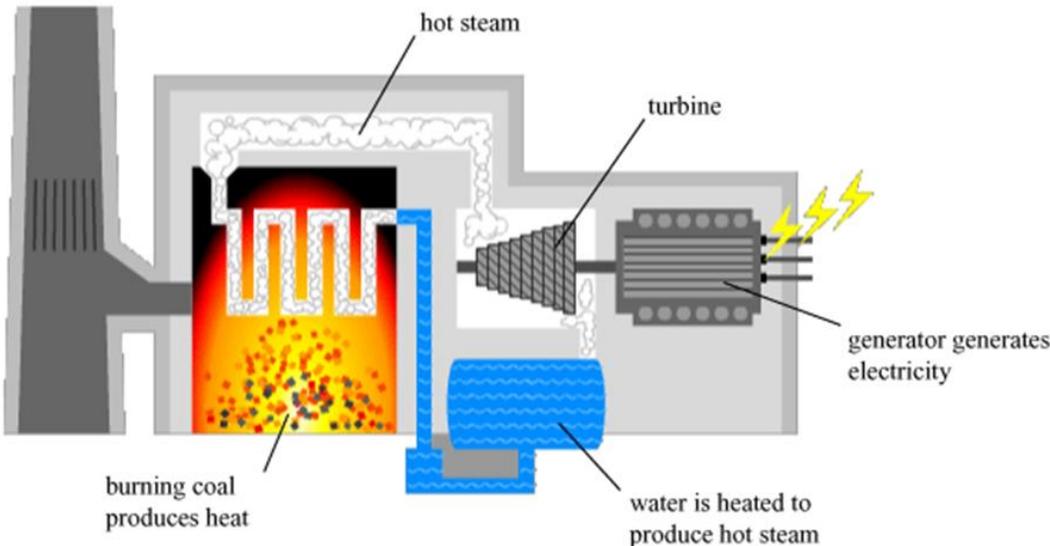
An electric _____ contains a source of _____ energy, a _____ of the electrical energy (_____) connected to the energy source, and a device that uses and transforms the electrical energy.

Source	Energy comes from ...
Battery	Stored chemical energy
Solar cell	Light energy from sun
Electrical outlets	<u>Power Plants</u> Chemical energy (burning coal) Nuclear energy Geothermal energy

All these components must be connected in a complete, unbroken path in order for energy transformations to occur. The electrical energy in circuits may come from many sources (see chart) and can be transformed to other forms of energy in a circuit.

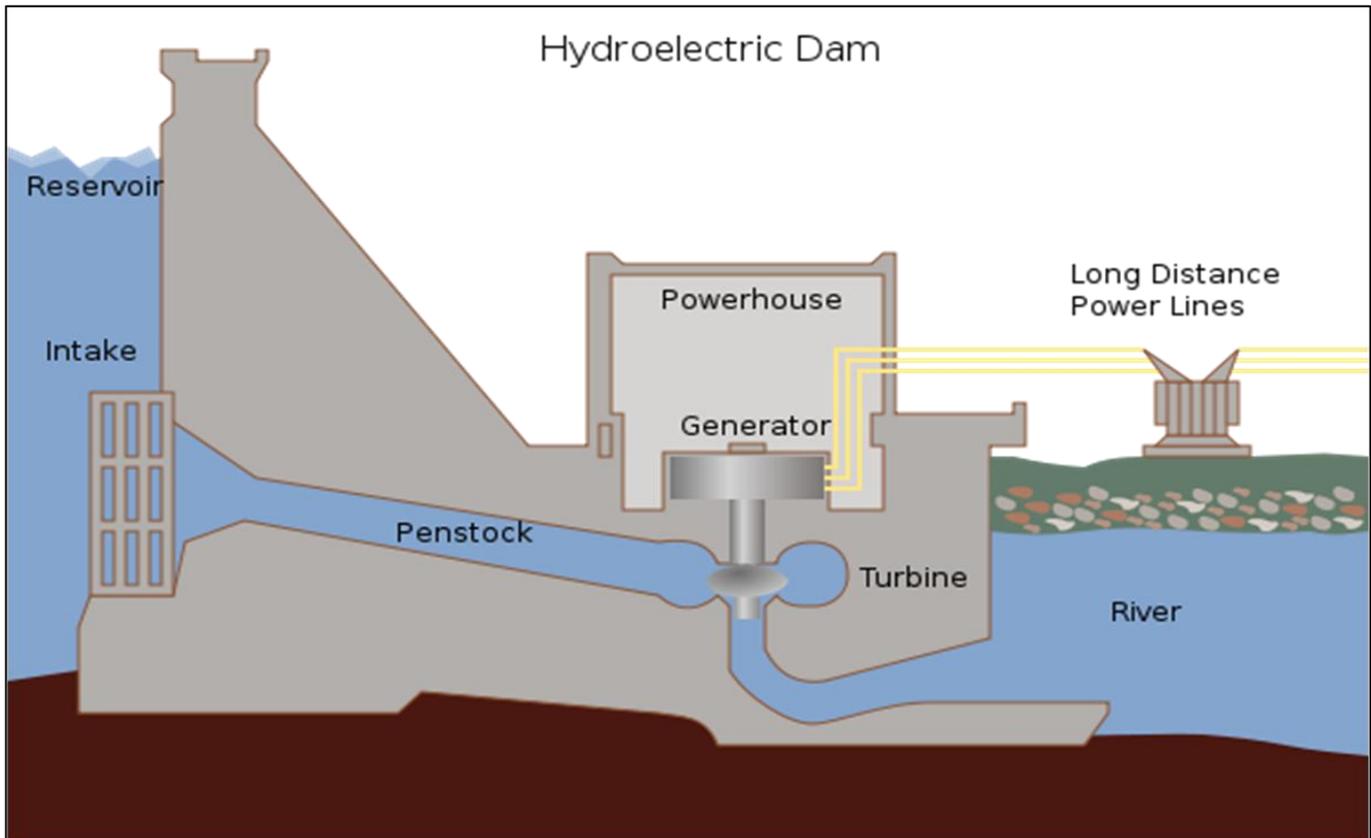
Devices used in electrical circuit	Energy Transformations
	Chemical (battery) → electrical → light & heat
	Chemical (battery) → electrical → sound
	Electrical (outlet) → heat & light
	Chemical (battery) → electrical → mechanical
Generators _____	Chemical energy (coal burning) → heat (steam) → mechanical (turning turbine) → electrical
Generators _____	Mechanical energy (moving water from dam) → mechanical (turning turbine) → electrical
Generators _____	Heat (steam) → mechanical (turning turbine) → electrical

Coal-burning Plant



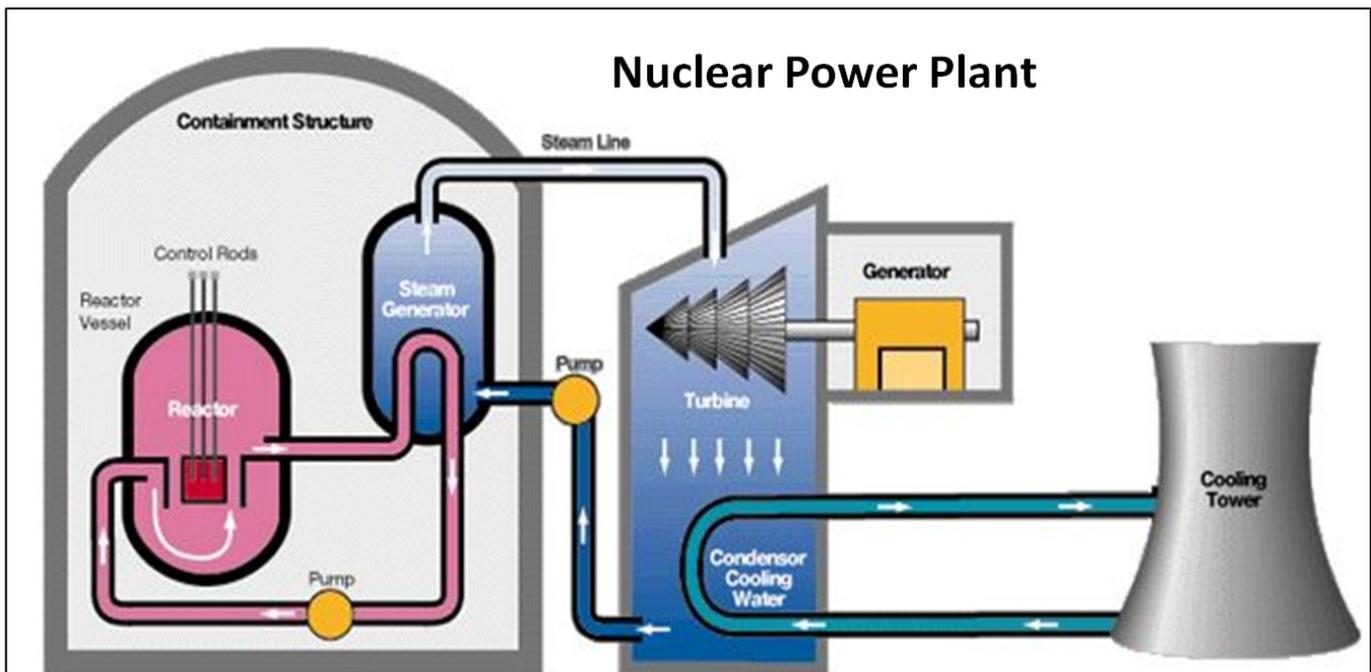
Describe the energy transformations in a coal plant.

_____ → _____ → _____ → _____



Describe the energy transformations in a hydroelectric plant.

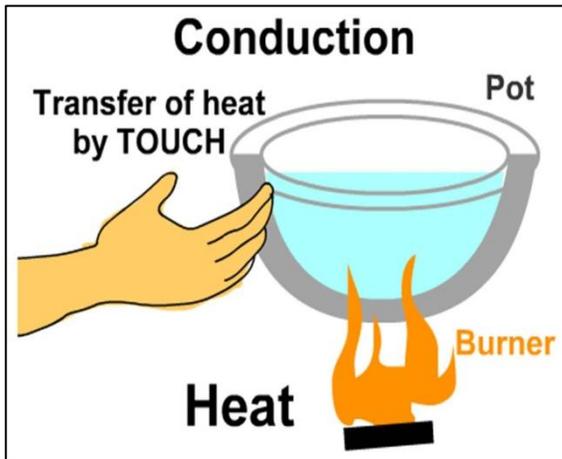
_____ → _____ → _____ → _____



Describe the energy transformations in a nuclear power plant.

_____ → _____ → _____ → _____

ENERGY TRANSFER



Energy transfer as _____ can occur in three ways:

- _____ involves objects in _____. The transfer of energy as heat occurs between particles as they collide within a substance or between two objects in contact.

- All materials do not conduct heat energy equally well.

- Poor conductors of heat are called _____.

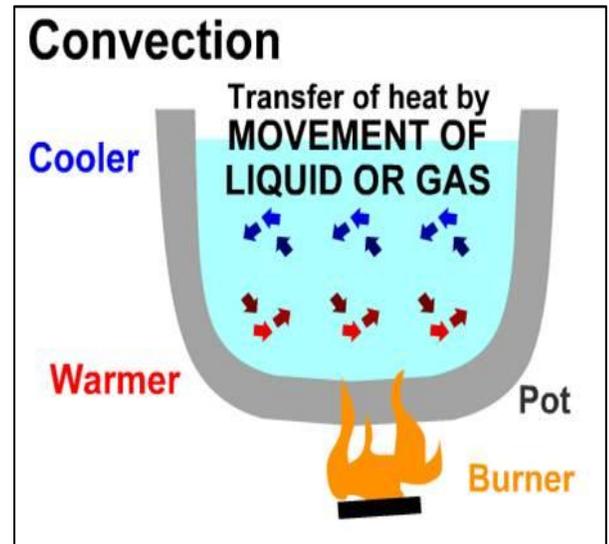
- The energy transfers from an area of _____ temperature to an area of _____ temperature.

- For example, if a plastic spoon and a metal spoon are placed into a hot liquid, the handle of the _____ spoon will get hot quicker than the handle of the _____ spoon because the heat is conducted through the metal spoon better than through the plastic spoon.

- _____ is the transfer of energy as heat by _____ of the _____ itself, as _____ in fluids (liquids and gases).

- Heat transfer occurs when particles with _____ energy move from _____ to _____ parts of the fluid.

- **Uneven** heating can result in convection, both in the

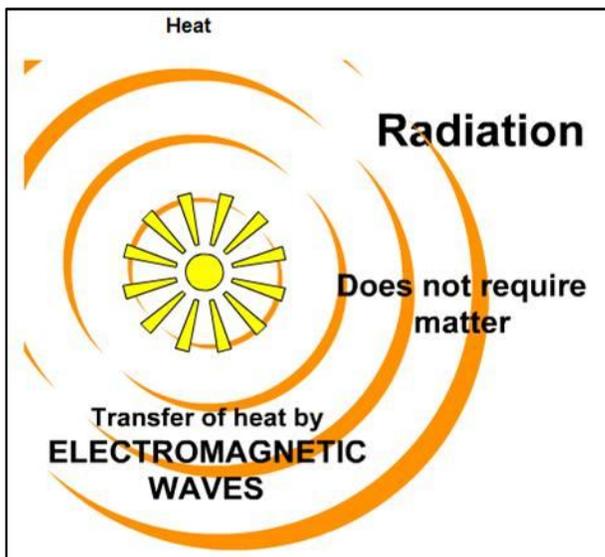


air and in water. This causes _____ in the atmosphere (_____) and in bodies of water on earth which are important factors in weather and climate.

- _____ is the transfer of energy through _____ of matter colliding or moving to transfer the energy.

- This radiated energy warms an object when it is absorbed.

- Radiant heat energy moves from an area of higher temperature to an area of cooler temperature.



REVIEW MOMENT!

- | | |
|-----------------------------------|---------------|
| _____ circulating currents | A. radiation |
| _____ heat transfer through space | B. conduction |
| _____ direct contact | C. convection |

ENERGY & WORK

_____ is a property that enables something to do _____.

Work means to (1) apply a _____ to an object over a _____, and (2) the object _____ in response to the force. If something has the ability to

cause a change in motion, it has energy.

Energy can cause _____ to be done, so when we see work done, we see evidence of energy.

An evidence of energy is when work is being done. For example:

- When a car at rest is _____, work is done on the car if it _____.

W = _____ x _____

Unit of force → _____

Unit of work → _____

Unit of distance → _____

Directions: Write "yes" if the example demonstrates work is being done or "no" if no work is being done.

Example	Yes/No
Child playing on a swing	
Mother holding a baby	
Weight lifter holding weights over his head	
Writing with a pencil	
Thinking about a math problem	

- When a fan is connected to an electric circuit, it moves, so work was done on the fan.

• When an object is lifted, it moves, so work is done on the object. A _____ is used to measure _____. Force (including weight) is measured in SI units called _____.

SIMPLE MACHINES

- A simple machine is a device that helps _____ the amount of _____ required to do

_____. Work is done when a _____ (effort force) is applied over a _____.

- A simple machine allows the user to apply a _____ over a _____ to move an object.

Work = Force x Distance

W = x =

Inclined Plane A: Taller

Work = Force x Distance

W = x =

Inclined Plane B: Shorter

- Simple machines can also change the _____ of the force applied.
- If the _____ over which the effort _____ is exerted is _____, the _____ amount of _____ can be done with a _____ effort force.

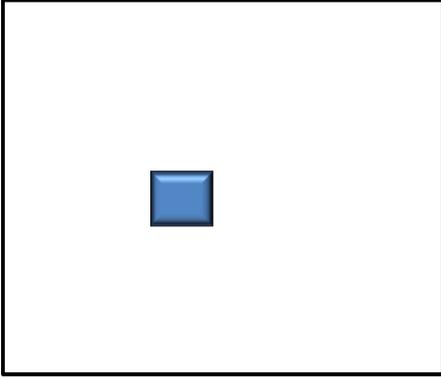
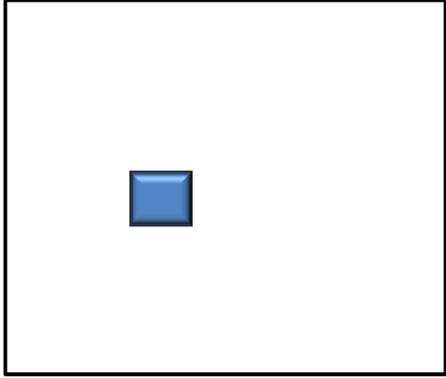
• The design of the simple machines can reduce the amount of force required to do work:

- A _____ is a _____ or board that is free to move around a _____ point called a _____.

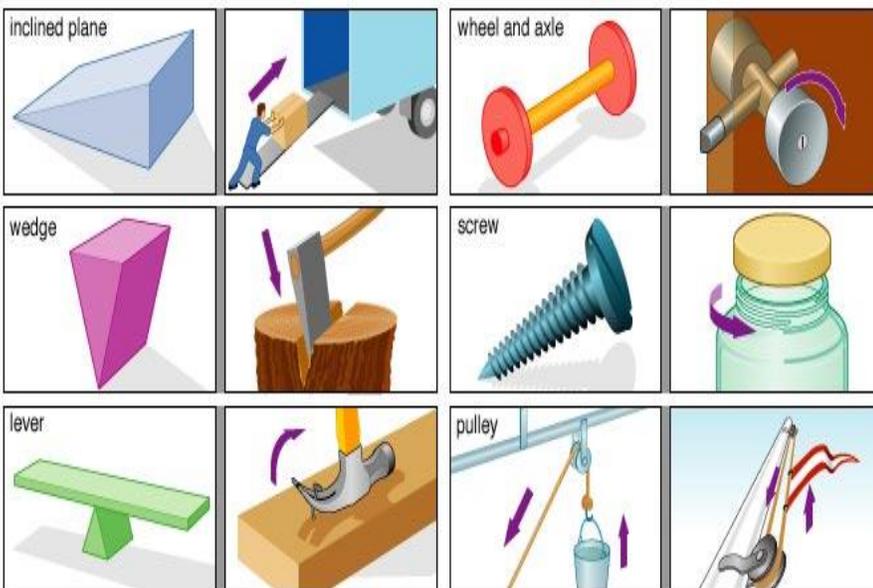
- The fulcrum may be placed at different locations along the bar.

- A lever can be designed to _____ the amount of _____ required to lift a weight in two ways:
- By increasing the distance from the fulcrum to the point where the effort force is applied, or (2) by decreasing the distance the weight is from the fulcrum.
- By increasing the distance the effort force moves relative to the distance the weight moves, a lever can reduce the effort force needed.
- A _____ has a grooved _____ with a _____ running along the groove.

- Pulleys can change the _____ and/or the _____ applied (effort force).
- By arranging the pulleys in such a way as to _____ that the effort force moves relative to the distance the weight moves, a pulley can _____ needed.

<p>Draw a diagram of a lever where the fulcrum (Δ) makes it easier to pick up the box.</p> 	<p>Draw a diagram of a lever where the fulcrum (Δ) makes it harder to pick up the box.</p> 
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- Movable pulleys are used to reduce the effort force.
- A _____ pulley changes only the _____ of the force (you pull down and the weight goes up.)



- An _____ is a sloping surface, like a _____, that reduces the amount of force required to lift an object.
- An inclined plane can be designed to reduce the force needed to lift a weight in two ways: _____ the length of the ramp or (2) _____ the height of the ramp.
- By increasing the distance the effort force moves (length of the

ramp) relative to the distance the weight is lifted (height of the ramp), an inclined plane can _____ the effort force needed.

COMPOUND/COMPLEX MACHINES

- Levers that have the fulcrum between where the effort force is applied and the weight is located can be found in tools, for example, _____ (two levers working together) and _____.

Write an example of each type of simple machine.

Simple Machine	Example
Inclined plane	
Lever	
Pulley	
Wheel and axle	
Screw	
Wedge	

- Levers that have the fulcrum on the end and the effort is applied in the middle to lift a weight on the other end can be found in tools, for example, _____ (two levers working together) or a _____.

- _____ that have the fulcrum on the end and the effort force are applied on the other end to lift a weight in the middle can be found in tools, for example, a _____, or a _____.
- _____ that are _____, meaning that they are attached to a structure, can be found on the top of a _____ and on _____.
- Pulleys that are _____, meaning that they are not attached to a structure, can be found on construction _____ and as part of a block and tackle system.
- _____ with a sloping surface can be found as _____ on a truck or wheelchair ramp and _____.
- Inclined planes that are _____, one inclined plane or two back-to-back inclined planes that can move are found as _____.
- _____ that are wound around a post or cylinder are called _____. Screws can be found in _____ and _____.
- Wheel and axles consist of two circular objects: a _____, called an _____, inserted through the middle of a wheel.
- Wheel and axles can be found as _____, steering wheels, screwdrivers, _____, and bicycles wheels.
- _____ machines, also known as _____ machines, consist of _____ simple machines.

Examples may include:

- _____ consisting of two levers and two inclined planes (wedges);
- a _____ consisting of a lever, a wheel and axle and a pulley;
- a _____ consists of levers (handlebars and handbrakes), wheel and axles (gears, wheels, and pedals), and a number of screws.