



Energy: Conservation and Transfer

Date:

6.P.3 Understand characteristics of energy transfer and interactions of matter and energy.

6.P.3.1 Illustrate the transfer of heat energy from warmer objects to cooler ones using examples of conduction, radiation and convection and the effects that may result.

6.P.3.2 Explain the effects of electromagnetic waves on various materials to include absorption, scattering, and change in temperature.

6.P.3.3 Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators).

Keep Your Cool

What is conduction?

• _____ as heat can be _____ in ____ main ways: conduction, convection, and radiation.

• _____ is the transfer of energy as heat from one substance to another through direct contact.



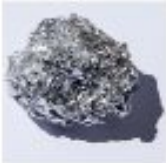





• As long as two objects are in _____, conduction continues until the temperatures of the objects are equal.

• A _____ is a material that transfers heat very well.

• _____ are typically good conductors.

• An _____ is a material that is a poor conductor of heat.

• _____, _____, and plastic foam are examples of good insulators.

Conductors	Insulators
 Aluminum	 Wood
 Steel	 Plastic
 Gold	 Rubber

What is convection?

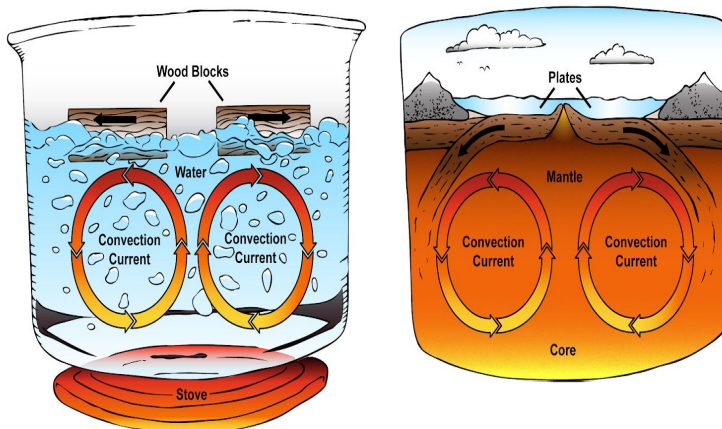
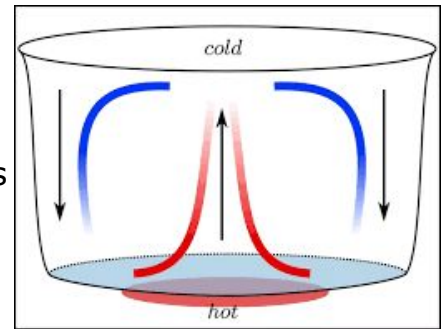
• _____ is the transfer of energy as heat by the movement of a liquid or gas.

• Convection occurs when a _____, denser mass of gas or liquid _____ a warmer, less _____ mass of gas or liquid by pushing it _____.

• When water is _____, the water moves in roughly _____ patterns because of convection.

• This motion is due to _____ differences that result from temperature differences.

• The motion is called a _____.



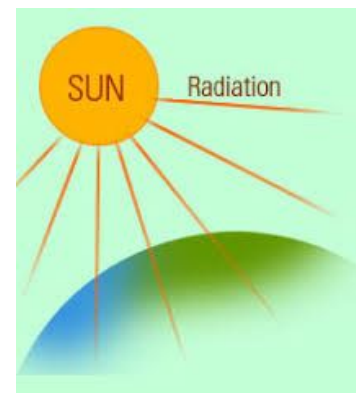
What is radiation?

• _____ is the transfer of energy by electromagnetic waves.

• _____ objects, including the sun and all living things, _____ radiation.

• When radiation is _____ from one object and is _____ by another, the result is often a transfer of heat.

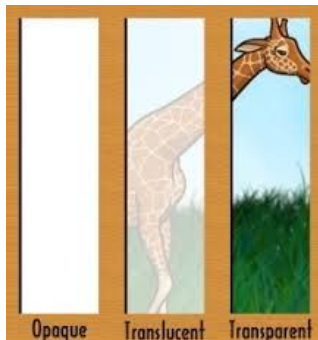
• Radiation can travel through _____ space.



Shedding Light on the Matter

How can matter interact with light?

- ___ forms of matter-light _____ play an important role in how people _____ light.



- When light enters a _____, the medium lets all, some, or no light pass through.
- Matter that transmits light is _____.
- Matter that transmits light but scatters it in all directions is _____.

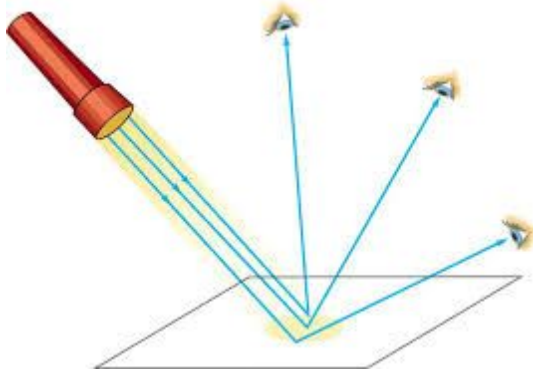
- Matter can _____ light. When light _____ a material but does not _____ it, the light is _____.



- _____ is the transfer of light energy to matter.



- _____ materials do not let any light pass through them because they reflect light, absorb light, or both.
- Matter can reflect light. _____ is the bouncing of light off a surface.
- When light strikes a _____ surface, the light _____ off at an angle equal to the angle at which it hit the surface, producing a clear image.



- When light strikes an _____ surface, the light is _____ in many directions. You see the object but do not see a reflected image of yourself.
- Nearly _____ we can see, we _____ because light is _____ off a surface.

Color Me Impressed!

What determines the color of objects we see?

- When _____ light strikes an object, the _____ of the object _____ on how the object _____, _____, or _____ the colors of light.
- An object that _____ a certain color of light _____ to be that color.
- A frog appears green because its skin _____ all colors _____ green.
- An object that _____ _____ color appears _____.
- An object that _____ _____ color appears _____.
- When light is _____ through an object, the object can _____ some colors and allow other colors to _____ through.
- The _____ that _____ through a transparent or translucent object _____ the color of that object.
- Some _____ absorbs certain types of _____ waves and allows other types of electromagnetic waves to pass through.
- Sometimes the color of an object _____ on what light shines on it.
- If a _____ filter is placed between a green frog and white light, the filter will _____ all colors of light _____ red, orange, and yellow.

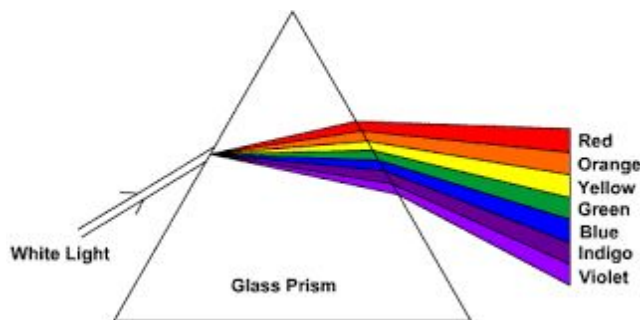


- The frog _____ no light, and you perceive the frog's color as _____ or black.

Matter Scatter

What happens when light waves interact with matter?

- Light travels 300 million miles per second through a _____. This is called the _____.
- When light waves pass through a _____, the medium can _____ properties of the light.
- _____ travels more _____ when it passes through matter. _____ wavelengths of light are _____ more than longer wavelengths of light.
- Light _____ when it passes at an _____ from one medium to another.
- The bending of a wave as it passes from one medium to another is called _____.

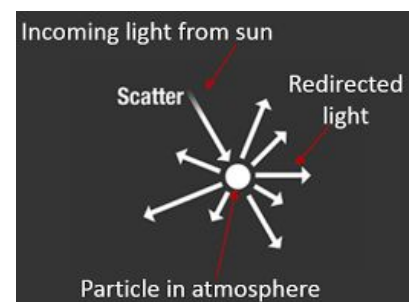


- Refraction _____ because light changes _____ as it enters a medium at an angle.

- When light _____ in a medium, it _____ inward, creating a _____ angle.

- Light waves with _____ wavelengths _____ more.
- The waves that make up _____ light have _____ wavelengths.
- As _____ light passes through a _____, the wavelengths _____ at different angles and you see a _____ of colors.

- When light strikes matter, the light can change direction. This is called _____.



- Light scattering _____ us to _____ objects that are _____ in the _____ path of the light source.
- Another result of scattered light is the _____ of the _____. Blue light is scattered _____ than other colors, so the sky appears blue.
- When the sun _____ Earth at an _____, light waves pass through more of the atmosphere. Only the long-wavelength _____ light _____ Earth.

What are some of the materials of technology?

- _____ has allowed people to change raw materials into modified materials.
- The modification and study of materials is the field of _____ **science**.
- Many materials _____ every day, such as plastic, polyester, and steel, were _____ by materials scientists.
- Materials are _____ into categories based on their _____.
- Classifications include _____, ceramics, _____, _____, composites, and exotic materials.
- _____ materials, such as _____, _____, and _____, are still used in technology applications.

Decisions, Decisions ...

How are materials chosen?

- Materials are _____ because of their _____.
- The characteristics of a material include the material's _____ and _____ properties.
- These properties _____ the way a material _____.
- _____ properties describe a material's _____ to take part in a chemical _____.

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- Some materials are chosen because they are _____ and don't take part in chemical reactions easily, such as stainless steel and some plastics.
 - Other materials are chosen because they do _____ chemically. For example, _____ is used in cleaners because it reacts with and dissolves grease.
 - _____ properties are the characteristics of a material that can be observed or measured without changing the material's composition.
 - Physical properties of materials include _____, _____ point, and _____.
 - Other physical properties include _____, the ability to let light pass through, and _____, the ability to carry _____ current.

What limits a material's use?

- Even though a material _____ be ideal for one reason, it could be a _____ choice for other reasons.
- A material may _____ be _____ for use in technology. Other materials may be more common and easier to obtain.
- When a material is _____ or difficult to make, it is usually _____. If a material is too expensive, an alternative should be found.
- Sometimes a material is too _____ to be widely used.

