Energy

Physical Science

Nature of Energy

Energy is all around you.

- You hear energy as sound, you see energy as light, you can feel energy in wind.
- Living organisms need energy for growth and movement.
- You use energy when you hit a tennis ball, compress a spring, or lift a grocery bag.
- **Energy is the ability to do work.**

Energy

- The energy released by a supernova is capable of destroying a nearby solar system in just a few hours. A supernova is one of the greatest concentrations of energy in the universe.
Forms of Energy

- Energy appears in many forms. There are five main forms of energy.
- Mechanical
- Heat
- Chemical
- Electromagnetic
- Nuclear

Mechanical Energy

Energy of motion.

**Examples:**
- Water in a waterfall
- Wind
- Moving vehicles
- Sound
- Blood traveling through your body

Heat Energy

- The internal motion of atoms.
- The faster the molecules move, the more heat energy is produced.

**Examples:**
- Friction
- Changes in state of matter
Chemical Energy

- Energy that exists in the bonds that hold atoms together.
- When bonds are broken, chemical energy is released.

Examples:
- Digesting food: bonds are broken to release energy for your body to store and use.
- Sports: your body uses energy stored in your muscles obtained from food.
- Fire—a chemical change.

Electromagnetic Energy

Moving electric charges.

Examples:
- Power lines carry electricity
- Electric motors are driven by electromagnetic energy
- Light is this form of energy (X-rays, radio waves, laser light etc.)

Nuclear Energy

- When the nucleus of an atom splits, nuclear energy is released.
- Nuclear energy is the most concentrated form of energy.
- Fission/fusion
Questions

• What is energy?
• Can energy be transferred from one object to another?
• What are the different forms of energy?

States of Energy

There are two states of energy:
Potential and Kinetic

Potential Energy

• Stored energy - energy of position.
• Not always mechanical energy - can be other forms.
• Gravitational Potential energy - dependent on height and weight.
  \[ GPE = \text{Weight} \times \text{Height} \]
• Units – Newton*meter
Kinetic Energy

- The energy of motion.
- The faster the object moves – the more kinetic energy.
- Kinetic energy depends on both mass and velocity.
- \( KE = \frac{1}{2}(\text{mass} \times \text{velocity}^2) \)
- \( \text{Kg m}^2/\text{s}^2 = \text{Newton} \cdot \text{meter} = \text{Joules} \)

Energy Conversions

- The most common energy conversion involves the changing of potential energy into kinetic energy or vice-versa.

Examples:
- Ball thrown in the air
- Roller coaster

More Conversions

- All forms of energy can be converted to other forms.
- Einstein - If matter is destroyed, energy is created, if energy is destroyed, matter is created. The total amount of mass and energy is conserved.
Concept Review

Writing Assignment

- Identify the various energy conversions involved in the following events:
  - An object is raised and then allowed to fall. As it hits the ground it stops, produces a sound and becomes warmer.
- Due tomorrow at the beginning of class.

Resources