Chapter 4.1: Forms of Energy
Energy exists in many forms.

Energy can be changed from one form to another.

Energy cannot be created or destroyed.
What is Always Present But Never Visible?

ENERGY

Although energy isn’t visible, you can detect evidence of energy.
Law of Conservation of Energy

- Energy can neither be created nor destroyed, but can be converted from one form to another.
With every transformation, some energy is converted to less useful forms. Energy conversions are not 100% efficient. The energy output for the intended purpose is rarely the same as the energy we put in.

100 J electricity in

95 J heat out

5 J light out
Different Forms of Energy

- Energy
  - Stored
    - Potential
    - Elastic
  - Electrical (In between)
  - In action
    - Sound
    - Kinetic
    - Thermal
    - Light
Eight Forms of Energy

- Kinetic
- Chemical
- Electrical
- Potential
- Heat/Thermal
- Nuclear
- Sound
- Light/Radiant
Potential Energy

This is also known as stored energy.
Potential Energy

There are 2 types of potential energy:

1) Gravitational Potential Energy
2) Elastic Potential Energy
1) Gravitational Potential Energy

Look at the picture below. What will happen to the professor?
The bucket will fall on the professor. This is called **Gravitational Potential Energy**.

Where did the energy come from?

There was energy in the bucket of water because it was lifted high up. The bucket of water falls because **GRAVITY** pulls it down.
2) Elastic Potential Energy

- The energy for the arrow to move came from the stretched bowstring. When the bowstring above was pulled and stretched, tension was created. Energy was present in the stretched bowstring.
Chemical Energy

- Energy released by a chemical reaction
- The food you eat contains chemical energy that is released when you digest your meal
- Wood, coal, gasoline, and natural gas are fuels that contain chemical energy
Nuclear Energy

- Energy contained in the nucleus of an atom
- Nuclear energy is released when nuclei are split apart into several pieces, or when they are combined to form a single, larger nucleus
Energy can be carried by electricity. When a lamp is switched on it gives off light energy. The electricity is transferring energy to the lamp.

• The same thing happens with all the electric appliances. We call energy transferred by electricity ELECTRICAL ENERGY.

• Lightning and static electricity are also forms of electrical energy.
Heat (Thermal) Energy

- Energy created by the motion of atoms and molecules that occurs within an object
- Thermal energy exists when you heat a pot of water on a stove
Kinetic Energy
Energy of a moving object
Light (Radiant) Energy

- Energy that can move through empty space
- The sun and stars are powerful sources of radiant energy
- The light given off by light bulbs and campfires are also forms of radiant energy
<table>
<thead>
<tr>
<th>What type of energy is being represented?</th>
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<tr>
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<td><img src="car" alt="Image" /></td>
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<td><img src="image" alt="Computer" /></td>
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<td><img src="image" alt="Airplane" /></td>
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Who would need more energy? Why?

- Manual worker vs. Office worker
- Boy vs. Girl
- Man vs. Woman
- Boy vs. Man
- Girl vs. Woman
- Footballer vs. Accountant
- Baby vs. Girl/Boy
- Woman/Man vs. Old woman/man
Energy Conversion

All forms of energy can be converted into other forms of energy
These forms of energy do work that end up as motion, light, or heat.

Energy is used to power manufacturing, light buildings, propel vehicles, and communicate messages.

What else do we use energy for?
Transferring Energy

- Look at the picture on the left. The picture shows a burning fire.
- What two types of energy is the fire giving off?
- Where did the energy come from?
In this case, we say that the energy was changed from chemical energy to thermal and light energy. We say that energy was transferred. This can be shown as an energy transfer diagram.

(starting energy)

Stored Energy

changes to

(final energy)

Energy in Action
Think of a light bulb

The electrical energy changes to light energy. This can be written as follows:

(starting energy) Stored Energy

changes to

(final energy) Energy in Action
Match each of these to the type of energy that it contains

- A mug of coffee: Heat energy
- A piece of coal: Chemical energy
- A squashed spring: Elastic energy
- A freewheeling bicycle: Kinetic energy
Heat as waste

- Whenever energy is transferred from ONE FORM to another, only part of the INPUT energy is usefully transferred as OUTPUT energy in the form that is wanted.

- The remainder is transferred in some non-useful way and is therefore WASTED ENERGY.

- In most cases the wasted energy is usually heat and so most energy chains end with heat.
What are the main energy transfers for a television?

- electrical
- light
- sound
- heat
What are the main energy transfers for a car engine?

chemical → kinetic
sound
heat
What are the main energy transfers for a radio?

- electrical
- sound
- heat
For example: A motor cycle is an energy changer because it changes chemical energy (stored energy) to kinetic and sound energy (energy in action). This can be written down as follows:

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CHEMICAL ENERGY
(starting energy)

MOTORCYCLE
(energy changer)

KINETIC AND SOUND ENERGY
(final energy)
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Energy Transfer Values

- Electrical energy: 100%
- Kinetic energy: 58% (Useful: spinning of the drill bit, Wasted: vibration of the drill)
- Heat energy: 20%
A microphone changes _______ energy to _________ energy.

A photosynthesizing plant changes ______ energy to __________ energy.
A climber climbing changes ____________ energy to ____________ ____________ energy and ____________ energy.

A skydive falling changes ____________ ____________ to ____________ energy.
A hair dryer changes __________ energy to __________ energy, __________ energy and __________ energy.

A burning candle changes __________ energy to __________ energy and __________ energy.
When a catapult is released it changes _______ energy to ____________
_________ energy and ____________ energy.

The Sun changes __________ energy to
________ energy and ______ energy.
A quacking duck changes ____________ to ___________ energy and ___________ energy.

A springboard changes ____________ energy to ___________ ___________ energy and ___________ energy.
<table>
<thead>
<tr>
<th>What is happening</th>
<th>Starting Energy</th>
<th>Finishing Energy</th>
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How is electricity produced?

Electricity is **generated** in power stations. Power stations need an energy resource, such as fossil fuels, nuclear fuels, or a **renewable resource**.

- In many power stations, fossil fuels are burnt. The energy is used to heat water and turn it to steam.

- The steam is forced through large fans, called **turbines**, making them turn around.

- The turbines turn **generators**. These are large magnets inside massive coils of wire. A moving magnet inside a coil of wire creates electricity (an **electric current**).

- The electricity flows along cables into the **National Grid**.