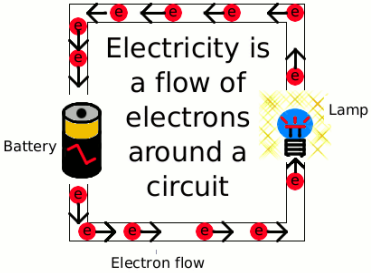
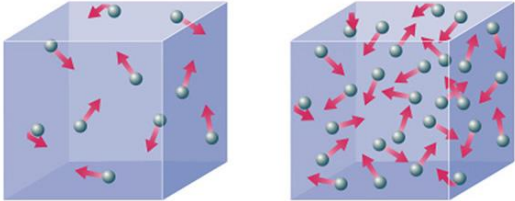


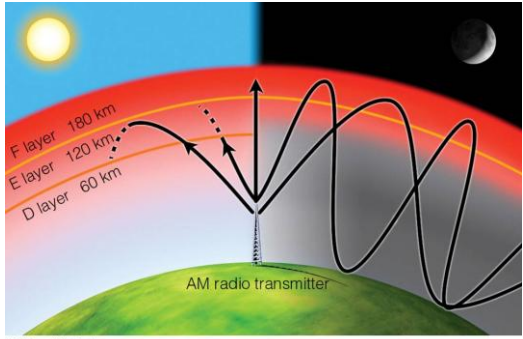
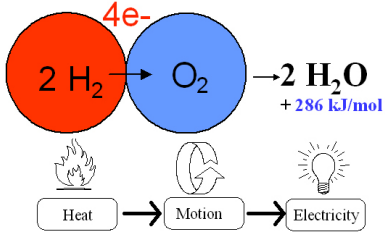

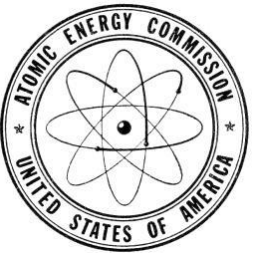
Energy: Its Forms, Conservation and Efficiency



1. What is energy?

2. Forms of Energy

Form	Description	Examples	How is work being done?
<p>Electrical</p>  <p>The diagram shows a rectangular circuit loop. On the left side is a battery. On the right side is a glowing lamp. Red arrows with the letter 'e' at their tails indicate the direction of electron flow: clockwise around the loop. Text inside the loop reads "Electricity is a flow of electrons around a circuit". Labels "Battery" and "Lamp" are placed next to their respective components. Below the loop, the text "Electron flow" is written.</p>	<p>Movement of electrons</p>	<p>Battery, power plant, generator</p>	<p>Electrons through magnetism can move mechanical parts or generate heat, light</p>
<p>Thermal</p>  <p>Two 3D cubes are shown. The left cube contains a few grey spheres (atoms/molecules) with red arrows pointing in various directions, representing low thermal energy. The right cube contains many more grey spheres with red arrows, representing high thermal energy.</p>	<p>Motion of atom and molecules releases heat</p>		

<p>Radiation energy</p>  <p>© 2007 Thomson Higher Education</p>	<p>Propagation (movement) of electromagnetic waves</p>		
<p>Chemical energy</p> 	<p>Stored in bonds</p>		
<p>Wind energy</p> 	<p>Results from the movement of air</p>		
<p>Nuclear energy</p> 	<p>Stored in the nucleus of atoms</p>		

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3. Conservation of Energy

Energy can be transformed from one form to another but cannot be destroyed or created.

Example 1: If a certain amount of water contains 150 kJ of energy, and it splits up into oxygen and hydrogen, which contain a total of 250 kJ, how much energy is required to electrolyze that same quantity of water?

4. Energy Efficiency

$$\% \text{ efficiency} = \frac{\text{useful energy}}{\text{total energy consumed}} \times 100\%$$

Example 1 A certain amount of gasoline with a total energy content of 1000 kJ is burnt, but only 120 kJ of it goes towards moving the car's wheels. 330 kJ are wasted through heat and pollution. What is the % efficiency of an automobile burning gasoline?

Example 2 A certain clock is 75% efficient. If it is provided with 0.10 kWh of energy, how much energy goes towards keeping time? How much energy is wasted? Where does the rest of the energy go?

5. **The Difference between Heat and Temperature**

Heat is a form of energy that depends on temperature and the total number of molecules at that temperature.

Temperature is related to how fast molecules are moving but does **not** depend on the number of molecules.

Example: Give an example of something with lots of heat but with a mild temperature. Also give an example of a high temperature object with a low heat content.

Exercises

1. Give examples for each of the following:
 - a) radiation energy=cell phone; radio; cable /satelliteTV
 - b) wind energy = wind turbines;
 - c) solar energy = solar calculator; solar tiles; solar panels
2. How do microwaves do work on the food? =they excite mostly water molecules, which then excite other food molecules, raising their temperature
3. If a cake contains 1000 kJ of energy, and 150kJ end up stored as fat in your body and 400 kJ ended up as heat, how much of the cake's energy went into movement and thinking etc.?

$$1000 = 150 + 400 + x$$

$$x = 1000 - 150 - 400 = 550 \text{ kJ}$$

4. A certain bike is 65% efficient. If it is provided with 600 kJ of energy, how much energy goes towards moving the wheels? How much energy is wasted? Where does the rest of the energy go?

$$0.65(600) = 390 \text{ kJ}$$

$$\text{Wasted} = 600 - 390 = 210 \text{ kJ lost as heat(friction)}$$

5. Calculate the % efficiency of a solar cell if it absorbs 2000 kJ of light energy and converts into 400 kJ of electrical energy.

$$400/2000 * 100\% = 20\%$$

6. Near Jupiter, the temperature of the thin gases from the planet Io's volcanoes is extremely high and yet the space probes that pass through the gases do not get damaged. Why is that?

The molecules are moving fast (high temp) but there are very few of them, lowering the total heat content.