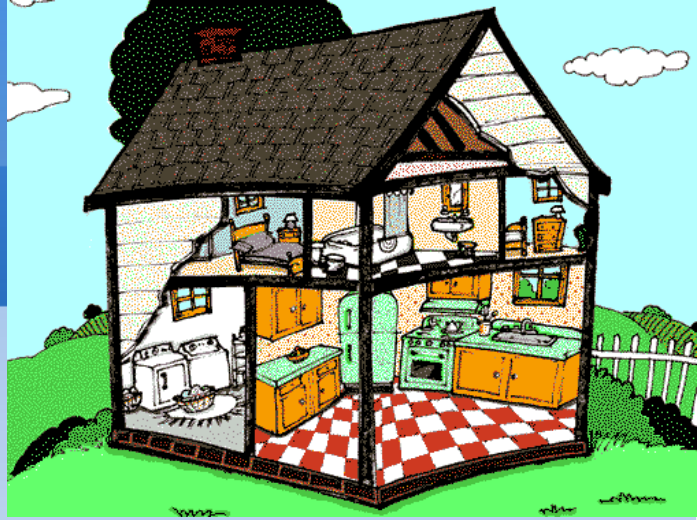


ENERGY LESSON

Manuel F. Lara Garrido

Date: 13/06/2006 Grade/Class/Subject: 4th ESO - Science

Unit/Theme: Energy Standards: 4th ESO

Para el curso DISEÑO DE MATERIALES DIDÁCTICOS EN CENTROS BILINGÜES

Prof. Dra. Ana María Ortega Cebreros

What is Energy?

Dictionary Definition - n., pl. -gies.

1. The capacity for work or vigorous activity; vigor; power. See synonyms at **strength**.
2.a. Exertion of vigor or power: a project requiring a great deal of time and energy.
2.b. Vitality and intensity of expression: a speech delivered with energy and emotion.
3.a.Usable heat or power: Each year Americans consume a high percentage of the world's energy.
3.b.A source of usable power, such as petroleum or coal.
4. Physics. The capacity of a physical system to do work.

[French *énergie*, from Late Latin *energīa*, from Greek *energeia*, from *energos*]

Physics: Concept of Energy

In physics, energy is the ability or capacity to do work or to produce change. The unit for energy is the **joule** (The International System unit of electrical, mechanical, and thermal energy; equals the work done by a force of 1 newton which acts over a distance of 1 metre in the direction of the force).

According to the language of physics, a person who strains without success to pull a rock out of the ground has done no work, whereas a child playing on a playground produces a great deal of work. Energy, which may be defined as the **ability of an object to do work**, is neither created nor destroyed; it simply changes form.

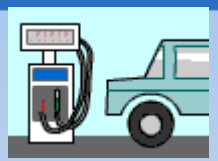
How does Energy work?

Energy is, as we said before**, the ability of "a thing" or "something" to do work**. Not only tangible objects (whether they be organic, mechanical, or electromagnetic) but also non-objects may possess energy. At the subatomic level, a particle with no mass may have energy. The same can be said of a magnetic force field.

One cannot touch a **force field**; hence, it is not an object—but obviously, it exists. All one has to do to prove its existence is to place a natural magnet, such as an iron nail, within the magnetic field. Assuming the force field is strong enough, the nail will move through space toward it—and thus the force field will have performed work on the nail.

Forms of energy

Chemical energy - stored in fuel, foods and batteries



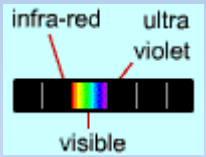
Elastic or strain energy - stored when something is lifted, or when something is stretched or squashed

Nuclear energy - stored in the nuclei of atoms

Gravitational energy

Other forms of energy

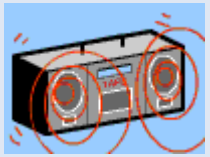
Radiant or light energy - including infra-red, and ultra-violet radiation. Energy in magnets and electromagnets



Kinetic energy - movement energy

Heat or thermal energy - also called thermal energy

Sound energy



Click **HERE**

Activity 1: Learning the types of Energy

You should be able to recognise the main types of energy. One way to remember the different types of energy is to learn this sentence:

M*ost* ***K****ids* ***H****ate* ***L****earning*
GCSE ***E****nergy* ***N****ames*

Each capital letter is the first letter in the name of a type of energy.

Type of energy

***M**ost **K**ids **H**ate **L**earning*
***GCSE E**nergy **N**ames*

If you remember that mnemonic it will be easy for you to remember these forms of Energy:

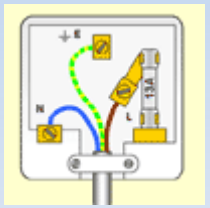
Magnetic or Electrical
Kinetic
Heat or thermal
Light
Gravitational potential
Chemical
Sound
Electrical
Elastic potential
Nuclear

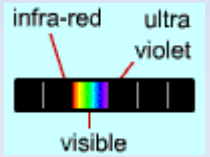
Activity 2

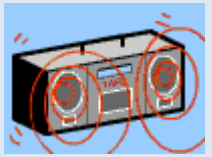
What kind of Energies are these? Match names to the pictures

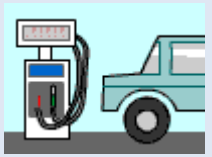
Kinetic
Heat
Light
Gravitational potential
Chemical
Sound
Elastic potential
Nuclear
Electric









Energy Efficiency

Energy efficiency is the amount of useful energy you get from a system. A perfect, energy-efficient machine would change all the energy put in it into useful work—an impossible dream. Converting one form of energy into another form always involves a loss of usable energy.

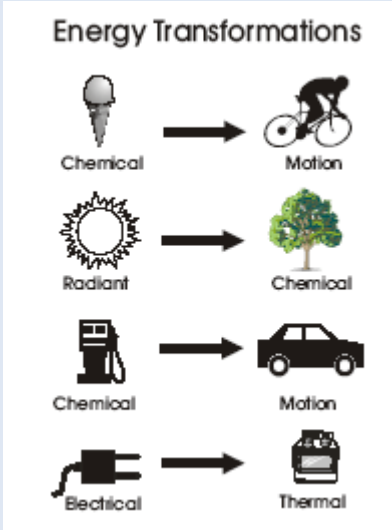
In fact, most energy transformations are not very efficient. The human body is a good example.

Your body is like a machine, and the fuel for your machine is food. Food gives you the energy to move, breathe, and think. But your body isn't very efficient at converting food into useful work. Your body is less than five percent efficient most of the time. The rest of the energy is lost as heat. You can really feel that heat when you exercise!

Conservation of energy

To scientists, **conservation of energy** is not saving energy. The law of conservation of energy says that energy is neither created nor destroyed. When we use energy, it doesn't disappear. We change it from one form of energy into another.

A car engine burns gasoline, converting the chemical energy in gasoline into mechanical energy. Solar cells change radiant energy into electrical energy. Energy changes form, but the total amount of energy in the universe stays the same. Scientists at the american Department of Energy think they have discovered a mysterious new form of energy called "**dark energy**" that is actually causing the universe to grow!



Energy Transfer: Energy inputs and outputs

Think about some facts about
energy transfer

What is the result of the football player throwing a ball?

The result is that the ball gets faster - it's gained some kinetic energy.

Energy Transfer: Energy inputs and outputs

What did the football player give to the ball?

He gave the ball some of the energy from his food.

Energy Transfer: Energy inputs and outputs

Energy Input

Chemical Energy from food

Energy Output

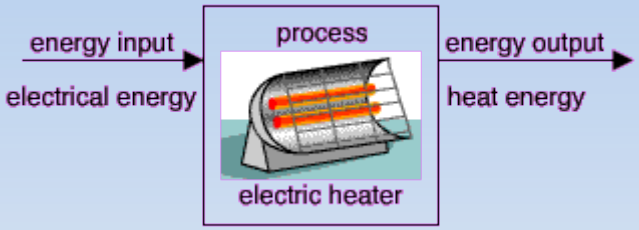
Kinetic Energy of ball

Energy Transfer: Energy inputs and outputs

- You need energy to do a job. We call this the **energy input**.
- When the job is done, energy appears in a new form. This is called the **energy output**.
- You can't make energy out of nothing - so you can't get more energy out than you put in.
- You can't use up energy or make it disappear. The output energy is sometimes in a form like heat or sound that you can't use again very easily. It's still there however.

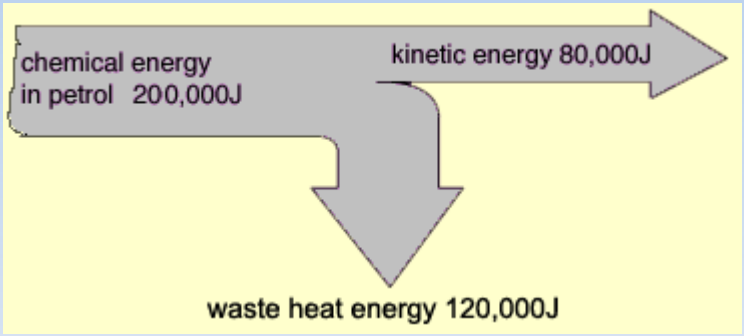
Energy Transfer: Energy inputs and outputs

Energy transfer diagrams help show this:



Another kind of diagram shows energy changes. Take for example what happens in a car as it burns petrol. It's called a Sankey diagram. Look at where the energy goes.

Energy Transfer: Energy inputs and outputs



A Sankey diagram for a car. Amounts of energy are per second.

Go on learning:

Types of Energy Transfers

Activity 3: Show and Tell Energy Transformations

Assign 2-3 students to bring an object to show and tell. Ask the rest of the class to write about the object. A student might bring in a flashlight and describe energy transformation. (Chemical energy from the battery to light energy from the bulb) Extension: student needs to describe the role of heat energy in the flashlight.

Have a look to this document:

How Does Heat Energy Move?

Activity 4: Test your knowledge on energy transfer and efficiency

Test:

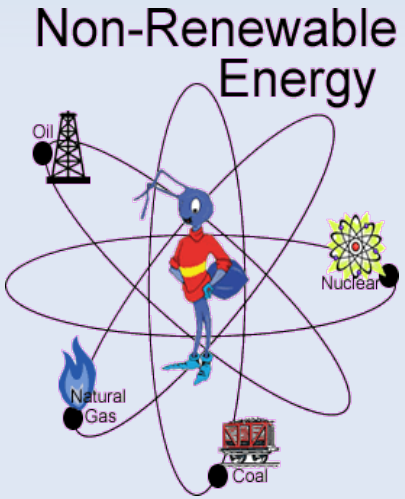
Energy transfer and efficiency

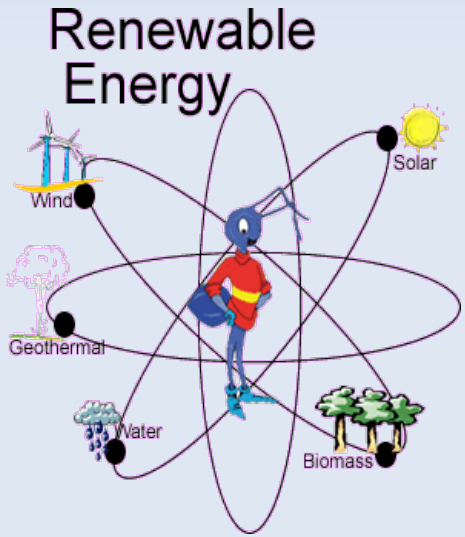
Energy Resources: Non-Renewable & Renewable Energy

We use many different energy sources to do work for us. Energy sources are classified into two groups—**renewable** and **non-renewable**. Renewable and non-reneable energy can be converted into secondary energy sources like electricity and hydrogen.

Energy Resources: Non-Renewable & Renewable Energy

Renewable energy sources include **biomass**, **geothermal** energy, **hydropower**, **solar** energy, and **wind** energy. They are called renewable energy sources because they are replenished in a short time. Day after day, the sun shines, the wind blows, and the rivers flow. We use renewable energy sources mainly to make electricity.





Energy Resources: Non-Renewable & Renewable Energy

Go on Learning:

Energy Sources

Non-Renewable Energy Sources

Alternative Energy Sources

Energy Resources

In Spain, most of our energy comes from non-renewable energy sources. Coal, petroleum, natural gas, propane, and uranium are non-renewable energy sources. They are used to make electricity, to heat our homes, to move our cars, and to manufacture all kinds of products.

These energy sources are called non-renewable because their supplies are limited. Petroleum, for example, was formed millions of years ago from the remains of ancient sea plants and animals. We can’t make more petroleum in a short time.

Energy Resources

Electricity and **hydrogen** are different from the other energy sources because they are **secondary sources of energy**. Secondary sources of energy—energy carriers— are used to store, move, and deliver energy in easily usable form. We have to use another energy source to make electricity or hydrogen. In the In Europe, coal is the number one energy source for generating electricity. Today the cheapest way to get hydrogen is by separating it from natural gas, a non-renewable energy source. Hydrogen can also be separated from water and from renewables but hydrogen made from these sources is currently too expensive to compete with other fuels. Scientists are working on ways to make hydrogen from water and renewables more affordable.

Energy Resources

When you use **petrol**, **gas**, **coal**... basically anything you burn to produce heat and then turn this energy into electricity of mechanical energy (a car engine) you are using a **raw material** that is not gonna be replaced. In fact petrol, gas, coal (in mines) takes million of years to be naturally produced.

When you are burning wood (from trees), the tree grows again... eventually if you let it do so. This energy can be "kind of renewable" as long as you plant another tree in order to replace the one you cut.

Wind mills, **Sollar cells** or **Turbines** in the sea take their energy from wind, solar heat, and the attraction from the moon on the sea. There are based on **"natural" energy**. This energy will be available as long as our planet exists.

Activity 5: Test your knowledge on Energy Resources

Energy Resources

Go on learning: Some more games & activities

Coloring & Activity Book for Kids - LIHEAP

Energy Quest: Games & Puzzles

Lesson Plans | Rolling Balls: Mass and Kinetic ...

edHelper.com – Energy Theme Unit