

Unit 1: Energy

In this unit we are going to study...

1. What is energy?

- ✓ **How energy is measured**

2. Types of energy

3. Energy sources

4. Temperature and Heat energy

- ✓ **Conductors and insulators**
- ✓ **How heat is transmitted**

<http://www.eia.doe.gov/kids/energyfacts/science/formsofenergy.html>

1. WHAT IS ENERGY?

We can prove that we constantly use energy throughout the day. We need energy to power various objects such as a car, make breakfast, turn on a light, etc.

People use energy to live. People use energy to breathe, to play, to think, to grow... People gain energy from food.

We can't touch energy, we can't see energy but we can feel its effects.

A light bulb turns on thanks to electric energy.

Food supplies the energy that human beings need to live.

A car moves because of the energy supplied by petrol, etc.

<i>Energy is the capacity of all objects or people to produce changes.</i>
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1.1 How is energy measured?

- *Energy is the capacity of all objects or people to produce changes.*
- Energy is a property of matter and we can measure it.
- Energy is measured in **Joules**.

- We use **calories** to measure the energy in food

All foods contain different amounts of calories . We can see it on most food packets. The more calories that food contains, the larger amount of energy provided.

TALKING ABOUT CALORIES

FOODS	CALORIES
glass of milk	129
chocolate milk	156
cheese sandwich	450
cheeseburger	320
toast with butter and jam	300
bollycao	361
muffin (Magdalena)	146
soft drink	150
bag of popcorn	190
biscuit (galleta Maria)	34

slice of pizza	420
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MODEL 1

How many calories are there in a/an _____?
There are _____ calories.

For example:

How many calories are there in a glass of milk?
 There are one hundred twenty-nine calories.

MODEL 2

How many calories do a/an _____ and a/an _____ add up to?
(¿Cuántas calorías suman un/a _____ y un/a _____?)
They add up to _____ calories.
(Suman _____ calorías.)

For example:

1. Glass of milk + cheese sandwich =579

How many calories do a a glass of milk and a cheese sandwich add up to?
 They add up to 579 calories.

2. Soft drink + cheeseburger =

3. Bag of popcorn + soft drink =

4. Bollycao + chocolate milk =

5. Biscuit + toast with butter and jam + glass of milk =

INVESTIGATING CALORIES

How many calories do the following foods have?

Suggestion: look at:

<http://www.thedailyplate.com/nutrition-calories/food>

1. Gum with sugar
2. Gum without sugar
3. Lollipop (piruela)
4. Chupa chups
5. Pack of Haribo gummy worms (paquete de gusanitos)
6. Licorice whip (regaliz)
7. 1 fried egg
8. Coke (330ml)
9. Diet Coke (330ml)
10. Sprite (330ml)
11. Fanta (330ml)
12. Redbull
13. Aquarius/Gatorade (500ml)

2. Energy forms

Energy is classified into the following groups:

- **Electric energy.** Electric energy is The energy associated with electric charges and their movements Electric energy is the most used form of energy.
- **Kinetic energy.** Kinetic energy is the form of energy associated with any movement.
- **Chemical energy.** Chemical energy is the form of energy stored in food or fuel (petrol etc).
- **Heat energy.** Energy that come from bodies of heat.
- **Light energy.**Light energy is the form of energy that is produced by bodies of light such as the sun or a light bulb.

ACTIVITIES

1. What is energy?
2. Give 4 examples of energy that we use during the day.
3. In what unit do we measure energy?
4. Why is food important to human beings?
5. Write the types of food that you usually have for breakfast and calculate the total number of calories it provides. You can look on the packets of food to see how many calories there are!

TALKING ABOUT ENERGY

TYPES OF ENERGY

- Electric energy
- Kinetic energy
- Chemical energy

- Heat energy
- Light energy

MODEL 1: THE VERB: USE (OBJECTS)

What type of energy is consumed when you use a/an _____?

When I use a/an _____, _____ energy is consumed.

1. LIGHT BULB (bombilla)
2. HEATER (estufa)
3. VACUUM (aspiradora)
4. HAIR DRYER (secador de pelo)
5. HAIR STRAIGHTENER (plancha de pelo)
6. MOBILE BATTERY (batería del móvil)
7. PLAYSTATION
8. CAR

For example:

What type of energy is consumed when you use a LIGHT BULB?

When I use a LIGHT BULB, ELECTRIC energy is consumed.

MODEL 2: OTHER VERBS (RIDE, CONNECT, READ, ETC)

What type of energy is consumed when you _____ a/an _____?

When I _____ a/an _____, _____ energy is consumed.

Repeat the dialogue as in the example below:

1. RUN
2. EAT (SANDWICH, OREOS)
3. RIDE (BIKE, TRAIN, PLANE, MOTORCYCLE)
4. DRINK (SOFT DRINK, TEA, COFFEE)
5. READ (BOOK, MAGAZINE)
6. HAVE A SHOWER WITH HOT WATER
7. DEFROST A CAKE (descongelar una tarta)
8. GROW A PLANT

For example:

What type of energy is consumed when you EAT a SANDWICH?

When I EAT a SANDWICH, CHEMICAL energy is consumed.

3. ENERGY SOURCES

An energy source is anything from that we can obtain energy

We can classify energy sources into two groups:

1. Renewable energy sources.
2. Non-renewable energy sources.

1. Sources of renewable energy

- Renewable sources of energy are those that can not *run out* (acabarse) even if they are used.
- They do not contaminate.

- Examples of renewable energies are: solar power (from the sun), hydroelectric (from water), windpower (from wind)

2. Sources of non renewable energy

- Non-renewable sources of energy are those that can *run out* (acabarse) and are not able to renew (renovarse) themselves.
- They contaminate.
- Examples of non renewable energies are: petroleum, coal, natural gas...

ACTIVITIES

1. What is an energy source?

2. True or False

Renewable sources of energy are those than can run out.

Hydro power is a renewable energy source.

Renewable energy sources do not contaminate.

Wind power contaminates.

Petrol is a non-renewable energy source.

TALKING ABOUT ENERGY SOURCES
NON-RENEWABLE ENERGY SOURCES

	ADVANTAGES	DISADVANTAGES	USES
COAL	<ul style="list-style-type: none"> • The most abundant fossil fuel • Easy and cheap to convert into energy 	<ul style="list-style-type: none"> • Extraction can be dangerous • Pollution: combustion produces carbon dioxide emissions 	<ul style="list-style-type: none"> • Production of: electricity, heat, steel (acero)
OIL	<ul style="list-style-type: none"> • Produces more heat than coal • Easy to extract • Easier to extract than coal • Easy to transport 	<ul style="list-style-type: none"> • Resources are limited • Extraction and transformation can harm (hacer daño) the environment • Pollution: produces carbon dioxide emissions 	<ul style="list-style-type: none"> • Production of: electricity, automobile fuel, heat, chemicals such as fertilizers, plastics, etc.
GAS	<ul style="list-style-type: none"> • Clean • Cleaner than coal and oil • Easy to transport in pipelines (tuberías) 	<ul style="list-style-type: none"> • Requires extensive processing • Very toxic • Leaks (escapes) can cause explosions 	<ul style="list-style-type: none"> • Production of: electricity, heat (for homes), automobile fuel
URANIUM	<ul style="list-style-type: none"> • <i>Small amounts of</i> (pequeñas cantidades de) uranium produce <i>large amounts of</i> (grandes cantidades de) energy • It does not pollute the atmosphere 	<ul style="list-style-type: none"> • Generates highly contaminating (altamente contaminante) nuclear waste (residuo) • An accident can produce dangerous radioactive substances 	<ul style="list-style-type: none"> • Production of: electricity, heat

SOME RENEWABLE ENERGY SOURCES

	ADVANTAGES	DISADVANTAGES	USES
BIOMASS	<ul style="list-style-type: none"> • Unlimited source of energy • Produces very little contaminating waste, mainly biodegradable • Less contaminating than fossil fuels 	<ul style="list-style-type: none"> • Low efficiency • Large volume makes <i>handling</i> (manejo) and transportation difficult 	<ul style="list-style-type: none"> • Provides heat, electricity and gases such as ethanol
Hydroelectric	<ul style="list-style-type: none"> • Unlimited source of energy • Low usage and maintenance costs • Clean energy source • Helps to control <i>flooding</i> (inundaciones) • Provides water to agricultural areas during dry seasons 	<ul style="list-style-type: none"> • High transportation costs • Dependent on weather conditions • Negative environmental impact • Risk of dam breakage and potential flooding 	<ul style="list-style-type: none"> • Production of heat, electricity for homes and industry
SOLAR POWER	<ul style="list-style-type: none"> • Unlimited source of energy • Low maintenance cost • Clean energy source 	<ul style="list-style-type: none"> • Availability affected by latitude, seasons, cloudiness, etc. • Requires large area to collect 	<ul style="list-style-type: none"> • Production of heat • Transformed directly into electricity
WIND POWER	<ul style="list-style-type: none"> • Unlimited source of energy • Low installation and mainenance costs • Clean energy source • High efficiency 	<ul style="list-style-type: none"> • Wind is intermittent and inconsistent • Difficult to store • Requires large areas • Wind turbines are loud • Interefers with radars, 	<ul style="list-style-type: none"> • Transformed directly into electricity

		televisions and radio • Danger to birds	
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TALKING ABOUT ENERGY SOURCES: ??????????????

NON-RENEWABLE ENERGY SOURCES or RENEWABLE ENERGY SOURCES

MODEL 1:

What's _____?
 It 's a _____

Example 1:

- What's COAL?
- It's a NON-RENEWABLE ENERGY SOURCE

Example 2:

- What's BIOMASS ?
- It's a RENEWABLE ENERGY SOURCE

Now talk to your partner and ask about:

1. Coal
2. Oil
3. Gas
4. Uranium
5. Biomass
6. Hydroelectric
7. Solar power
8. Wind power

And now, complete this table:

	Contaminating	Not contaminating	Easy to extract	Difficult to extract	Limited source of energy	Unlimited source of energy	Toxic	Clean	Easy to transport	Difficult to transport	Cheap, low maintenance cost	Expensive, high maintenance cost	Dangerous for nature	Safe for nature
Coal														
Oil														
Gas														
Uranium														
Biomass														
Hydroelectric														
Solar power														
Wind power														

Make sentences as in the example:

For example

- ON ONE HAND coal is contaminating. ON THE OTHER HAND solar power is ecological.

Colocar los ejemplos concretos.

4. Heat energy and temperature

Heat energy is what is transmitted between two bodies when they are at a certain temperature.

Temperature indicates the amount of heat a body has. To measure heat energy we use a thermometer. Units of heat energy are represented by degrees centigrade (°C).

When we are ill and the thermometer reads 39°C, we can say that we have a high temperature. A glass of water in the fridge that has a temperature of 4°C is said to have a low temperature.

For example, if we have a hot bowl of soup and we pour cold water into it, the temperature of the soup will be lower.

4.1 Conductors and insulators

Meter el texto traducido del libro adaptado

TALKING ABOUT CONDUCTORS AND INSULATORS

Material	Conductor	Insulator
Iron	X	
Steel	X	
Copper	X	
Gold	X	
Water	X	
Plastic		X
Glass		X
Leather		X
Diamond		X
Rock		X
Cotton		X
Coal		X
Paper		X
Wool		X
Wood		X
Cement		X
Chalk		X

Salt		X
Oil		X
Alcohol		X

1.

<p>Is _____ a conductor? Yes it is / No it is not</p> <p>Is _____ an insulator? Yes it is / No it is not</p>
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Examples

Is iron a conductor?
Yes it is

Is water an insulator?
No it is not

2.

_____ is an insulator while _____ is a conductor.

Example: Wool is an insulator while copper is a conductor.

3.

<p>Why is _____ a conductor? _____ is a conductor because it easily transmits heat.</p> <p>Why is _____ an insulator? _____ is an insulator because it does not easily transmit heat.</p>

Examples:

Why is gold a conductor?
Gold is a conductor because it easily transmits heat.

Why is chalk an insulator?
Chalk is an insulator because it does not easily transmit heat.

THE TEMPERATURE

The Fahrenheit Scale

The Fahrenheit scale was invented in the early 1700s by G. Daniel Fahrenheit.



The start of the scale is at 0° F which is the temperature of a mixture of equal parts of water, ice and salt.

212 °F is the top of the scale which is the boiling point of water.

So the Fahrenheit scale has 212 degrees in it!

The Celsius Scale

The Celsius scale was invented in 1742 by Anders Celsius



The start of the scale is at 0° C which is the temperature of the freezing point of water.

100° C is the top of the scale which is the boiling point of water.

So the Celsius scale has just 100 degrees in it!

Useful Temperatures To Know

Fahrenheit		Celsius
212° F	Boiling Point of Water	100° C
99° F		37° C
77F	Human Body Temperature	25C
32F	A Nice Day	0C
	Freezing Point of Water	

Celsius is a scale that is easier to use and easier to measure

Talking about temperature

Temperature is measured in degrees Celsius and degrees Fahrenheit.

City	°C	°F
Seville	35	
Moscow		10
Rome	26	
London		63
Paris	19	
The sun	6000	
The moon	-233	
Volcano		2282
The North Pole	-68	

1. What is the temperature in °C in _____? The temperature in _____ is _____ °C.
What is the temperature in °F in _____? The temperature in _____ is _____ °F.

Example:

What is the temperature in °C in Moscow? The temperature in Moscow is -12 °C.

What is the temperature in °F in Seville? The temperature in Seville is 95°F.

Page to convert scales of temperatures:

<http://www.stabb.com/tools/convert.html>

Equation to convert temperatures:

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MAKING THINGS????

Let's build a thermal tank

Materials – Pieces of polystyrene, plastic bags, plastic bottle

Instructions

1. Cut the polystyrene into small balls.
2. Put the palls into the plastic bag.
3. Fill the plastic bottle with liquid.
4. Put the plastic bottle inside the plastic bag surrounded by polystyrene.

Draw the steps:

Step 1:	Step 2:	Step 3:	Step 4:

Testing water temperature

1. Fill two bottles with liquid that are the heated at same temperature.
2. Place one bottle inside the thermal tank and the other on the side.
3. Record the time taken for each bottle to cool.

Bottle	Time to cool
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Bottle inside tank			
Property	Magnitude	Unit	Symbol
Bottle inside tank	Volume	Cubic metro	m ³
Inertia	Mass	Kilogram	kg
Interaction	Force	Newton	N
Corpuscular structure	Amount of Substance	Mol	Mol

GENERAL PROPERTIES OF MATTER

LET'S TALK TECHNICAL!

MODEL 1

- A) What is the magnitude of _____?
 B) The magnitude of _____ is _____.

MODEL 2

- A) What is the unit used for _____?
 B) The unit used for _____ is _____.

MODEL 3

- A) What is the symbol of _____?
 B) The symbol of _____ is _____.

1. Practice orally
2. Write examples using each model

MODEL 1

MODEL 2

MODEL 3
