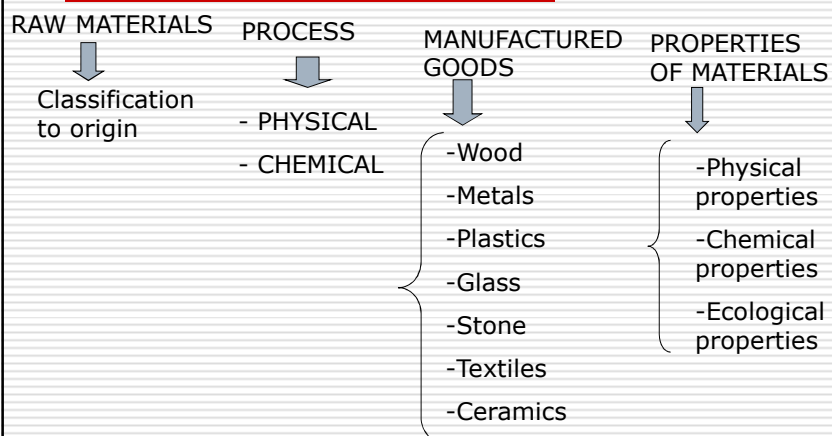


MATERIALS

UNIT 3
IES MIGUEL ESPINOSA
1º ESO BILINGUAL

UNIT 3: MATERIALS



Actividad:

- Busca al menos tres ejemplos de cada tipo de material manufacturado, indicando cual es su origen.
 - Ejemplo:
 - Madera: mesa, cucharón y marco de cuadro. Origen: los árboles.
-

1. RAW MATERIALS

- Raw materials are substances that are extracted directly from natural objects.
- Classification of raw material according to their origin:
 - **Animal origin:** wool, silk, *hides*...
 - **Vegetable origin:** paper, wood, linen, *cork*, latex...
 - **Mineral origin:** marble, iron, clay...

Hide: the skin of an animal processed to be used to make clothes

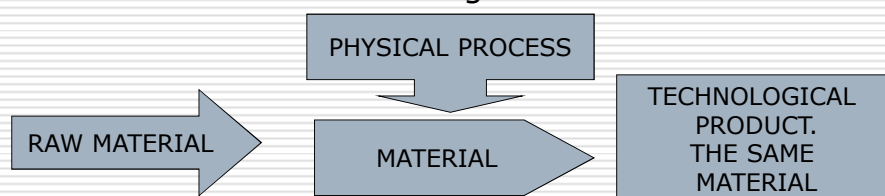
Cork: Cork is a soft, light substance which forms the bark of a type of Mediterranean tree

2. PROCESS

- Raw materials are transformed by physical processes and chemical processes into the various types of materials.
 - Then, they are ready to be used for making different products.
-

2. PROCESS

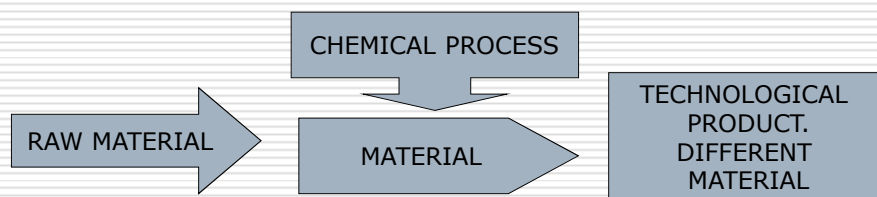
- The **physical processes** are when a substance change its state, for example, when a *metal melts*. The chemical composition of the material doesn't change.



melts: When a solid substance melts or when you melt it, it changes to a liquid, usually because it has been heated

2. PROCESS

- The **chemical processes** are when a substance is transformed into a different substance with different characteristics. For example, petrol derivatives are transformed to create some types of plastic.



3. MANUFACTURED GOODS

- A book, a chair, a table, a desk, a computer, a pen and a sweater are all manufactured goods.
 - A **manufactured good** is any object created by humans to satisfy their needs and improve their standard of living.
-

3. MANUFACTURED GOODS

□ TECHNICAL MATERIALS

Common materials used to make manufactured goods:

- Wood
 - Metals
 - Ceramics
 - Plastics
 - Textiles
 - Stones
 - Glass
-

3. MANUFACTURED GOODS

□ THE MANUFACTURING PROCESS:

1. Get raw materials from nature.
 2. Process them to make materials.
 3. Make goods with these materials.
-

3. MANUFACTURED GOODS

MATERIAL	SOURCE AND CHARACTERISTICS	USES
WOOD	TREE TRUNKS. E.G. FIR, PINE AND CHESTNUT.	-FURNITURE -FLOORS -PAPER MANUFACTURING -CONSTRUCTION MATERIALS -WALL PANELLING -DECORATIVE OBJECTS -TOOL HANDLES.

3. MANUFACTURED GOODS

MATERIAL	SOURCE AND CHARACTERISTICS	USES
METALS	FROM MINERAL WHICH ARE FOUND IN ROCKS. CLASSIFICATION: -FERROUS METAL, WHICH CONTAINS IRON (STEEL). -NON-FERROUS METALS, WHICH DON'T CONTAIN IRON (COPPER, BRONZE, TIN, ZINC AND ALUMINIUM)	-STRUCTURAL COMPONENTS - MACHINE PARTS - TOOLS - ELECTRICAL COMPONENTS - FASTENERS.

3. MANUFACTURED GOODS

MATERIAL	SOURCE AND CHARACTERISTICS	USES
PLASTICS	OIL, COAL, NATURAL GAS, VEGETABLE MATERIALS (CELLULOSE) AND ANIMAL PROTEINS, MADE INTO CELLOPHANE, PVC AND RUBBER.	<ul style="list-style-type: none"> -TUBING -PACKAGING -TOYS -CONTAINERS -OUTER COVERLING OF ELECTRICAL CABLES

3. MANUFACTURED GOODS

MATERIAL	SOURCE AND CHARACTERISTICS	USES
TEXTILES	NATURAL RAW MATERIALS (vegetal, animal or mineral) OR SYNTHETIC TEXTILES (petroleum)	-THREAD FOR MAKING TEXTILES WITH DIFFERENT USES.

3. MANUFACTURED GOODS

MATERIAL	SOURCE AND CHARACTERISTICS	USES
STONE	STONE IN DIFFERENT FORMS AND SIZES (FROM LARGE ROCKS TO FINE SAND) PROCESSED INTO MARBLE, SLATE, GLASS AND PLASTER.	<ul style="list-style-type: none"> -CONSTRUCTION MATERIALS -DECORATIVE OBJECTS AND SCULPTURE

3. MANUFACTURED GOODS

MATERIAL	SOURCE AND CHARACTERISTICS	USES
CERAMICS	CLAY (TRANSFORMED INTO CERAMIC BY USING A PROCESS CALLED FIRING). MADE INTO POTTERY, EARTHWARE AND PORCELAIN.	<ul style="list-style-type: none"> -CONSTRUCTION (BRICKS, ROOFING TILES) -PLATES AND BOWLS -SINKS -DECORATIVE OBJECTS.

3. MANUFACTURED GOODS

MATERIAL	SOURCE AND CHARACTERISTICS	USES
GLASS	FIRING A SPECIAL KIND OF SAND.	-GLASS -WINDOWS -SOME FURNITURE -SCREENS

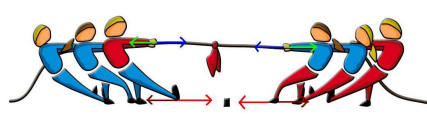
4. PROPERTIES OF MATERIALS

- We use different materials in different ways depending on their properties.
 - Properties are the characteristics of materials, and we can evaluate them according to how materials react to external stimuli.
-

4. PROPERTIES OF MATERIALS

4.1. Physical properties

Related to how materials react to external stimuli,
e.g. electricity,
light,
heat
or the applying of various forces.



4. PROPERTIES OF MATERIALS

a) Electrical properties

What happens when an electric current is passed through a material?

- Electrical conductivity: some materials conduct electricity. E.g. metals.
- Electrical insulation: some materials don't conduct electricity. E.g. plastic materials and wood.



4. PROPERTIES OF MATERIALS

b) Thermal properties

What happens when a material is heated?

Thermal properties	Characteristics	Examples
Thermal conductivity	<ul style="list-style-type: none"> - Thermal conductors are materials that conduct heat. - Thermal insulators are materials that don't conduct heat 	<ul style="list-style-type: none"> - Thermal conductors: metals - Thermal insulators: Wood and plastic




4. PROPERTIES OF MATERIALS

Thermal properties	Characteristics	Examples
Expansion and contraction	<ul style="list-style-type: none"> - When the temperature increases, the material expands. (<i>dilatación</i>) - When the temperature decreases, the material contracts. (<i>contracción</i>) 	Metals are specially sensitive to expansion and contraction.



4. PROPERTIES OF MATERIALS

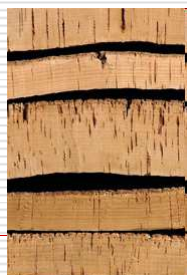
Thermal properties	Characteristics	Examples
Fusibility	-Some materials change from solid to liquid when their temperature is increased.	Metals, some plastics and glass.
Welding	Some materials can be used to weld two pieces of the same materials or different materials together	Metals. 

4. PROPERTIES OF MATERIALS

c) Acoustic properties

Can you hear sound through a material?

- **Acoustic conductivity:** the capacity of the material to transmit sound.
- **Acoustic insulation:** some materials don't conduct sound well, e.g. glass, fibre, cork and plastics.



4. PROPERTIES OF MATERIALS

d) Magnetic properties

Does a material react to magnet?

- **Magnetism:** some materials attract other metallic materials; iron has this property. This allows it to become a permanent magnet. It attracts other ferrous materials, such as steel.



4. PROPERTIES OF MATERIALS

e) Optical properties

Can you see light through a material?

Optical properties	Opaque	Translucent	Transparent
Characteristics	Can't see through them. Don't allow light to pass through them.	Allow light to pass through them. Don't allow objects behind them to be seen clearly.	Other objects can clearly be seen through them. Allow light to pass.
Examples:	Wood and metals	Some type of glass, tissue paper and plastic.	Glass and some plastics.

4. PROPERTIES OF MATERIALS

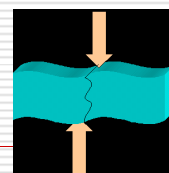
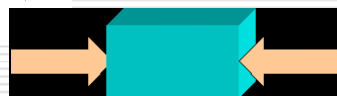
f) Mechanical properties

What happens to a material when external forces are applied?

- **Mechanical strength:** depends on the type of force that acts upon the material.

Types of strength:

- Tensile strength
- Compressive strength
- Flexural strength
- Torsional strength
- Shear strength



Shear: esquilar

4. PROPERTIES OF MATERIALS

Tensile strength: TRACCIÓN.

Un par de fuerzas en la misma dirección y sentido contrario tienden a alargar el material.

Ejemplos:

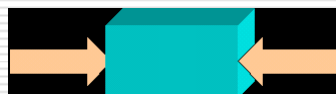


4. PROPERTIES OF MATERIALS

Compressive strength: COMPRESIÓN.

Un par de fuerzas en la misma dirección y sentido contrario tienden a acortar la longitud del material o a comprimirlo.

Ejemplos:



4. PROPERTIES OF MATERIALS

Flexural strength: FLEXIÓN

Una fuerza aplicada en un elemento situado entre dos apoyos tiende a doblar la pieza.

Ejemplos:



4. PROPERTIES OF MATERIALS

Torsional strength: TORSIÓN

Un par de momentos o movimientos de giro en ambas caras del material y de sentido contrario tienden a escurrir o retorcer una cara con respecto de la otra.

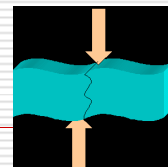


4. PROPERTIES OF MATERIALS

Shear strength: CORTADURA o CIZALLA

Un par de fuerzas en la misma dirección y sentido contrario tienden a desplazar una cara del material con respecto de la otra, provocando el corte de la misma.

Ejemplos:



Shear: esquilar

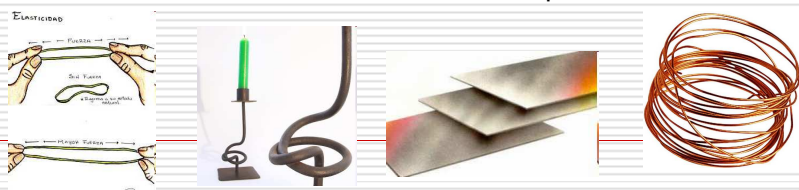
4. PROPERTIES OF MATERIALS

- Elasticity and plasticity:

- a) **Elasticity.** Allows the material to return to its original form after a force that changed its shape is removed.
- b) **Plasticity.** Allows it to be permanently deformed.

- Malleability and ductility:

- a) **Malleability:** allows a material to be **spread** into **sheets** or films. Malleable materials: metals and plastics
- b) **Ductility:** allows a material to be formed into filaments, or wires. Ductile materials: metals and plastics.



4. PROPERTIES OF MATERIALS

- Hardness:

A hard material is not easily scratched by another material.

Scratch: to make a mark on the surface of something.

Mohs scale of mineral: from talc to diamond.

- Toughness and brittleness:

Toughness is the resistance to breaking that a material shows when hit by something.

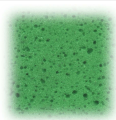
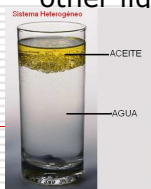
Brittleness is the opposite, when the material breaks easily.



4. PROPERTIES OF MATERIALS

- Other properties:

- a) **Density:** the relationship between the mass and its volume. Related to its weight.
- b) **Porosity:** some materials can absorb or release (emit, expel) liquids or gases. A porous material, as wood, contain tiny holes called pores. This property is related to density.
- c) **Permeability:** some materials allow water or other liquids to filter through them.
- d) **Impermeability:** some materials don't allow water or other liquids to filter through them. *Waterproof.*



4. PROPERTIES OF MATERIALS

4.2. Chemical properties

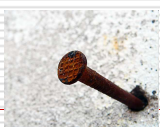
We can see this properties when the chemical composition of a material changes because it interacts with other substances.

- Oxidation:

When a mineral reacts with oxygen in the air or water. Metals are the most sensitive materials to oxidation.

Rust: The reddish-brown substance produced.

To prevent rusting materials are coated with paint, varnish or enamel.



Enamel: Esmalte.

Stainless steel.

4. PROPERTIES OF MATERIALS

4.3. Ecological properties

The environment is a system made up of human beings, flora, fauna, earth, air, climate and landscape which all interact.



4. PROPERTIES OF MATERIALS

Materials are classified according to the impact they have on the environment:

	Characteristics	Examples
Recyclable materials	Can be reused. Help to conserve natural resources and avoid the accumulation of waste products.	Glass Paper Cardboard Metal Plastic
Toxic materials	Harmful to the environment. Can be poisonous for living things because they contaminate the soil, the water and the atmosphere.	Mercury Heavy metals Petroleum
Biodegradable materials	They decompose naturally and don't cause damage to the environment.	Paper Water-soluble plastics.

4. PROPERTIES OF MATERIALS

Some materials come from **renewable raw materials**.

The raw materials can be regenerated.

- **Renewable raw materials:**

Wool, cotton and wood.

- **Non-renewable materials:**

Coal, oil and minerals.

