

New Materials

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UAB



TED Master's Degree, 2011

**Student's
book**

Acknowledgements

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Introduction to the New Materials teaching unit

This unit is about New Materials. We live in an artificial world. At the end of the teaching unit, you will be able to look at an object and identify some types of materials it is made of. You will be able to explain the origin of some of these materials, some of their properties, some applications, and the social and environmental repercussions of using some of these materials.

This unit is divided into seven sessions. We have designed six units of content in the following order:

- ① History of materials
- ② Necessities and ambitions of the Modern World
- ③ Properties of materials
- ④ Classification of materials
- ⑤ Earth's limited resources
- ⑥ Environmental impacts

The last session of the teaching unit will be devoted to the written exam. You will also have to present your PPT presentations about objects and materials.

Your sitting arrangement

You will be seated in groups of 4 according to what professor Jill Simon thinks it will work better. In this teaching unit there will be times where you will have to work in pairs and also with your groups of 4.

Assessment

You will be assessed taking into account the following 3 items:

Participation or attitude: 10% of your mark

Procedure (Homework assignments & PPT oral presentations): 50% of your mark

Written exam: 40% of your mark

PowerPoints

Each session (except for session 3) is explained using a PowerPoint presentation. You can find these 5 PPTs in the "PPTs used in class to explain content" section in the Teacher's book.

Session-by-session overview

Session	Activities	Interaction	Skills	ICT	Comments
1 <i>History of materials</i>	Task 1: Word search and possible ways of surviving	S-S			
	Task 2: Reading Comprehension	Ss-Ss			
	Task 3: Quiz	S			
	HW: Task 1: Completing a chart	S			
	HW: Task 2: Matching names and definitions	S			
2 <i>Necessities and ambitions of the Modern World</i>	Task 1: Video to present materials around us	T-Ss			
	Task 2: Warmer for PPT (materials around us)	Ss-Ss			
	PPT presentation of content	T-Ss			
	Task 3. Jigsaw Task	Ss-Ss	 		
	Task 4. Quiz	S			
3 <i>Properties of materials</i>	Task 1: Listening activity	Ss-Ss			
	Card game (physical and Chemical properties)	Ss-Ss			
	Task 2: Matching properties, antonyms and definitions	Ss-Ss			
	Task 3: Define properties	Ss-Ss			
	HW: Task 1: Matching columns to create sentences	S			
4 <i>Classification of materials</i>	PPT Presentation	T-Ss			
	Task 1: match lists on the different type of materials	S-S			
	Task 2. Writing about metals	S-S			
	Task 3: Mind map of metals	S-S			
	HW: Task 1: Writing on the disadvantages of using plastic	S	 		
	HW: Task 2: Collaborative Mind map on materials and properties	Ss-Ss		✓	Ss create a mind map of materials around us using Webspirationclassroom.com
5 <i>Earth's limited resources</i>	PPT Earth's limited resources	T-Ss			
	Task 1: Report on the video	S-S	 		
	Task 2: Report on the video	S-S	 		
	Task 3: Quiz	S			
	HW: Task 1: Watching a video on paper production	S	 		
6 <i>Environmental impacts</i>	PPT presentation on Environmental Impacts	T-Ss	 		
	Task 1: Paper production	S-S	 		
	Task 2: Waste Management	S-S	 		
7 <i>Final Project + Unit Test</i>	PPT oral presentations	Ss-Ss	 		Peer assessment with rubric
	Unit test	S			

Type of tasks

Symbols we use in order to help students know what type of activity they will do.

- 1** Individual
- 2** Pair- work
- 4** Group- work
- L** Listening
- W** Writing
- R** Reading
- V** Video
- ICT** Using ICT



History of materials

W

2

Task 1

Look for the materials you could find in the island:

a	d	w	o	o	d	f	g	h	e
e	r	d	s	e	o	f	i	o	d
s	i	i	l	h	n	l	p	q	d
g	r	c	t	r	u	b	b	e	r
l	e	a	t	h	e	r	w	v	g
w	s	t	o	n	e	v	n	c	e
v	f	r	d	s	w	x	t	y	u
a	z	d	l	a	t	e	x	e	u
f	g	t	y	h	b	v	n	k	i
f	i	b	r	e	s	a	f	j	m

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

W

2

Now that you know the name of the materials in the island, imagine you are in the situation shown in the video, what materials would you do to survive?

1. I would use _____

2. _____

3. _____

4. _____

Task 2: Paleolithic (250.000 - 10.000 BC)

Anthropologists define the civilization in relation to the materials that different cultures used. The records they left are used by anthropologists to see the human development.



Image 1: Flint

As a result of being more intelligent, the volume of the brain increased and humans were capable of creating better tools.

150.000 years ago, Homo Sapiens started using pigments to represent hunting scenes in cave painting. This fact shows the high level of cultural sophistication and the knowledge of the environment.

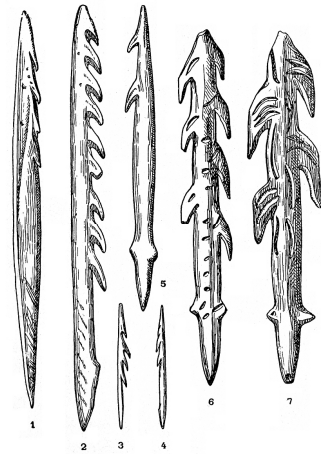


Image 2: Tools

Neolithic (8.000- 2.000 BC)



Image 3: Copper

This period is very important because humans started using bronze to create weapons and tools. Bronze is obtained through the extraction of copper and tin. Once you have the two metals, you have to melt them and then you have bronze.

The production of bronze required moving big quantities of soil and cutting down trees to obtain charcoal to melt the copper and the tin.

Another important discovery was the use of ceramics. It allowed the storage of food, the construction of houses and big buildings and the possibility of boiling legumes.

New Materials

Besides, producing *pottery* was very difficult and a long process, for this reason, humans created the *pottery wheel*; a wheel that made the process of creating pottery easier and faster.

Another relevant discovery was *iron*, a metal that was more resistant than bronze and that allowed the production of *arrows*, *swords*, *ploughs*, etc. All this progress contributed to the growth of the population and the creation of bigger cities and empires.



Image 4: Pottery

Glossary

Flint: Sílex
Bipedy: bipedisme
Cave painting: Pintures rupestres
Weapons: Armes
Charcoal: carbó vegetal
Pottery: Terrissa
Copper: Coure

Tin: Estany
Soil: Terra, sorra
Pottery wheel: Torn
Iron: Ferro
Arrow: Fletxa
Sword: Espasa
Plough: Arada

Task 2: Industrial Revolution (AD 1750 – 1900)

In Britain a series of technical and scientific discoveries changed forever traditional trades and customs. This period is known as the Industrial Revolution.

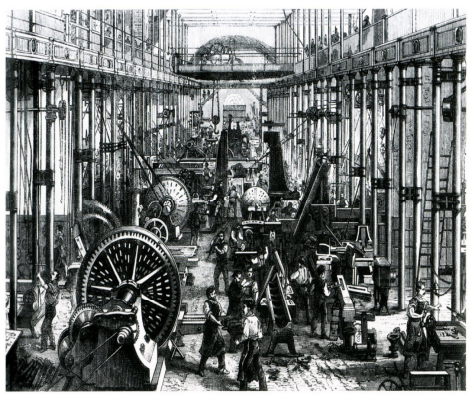


Image 5: Industrial warehouse

It was a transition from manual labour to the use of machines. Machines were now powered by *steam* instead of water, so factories could be placed anywhere, not just next to a river. Soon country people went to work in the cities. The new cities were full of people who needed to buy everything. This meant new housing, new clothing, new furniture and new transportation.

The major change in the metal industries during the era of the Industrial Revolution was the replacement of organic fuels based on **wood** with fossil *fuel* based on **coal**. The use of **coke** as fuel was key in the production of **steel** and **iron**.

New materials favoured the development of communications. The introduction of canals and railways and the improvement of roads expanded trade. The large scale production of chemicals was an important development during this period.

It was the beginning of the industrial and commercial world we know today.



Image 6: Workers going to the factory

The Modern World (AD 1900 - today)



Image 7: Aluminium

During the 20th century the economical growth and the technical and scientific discoveries resulted in new needs.

Aluminium is the most abundant metal in the Earth's crust. Its use was made extensive during the 20th

New Materials

century. It is *light*, and malleable, which makes a material ideal to work with. After steel, aluminium has become the most used metal. It is vital to the aerospace industry and very important in other areas of transportation and building.

The invention of **plastic** in the 19th century and its extensive use after the Second World War has forever changed the way we live. Thousands of scientists and



Image 8: Plastic objects

engineers worked for over a century trying to substitute old materials and meet new needs. Today the raw materials needed to make most plastics come from petroleum. This is an important *drawback* as plastics depend on petrol availability.

Nanotechnology is the manipulation of *matter* at an atomic scale. Using nanotechnology we can control atoms and create materials with unique properties. With nanotechnology we can arrange atoms in a way that they do not normally occur in nature. We can have materials 'a la carte'.

Glossary

Coal: Carbó
Coke: Carbó de coque
Iron: Ferro
Fuel: Combustible
Steam: Vapor
Steel: Acer

Trade: Comerç
Drawback: Inconvenient
Light: Lleuger
Matter: Matèria

Task 2: What can you say about the history of materials?

Answer the following questions with the help of your classmates:

1. What did the use of tools contribute to?

.....

2. What did they use to represent hunting scenes?

.....

3. What is flint?

.....

4. Why was the discovery of ceramics that important?

.....

5. Which was the material that contributed to the growth of the population?

.....

6. What type of material was mainly used as fuel during the Industrial Revolution?

.....

7. What types of metal were massively produced during the Industrial Revolution?

.....

8. Why is aluminium such an ideal material to work with?

.....

9. What is the raw material of plastic?

.....

10. What can you do with nanotechnology?

.....

Task 3: Quiz on the history of materials

History of materials	TRUE	FALSE
1. Food contributed to the development of the brain.		
2. Pigments were used to represent hunting scenes.		
3. Flint is a type of stone used to create tools.		
4. Ceramics were only used for decoration.		
5. Iron allowed the creation of bigger cities.		
6. During the Industrial Revolution, coal was replaced with wood.		
7. Steel has become the most used metal.		
8. Aluminium, the most abundant metal in the Earth's crust, is a heavy metal.		
9. Plastics were extensively used before the Second World War.		
10. Using nanotechnology we can manipulate atoms and create materials that do not normally occur in nature.		

Homework

- W** **1** Fill in the chart to make a chronological line. Fill in the motivation column with the words you will find below (you don't have to use all of them):

Coincidence
Basic
Consumerism
Boredom
Mistake
needs
Fun

Motivation for the discovery of new materials	Age/Historical Moment	Relevant materials	Applications
Basic needs			
	Neolithic		
		Coke, steel, iron	
			Aerospace industry, transportation, buildings, films, materials 'a la carte'

Homework

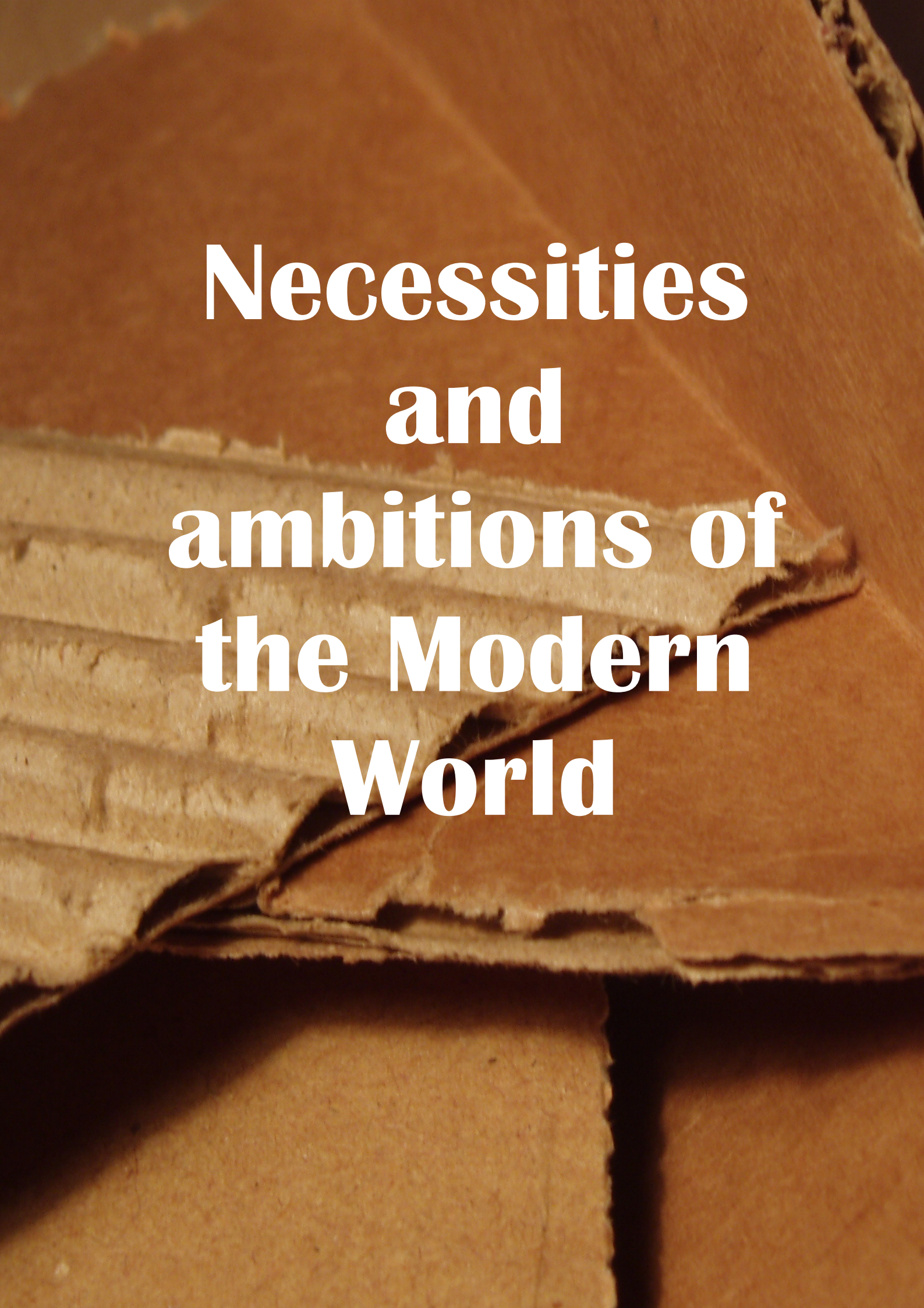
W

1

Match each definition with its material:

A	Wood
B	Flint
C	Copper
D	Iron
E	Concrete
F	Steel
G	Bronze
H	Aluminium

	A hard strong building material made by mixing a cementing material, sand and water.
	A silver-white malleable, magnetic, heavy and metallic element that easily rusts in moist air.
A	The hard fibrous substance that constitutes the greater part of the stems, branches, and roots of trees.
	A massive hard dark quartz that produces a spark when struck by steel.
	A metal alloy consisting primarily of copper and tin.
	A silvery white chemical element found combined in many different minerals, mainly in the bauxite ore. It is very resistant to corrosion.
	A common reddish metallic element that is ductile and malleable and is one of the best conductors of heat and electricity.
	An alloy that consists mostly of iron and has carbon content. With increased carbon content, it can be made harder and stronger than iron, but less ductile.



Necessities and ambitions of the Modern World

V

Watch the following video:

<http://www.youtube.com/watch?v=QBndaE56Rao>

W

2

Task 1

Now that you have watched the video, let's go back and see if you begin the day in a similar way... Did you use all those objects this morning?



Image 9: Friends

Rachel was peacefully sleeping in her bed made of wood, with a foam mattress under the cotton sheets and the duvet made of synthetic feathers. Then a man starts singing while he is tying his tie made of silk. Does your dad have any of those ties? Rachel, who is wearing a polyester pyjama, opens the window made of glass and then leaves the room and starts shouting at two friends. They are having breakfast in their ceramic mugs by using a stainless steel spoon and reading the newspaper that is made of paper.

Glossary

Mattress: You sleep on it

Sheets: You use them to cover you when you are sleeping

Duvet: Thick blanket made of feathers

Tie: Men wear it around the neck when they wear smart clothes.

Mugs: What you use to drink a coffee.

Tick the materials you have used in the morning and add any other material you have used:

wood	<input type="checkbox"/>	ceramic	<input type="checkbox"/>
foam	<input type="checkbox"/>	stainless steel	<input type="checkbox"/>
cotton	<input type="checkbox"/>	paper	<input type="checkbox"/>
synthetic feathers	<input type="checkbox"/>		<input type="checkbox"/>
silk	<input type="checkbox"/>		<input type="checkbox"/>
polyester	<input type="checkbox"/>		<input type="checkbox"/>
glass	<input type="checkbox"/>		<input type="checkbox"/>

W

2

Task 2

In pairs, think of 2 objects made of the following types of materials and write them down. Each box is a type of material. Can you think of the name? An example is given for you.

aluminium

copper

stainless steel

porcelain

clay

concrete

Cotton

Nylon

PET (polyethylene terephthalate)

Polycarbonate (PC)

Polymers

R 2 Task 3: JIGSAW TASK

Read and remember as much information as possible because you will have to explain everything to your team:

Medicine

Nowadays, cardiac surgery uses new techniques capable of repairing different problems of the heart.

"Arteriosclerosis" is an illness in which arteries *harden* and cholesterol gets deposited inside them.

The arteries become inelastic and *narrow*, and for this reason, the stress on the heart increases as it tries to *pump* more blood.

In the hospital, doctors introduce a *folded net* called "stent" made of **nickel** and **titanium**. This net has the property of shape memory; consequently, once the stent is introduced into the coronary artery, a balloon inflates it and then, it retakes its original form and makes the diameter of the artery bigger.

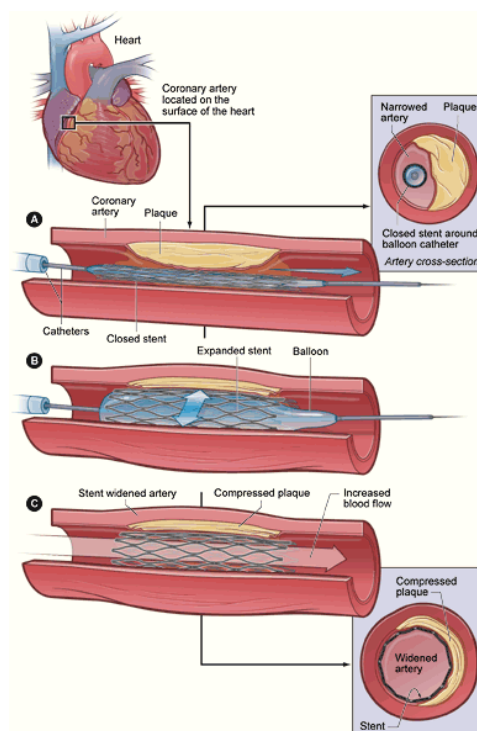


Image 10

Glossary

Surgery: cirurgia
Harden: endurir-se
Narrow: estret

Pump: bombejar
Folded: doblegat
Net: xarxa

Task 3: JIGSAW TASK

Read and remember as much information as possible because you will have to explain everything to your team:

Construction

The construction of buildings has changed a lot during the last decades.

The materials used in the construction of houses and infrastructures are basically *reinforced concrete* and *steel*. Both materials have been improved and now are more resistant and *last* longer.

Moreover, nowadays, new materials are being used because they respond to different needs and also because they are not heavy. These new materials are *carbon fibre*, organic *polymers* and *glass*.

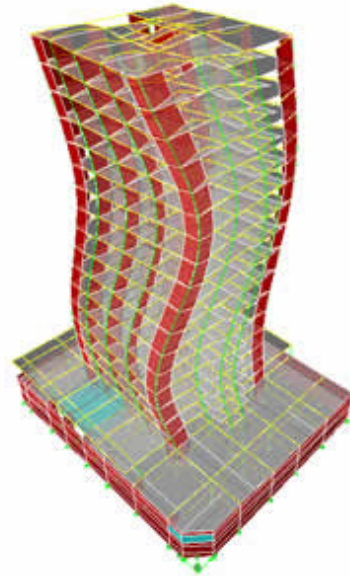


Image 11

The use of these new materials allows architects and engineers to design buildings that are able to resist earthquakes. They are frequently used in Japan because it is located in one of the most earthquake- *prone* regions in the world.

Glossary

Reinforced concrete: formigó armat

Steel: acer

Last: dura

Carbon fibre: fibra de carboni

Prone: propens

Task 4: Quiz on the uses of new materials

Tick **TRUE** or **FALSE** according to what you have learnt. If you know the correct answer, write it down:

Uses of new materials	TRUE	FALSE
1. The use of new materials allows overcoming illnesses such as "Arteriosclerosis".		
2. The materials used in the construction of houses are mostly reinforced concrete and steel.		
3. Medicine does not use materials with shape memory.		
4. New materials used in construction allow buildings to resist earthquakes.		
5. "Stents" are made of aluminium.		
6. Shape memory is a property of some materials.		
7. Carbon fibre is a very heavy material.		
8. New materials used in construction are more resistant.		



Properties of materials

L 2 Task 1

Before listening to the following video (1:32) on **fog-free glass** (http://www.sciencedaily.com/videos/2006/0112-fogfree_glass.htm), fill in the missing words to get familiar with the vocabulary you will hear:

Droplet: A tiny drop

Coating: A thin layer that covers something

Scatter: To disperse

Moisture: Condensed liquid that makes something wet

Nanopores: Tiny pores

1. It can happen anywhere where _____ condenses on a cool surface.
2. When they condense they are just the right size to _____ light.
3. Materials chemist, Michael Rubner, created a polymer _____, made from different materials that transform the opaque _____ of water into a transparent sheet.
4. We're forming what we call _____. The pores are so small that you can't see them with your eyes.

Next, tick the box that best summarizes the information from the video you just heard:

☐

Fog is caused when moisture condenses on a cool surface and then forms miniscule water droplets. A new polymer coating attracts droplets into nanopores and transforms them into a transparent sheet, improving vision. This solution can have many applications in everyday life but it is also interesting in the military field.

☐

Foggy windows and lenses are a nuisance, and in the case of aircrafts windows, can pose a driving hazard. Now, a group of scientists at the Massachusetts Institute of Technology (MIT) may have found a permanent solution to the problem. The team has developed a unique polymer coating — made of silica nanoparticles — that they say can create surfaces that never fog.

Match the properties with their antonyms, definition and translation:

Properties	Antonym	Definition of the antonym	Translation
Hardness	Softness		
Brittleness			Fragilitat/ Tenacitat
Elasticity			
Solubility		It is the ability of being impossible to be dissolved	

Antonym

Softness
Plasticity
Insolubility
Toughness

Definition of the antonym

The ability of a material to change its shape (permanent deformation) without breaking after the stress is removed.

It is the ability of a material to withstand blows without breaking. Ex.: wood

~~It is the ability of being impossible to be dissolved~~

It is the opposite of hardness. Easily deformed as a result of thermal stresses. Ex. Polymers, wood.

W

2

Task 3

Now that you have seen how to define the properties of materials, define the following concepts in relation to what you have seen in the card game.

1. Hardness

.....

2. Brittleness

.....

3. Elasticity

.....

4. Solubility

.....

Homework

1

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Connect the 4 columns and create sentences:

A material that	conducts electricity	is	a thermal conductor
	recovers its original size after deformation		dense
	degrades as a consequence of a chemical reaction with the environment		an electrical conductor
	has a great amount of mass per unit of volume		recyclable
	conducts heat		soluble
	burns easily		elastic
	dissolves in a given substance		corrosive
	is attracted by a magnet		ferromagnetic
	breaks easily		flammable
	can be reprocessed		brittle



Classification of materials

W 2 Task 1

After the PPT presentation on the Classification of Materials, you should be able to say a few things on the different types of materials. In pairs, match the following lists. Number 1 is done for you:

1	The main properties of metals are		are those composed by the combination of simple materials.
2	Composite materials		brittle and hard.
3	Metals are mixed		amber, natural rubber, cellulose, etc.
4	Ceramics materials are	1	ductility, high electrical and thermal conductivity.
5	Natural polymers include		to form alloys in order to make another metal with particular properties (steel, for example).
6	Synthetic polymers include		neoprene, PVC, polyethylene, silicone, etc.
7	Thermoplastics polymers		are those based on synthetic polymers. The four main types are nylon, polyester, acrylic and polyamide.
8	Thermoset polymers		is used to create most semiconductors. Its use in computer chips meant a revolutionary advance in the high-tech industry.
9	Synthetic fibres		can be heated and shaped many times.
10	Silicon		can only be heated and shaped once.

W

2

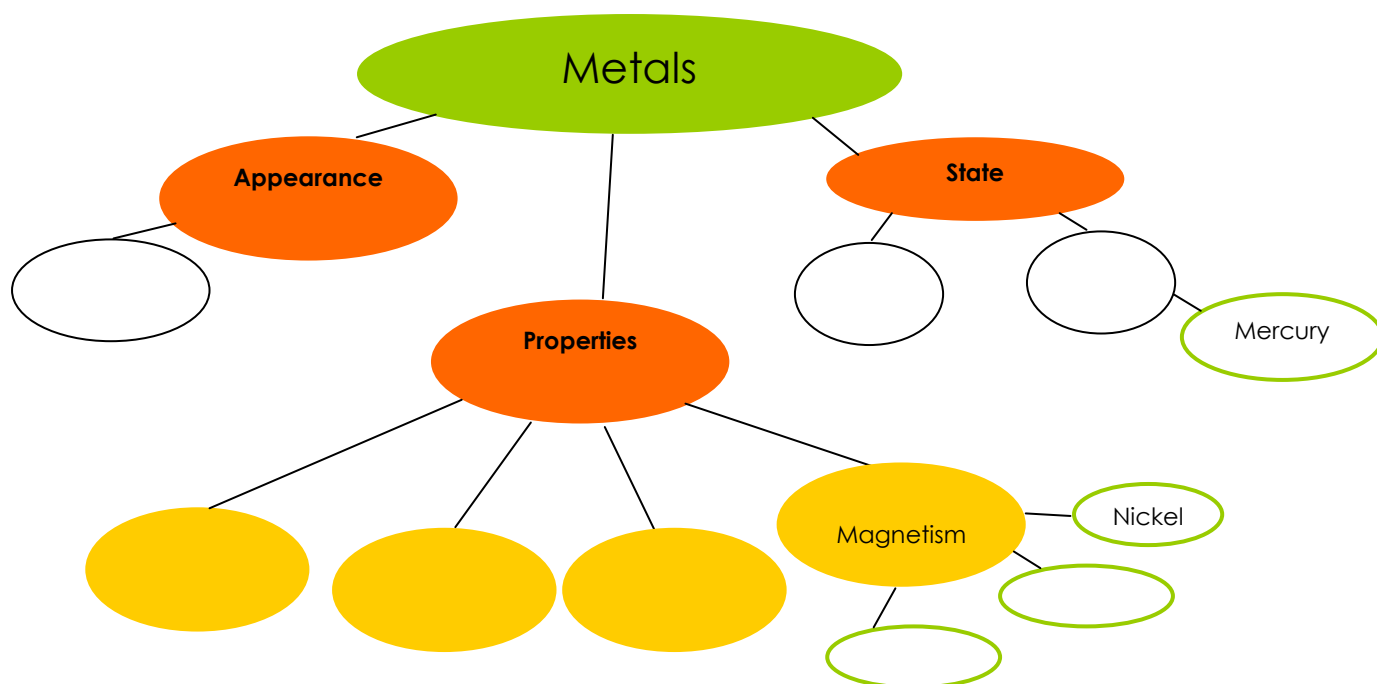
Task 2

After listening to the PPT presentation on properties and metals, what can you say about metals? Think of 4 properties at least.

Metals _____

W 2 Task 3

Complete the following mind map with the information given:



Magnetism

Density (heavy for their size)

Shiny or lustrous

Solid

Ductility (easily deformed without fracture)

Conductivity of heat and electricity

Mercury

Iron

Nickel

Cobalt

Liquid

1

W

Homework

Carol is a 16 year-old student studying the use of plastics in modern manufacturing. After having researched the topic, she has written the following essay on the advantages of using conventional plastics derived from oil. Read her essay and answer the comprehension questions below.

Plastics are forever!

The many different types of plastics offer a broad range of properties. It is all about choosing the right type of plastic for a particular product based on requirements concerning hardness, rigidity, impact-resistance, insulating capacity with regard to electricity or cold/heat, weight, etc. **For this reason, we can state that** plastic can meet any requirement.

Moreover, plastic is an economical material as it well suited to mass production, e.g. through injection-molding, extrusion or blow-molding.

Researchers point out that the amount of energy consumed during the manufacture of plastic is low **compared with** many other materials. **In other words**, plastic saves resources - replacing heavy materials in cars, trains, ships and aircraft with lighter plastic components saves fuel. Much plastic waste is collected and recycled for use in new plastic products. Plastic which is not recycled can be incinerated, without any environmental problems for most plastics. Therefore, we can state that plastic has environmental advantages.

In my opinion, plastic is a very versatile material, often chosen in preference to other materials. For instance, in the car industry, plastic components are increasingly being used to replace metal.

Say whether the following statements are true or false according to Carol's essay:

	TRUE	FALSE
Plastics can only have a very limited set of properties.		
Plastic is a cheap material as it can be massively produced.		
Plastic is environment friendly, as it helps saving resources.		
Plastic waste cannot be recycled.		

Now, using the following phrase bank to connect sentences, answer Carol's essay with the **disadvantages** of using plastic (you can use Carol's essay as a model). Finish your essay with an opinion about our dependance on plastics. (120 words aprox.)

Phrase Bank	
<p>Beginning a composition</p> <p>To begin with,</p> <p>Firstly,</p> <p>Adding information</p> <p>Apart from this/that,</p> <p>Furthermore,</p> <p>Besides,</p> <p>Moreover,</p> <p>In addition to ...,</p> <p>Rephrasing</p> <p>In other words,</p> <p>That is to say,</p> <p>Stating facts</p> <p>Researchers point out that ...</p> <p>Some studies have highlighted that ...</p> <p>We can state that ...</p>	<p>Contrasting facts</p> <p>While xxx, it...</p> <p>Compared with...</p> <p>Stating your opinion</p> <p>In my opinion,</p> <p>I think that,</p> <p>As far as I am concerned,</p> <p>I believe that...</p> <p>It seems reasonable that...</p> <p>Personally,</p> <p>Ending a composition</p> <p>In conclusion,</p> <p>To sum up,</p>

You can use the following writing plan to guide your thoughts. Do not forget to write a catchy title!

Writing Plan

Paragraph 1: Plastic packaging, environmental and health costs. Some advantages, but accumulation of wasted plastic

Paragraph 2: durable materials, do not degrade, stay forever in landfills, not easy to be recycled.

Paragraph 3: manufacture of plastics involves chemicals, toxic impact on humans, migration of toxic substances into food, not enough tested, potential risk to health, some type of PVC is banned in Europe, not in America.

Paragraph 4: In my opinion, ...

Title:

Homework



Collaborative mind map "Properties of the types of materials"

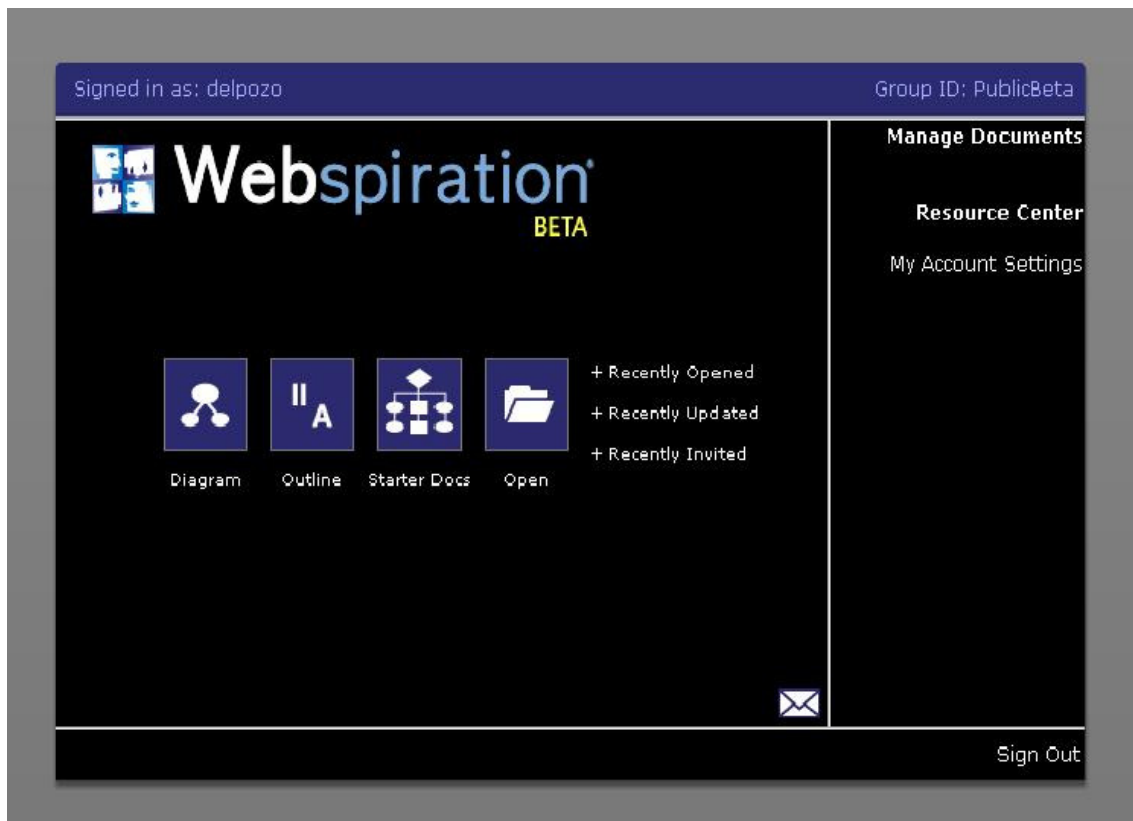
How are you going to do this task?

1. You will receive an invitation to join the following webpage:

<http://www.mywebspiration.com>

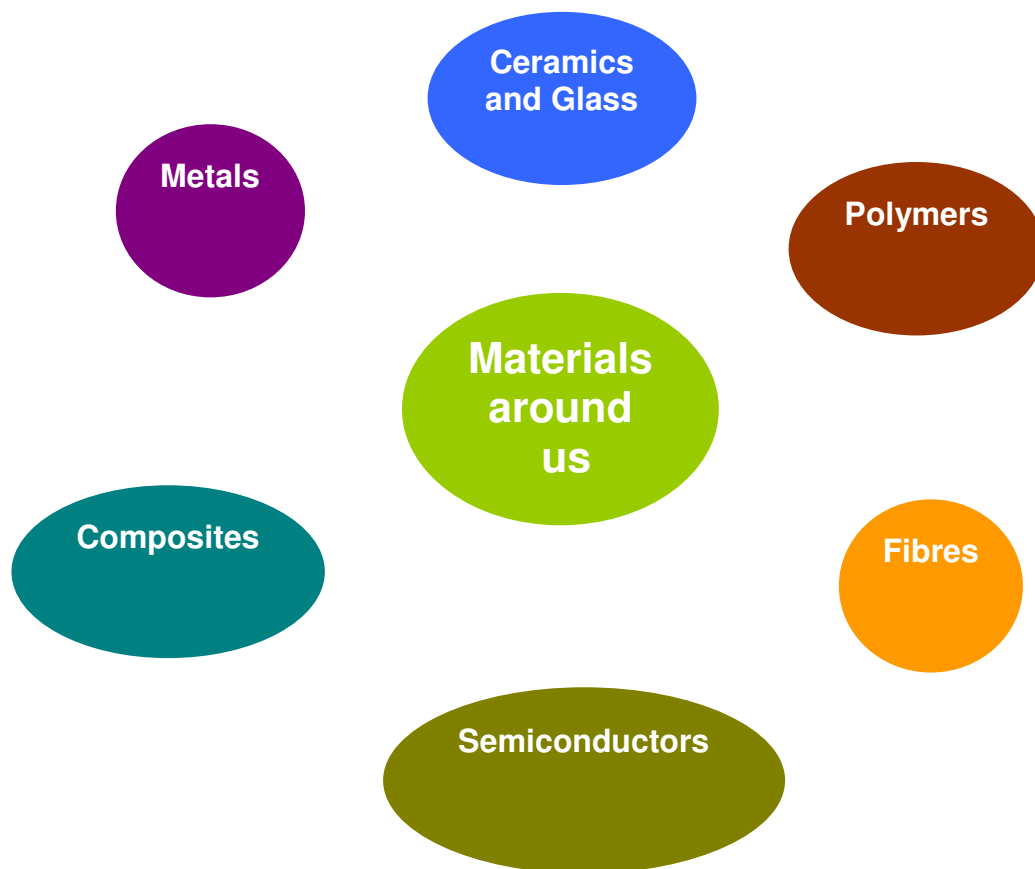
2. Fill in the information to sign up.

3. You should get to the following screen:



4. Click on "+ Recently invited" to open the link. You should see a document titled "Materials". Click on "Materials" to open the document.

5. You should see a mind map about “Materials around us” with the following structure:



6. We have added some words (see our names in brackets) to the mind map. Now it's your turn to collaborate in this mind map. Write 2 properties of materials we have seen today or add 2 examples of types of materials. Don't forget to write your name next to your 2 contributions.

7. By next class, all of you will have contributed to the mind map. Remember that we have seen physical and chemical properties of materials!



Watching videos on world conflicts

In the next session we will be dealing with world conflicts related to the extraction of some raw materials. Watch the following 2 videos to have an opinion:

Congo and Coltan (4':37)

<http://www.youtube.com/watch?v=3OWj1ZGn4uM>

Sierra Leone Diamond Mines (3')

<http://www.youtube.com/watch?v=IYPMm6qxFZQ>



Earth's limited resources

L

V

Watch the following video:

"Nigeria and the oil"

W

2

Task 1

Fill in the report with the relevant information obtained in the video.

Report on the video

Resource:

Where is it exploited?

Describe the conflict in rough lines:

.....

.....

.....

.....

Who are the ones that suffer the negative effects of this exploitation?

.....

.....

.....

.....

What is your opinion?

.....

.....

.....

.....

L V 2 Task 2

Now you will have to watch one of the following videos and fill in the report as you did before with the rest of the class:

“Sierra Leone and diamonds” or “Congo and coltan”

Report on the video

Resource:

Where is it exploited?

Describe the conflict in rough lines:

.....
.....
.....
.....

Who are the ones that suffer the negative effects of this exploitation?

.....
.....
.....
.....

What is your opinion?

.....
.....
.....
.....

Task 3

Answer the following quiz

Quiz on the videos

Video name:

Where are blood diamonds located?

.....

Where is the oil exploited?

.....

Who is suffering the bad consequences of the exploitation of oil?

.....

Who is suffering the bad consequences of the exploitation of blood diamonds?

.....

Who takes profit of the blood diamonds?

.....

Who takes profit of the oil?

.....

Which is the conflict that shocked you the most? Why?

.....

.....

1

Homework

Before watching the following video (3:14) on papermaking process

<http://www.youtube.com/watch?v=4x9HlzPZLyM>, fill in the missing words:

squeeze: to firmly press from opposite or all sides.

woodchips: smaller pieces logs are cut into.

logs: a part of the trunk of a tree that has been cut off.

pulp: a soft wet mass of fibres derived from wood in making paper.

bark: the tough protective outer skin of the trunk.

1. To begin the papermaking process, the harvested _____ arrive at the mill.
2. After the _____ is removed, the logs run through machines that cut the wood into chips.
3. The _____ and the recycled fibre are then pressure cooked with a mixture of water and chemicals in a digester in order to make the pulp.
4. The _____ created from the harvested logs and recycled fibre is washed, refined, cleaned and then turned to slush or watery mud in another machine.
5. The resulting crude paper sheet is _____ between large rollers to remove most of the remaining water and ensure smoothness and uniform thickness.

Watch the video, and tick the box which best describes the procedure for paper making according to the video:

☐

1. After the harvested logs arrive at the mill, they are debarked and reduced to woodchips.
2. The woodchips and the recycled fibre are mixed with water and chemicals in a digester to make a pudding.
3. Chemicals are used to clean the pulp.
4. Paper sheet is squeezed between rollers to remove water, and then through dryer rollers to remove the extra water.
5. The paper sheet is tested for uniformity of colour and surface, and water resistency.
6. The finished paper is wound into large rolls.

☐

1. After the harvested logs arrive at the mill, the bark is removed and logs are reduced to woodchips.
2. The woodchips are mixed with water and chemicals in a digester to make a pudding.
3. Chemicals are used to clean the pulp.
4. Paper sheet is squeezed between rollers to remove water.
5. The paper sheet is run through a series of dryer rollers to remove the remaining water.
6. The finished paper is wound into large rolls.



Environmental impacts

Describe the process of paper production in pairs. Once you are done, choose between the words below in order to complete the "environmental impacts" box:

First,.....

.....
.....
.....
.....
.....

Then,.....

.....
.....
.....
.....
.....

Afterwards,.....

.....
.....
.....
.....
.....

Finally,.....

.....
.....
.....
.....
.....

Noise Air Pollution
Deforestation Energy Consumption
Water Pollution

We think that the **environmental impacts** may be

.....
.....
.....
.....
.....

Task 2

Match the following ways of treating waste with the correct definition:

A	Landfill	To process materials in order to be used again by humans/ Organic matter used as fertilizing.
B	Recycled/composted	To burn organic substances contained in waste materials.
C	Incineration	To eliminate waste material by burying it under layers of earth.

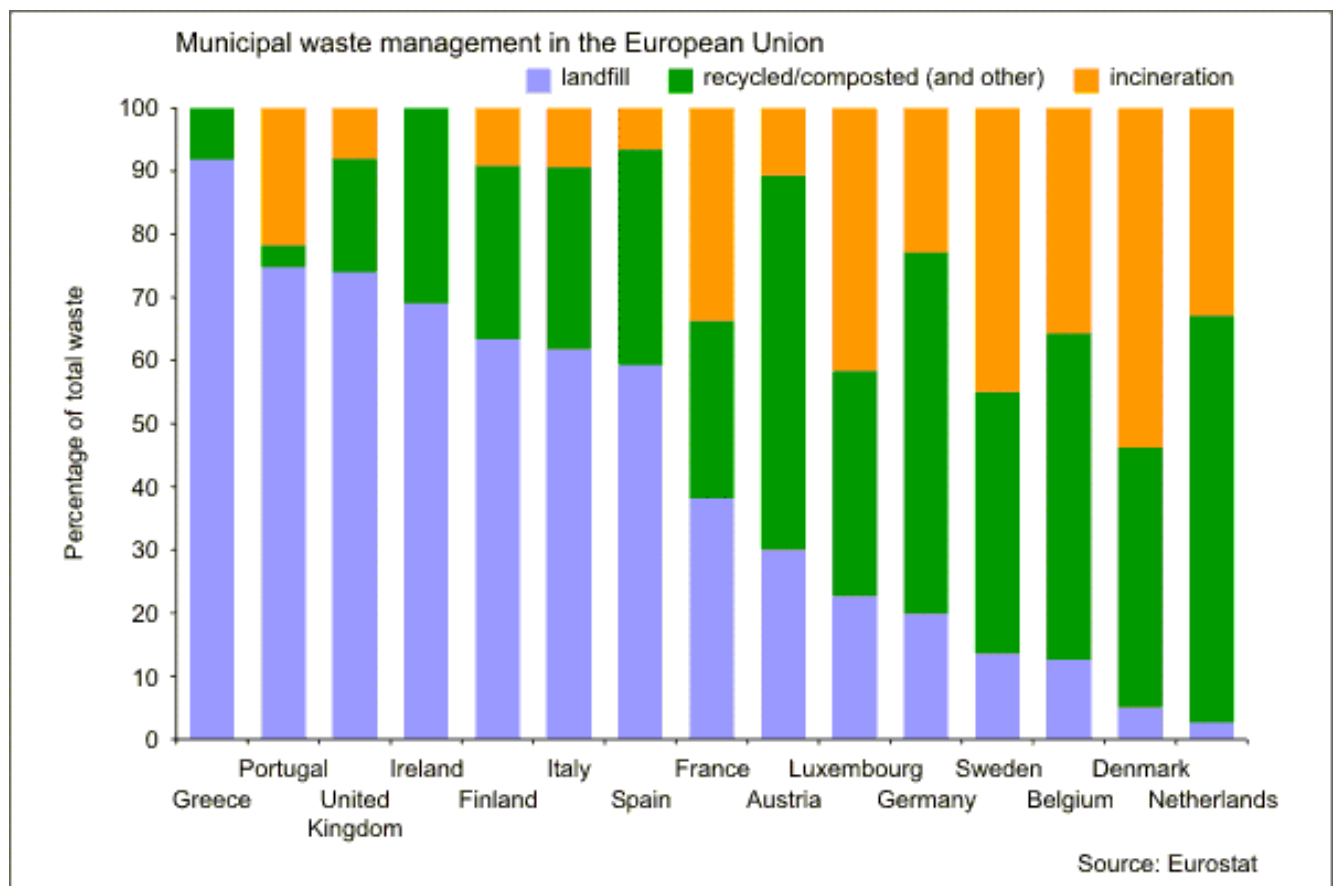


Image 12

Interpreting data

Look at the amount of waste that goes into landfill per countries and extract some information. Number 1 is done for you. Use help from the boxes below.

1. Greece **landfills** over 90% of its waste.
2. Portugal and the United Kingdom _____

3. The Netherlands and Denmark _____

4. Belgium, Sweden, Germany and Luxembourg _____

5. Italy, Spain and Finland _____

$\frac{3}{4}$ of waste

less than a quarter

almost no waste

~~90% of its waste~~

less than $\frac{3}{4}$ of waste

Drawing conclusions

1. Which is the country that recycles the most? And the country that recycles the least?

.....

.....

2. Most countries belonging to the north of Europe recycle more than the ones closer to the Mediterranean Sea. Why do you think it happens? Is it related to any particular policy?

.....

.....

3. Compare Spain with Netherlands

.....

.....

.....

Final Project: PPT Oral Presentations



Group 1: Car

How are you going to do this final project?

1. You will have to work in groups of 4 and identify the following materials of a car by using the following websites:

- Steel
- Carbon fibre
- Rubber

- <http://www.whatcar.com/car-news/what-car-tv-how-a-car-is-made/228187>
- [Nissan factory on Windows Media](#) (video showing a car factory)
- http://www.ehow.com/facts_4897896_what-materials-used-car.html
- http://www.bbc.co.uk/schools/gcsebitesize/science/ocr_gateway/rocks_metal/5_cars_for_scrap2.shtml
- <http://www.carsdesignonline.com/production/materials/carbon-fiber.php>
- <http://ezinearticles.com/?What-Metals-and-Other-Materials-Make-Up-Cars?&id=2421163>
- www.wikipedia.org

2. You will have to create a power point presentation with 6 slides. You have a model (*What's your mobile phone made of?*) up in the Moodle.

3. The content of the presentation must include the following information about the materials used in the car:

- Slide 1: cover and title. Ex. "What's a car made of?"
- Slide 2: 3 materials used in a car
- Slide 3: Origin of the materials
- Slide 4: Applications of the materials
- Slide 5: Properties of the materials
- Slide 6: Social and environmental repercussions of using these materials

4. Oral presentations:

- a. Each group must bring their PPT on a **pen drive** (PPT format).
- b. **Every** student in the group must explain **1 slide** (each student should speak the same amount of time). Slides 3, 4, 5 and 6 are the main slides and each one of them should be explained by a different member of the group. Total time of the **oral presentation is 6 minutes**.

- c. While one group is explaining their topic, another group fills in a rubric evaluating the presentation based on 4 categories (preparedness, clear speech, vocabulary, and content).

5. The PPT oral presentations and the written exam will take place on **8th April** at **sixth** hour. Tutoria will be at first hour. At sixth hour, the first 30 minutes of class will be devoted to your PPT oral presentations. Groups 1, 2, 3 and 4 will stay in the CMC classroom. Groups 5, 6, 7, 8 will go to a different class. The last 30 minutes of class will be devoted to the written exam.

ICT Group 2: Running shoe

How are you going to do this final project?

1. You will have to work in groups of 4 and identify the following materials of a running shoe by using the following websites:

- **Synthetic leather**
 - **Polymers: EVA (ethylene vinyl acetate)**
 - **Carbon rubber**

 - <http://www.madehow.com/Volume-1/Running-Shoe.html>
 - <http://en.wikipedia.org/wiki/Insole#Insole>
 - <http://www.epodiatry.com/running-shoes.htm>
 - <https://www.roadrunnersports.com/rrs/content/content.jsp?contentId=content1106>
 - <http://www.sneakerhead.com/nike-brand-technology.html>
- a. You will have to create a power point presentation with 6 slides. You have a model (*What's your mobile phone made of?*) up in the Moodle.
- b. The content of the presentation must include the following information about the materials used in the running shoe:
- Slide 1: cover and title. Ex. "What's a running shoe made of?"
 - Slide 2: 3 materials used in a running shoe
 - Slide 3: Origin of the materials
 - Slide 4: Applications of the materials
 - Slide 5: Properties of the materials
 - Slide 6: Social and environmental repercussions of using these materials

4. Oral presentations:

- a. Each group must bring their PPT on a **pen drive** (PPT format).
- b. **Every** student in the group must explain **1 slide** (each student should speak the same amount of time). Slides 3, 4, 5 and 6 are the main slides and each one of them should be explained by a different member of the group. Total time of the **oral presentation is 6 minutes**.
- c. While one group is explaining their topic, another group fills in a rubric evaluating the presentation based on 4 categories (preparedness, clear speech, vocabulary, and content).

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ICT Group 3: Computer

How are you going to do this final project?

1. You will have to work in groups of 4 and identify the following materials of a computer by using the following websites:

- **Silicon (semiconductor) -> silicon wafer**
- **Liquid crystal (for the screen)**
- **Polymer for the keyboard: Acrylonitrile butadiene styrene (ABS)**

- <http://www.youtube.com/watch?v=aWVywHzuHnQ>
- http://www.ehow.co.uk/facts_4911761_what-material-computer-screen-made.html
- <http://www.howstuffworks.com/lcd.htm>
- http://en.wikipedia.org/wiki/Acrylonitrile_butadiene_styrene
- <http://www.rutlandplastics.co.uk/abs.shtml>

2. You will have to create a power point presentation with 6 slides. You have a model (*What's your mobile phone made of?*) up in the Moodle.

3. The content of the presentation must include the following information about the materials used in the computer:

- Slide 1: cover and title. Ex. "What's a computer made of?"
- Slide 2: 3 materials used in a computer.
- Slide 3: Origin of the materials
- Slide 4: Applications of the materials
- Slide 5: Properties of the materials
- Slide 6: Social and environmental repercussions of using these materials

4. Oral presentations:

- a. Each group must bring their PPT on a **pen drive** (PPT format).
- b. **Every** student in the group must explain **1 slide** (each student should speak the same amount of time). Slides 3, 4, 5 and 6 are the main slides and each one of them should be explained by a different member of the group. Total time of the **oral presentation is 6 minutes**.
- c. While one group is explaining their topic, another group fills in a rubric evaluating the presentation based on 4 categories (preparedness, clear

speech, vocabulary, and content).

5. The PPT oral presentations and the written exam will take place on **8th April** at **sixth** hour. Tutoria will be at first hour. At sixth hour, the first 30 minutes of class will be devoted to your PPT oral presentations. Groups 1, 2, 3 and 4 will stay in the CMC classroom. Groups 5, 6, 7, 8 will go to a different class. The last 30 minutes of class will be devoted to the written exam.

Group 4: Backpack

How are you going to do this final project?

1. You will have to work in groups of 4 and identify the following materials of a backpack by using the following websites:

- **Nylon (polymer-based fibre)**
- **Steel for the zipper (the slider is made of steel)**
- **Closed cell foam (polymer) for padded straps**

- <http://ezinearticles.com/?Why-a-Nylon-Backpack-is-Useful&id=2376485>
- <http://www.helium.com/items/1914789-best-material-for-a-backpack>
- http://www.whitemountain.com.au/backpack_construction/material_faqs.html
- <http://www.enotes.com/how-products-encyclopedia/zipper>
- http://zenbackpacking.net/BackpackFabrics.htm#Closed_Cell_Foam

2. You will have to create a power point presentation with 6 slides. You have a model (*What's your mobile phone made of?*) up in the Moodle.

3. The content of the presentation must include the following information about the materials used in the backpack:

- Slide 1: cover and title. Ex. "What's your backpack made of?"
- Slide 2: 3 materials used in a backpack.
- Slide 3: Origin of the materials
- Slide 4: Applications of the materials
- Slide 5: Properties of the materials
- Slide 6: Social and environmental repercussions of using these materials

4. Oral presentations:

- a. Each group must bring their PPT on a **pen drive** (PPT format).
- b. **Every** student in the group must explain **1 slide** (each student should speak the same amount of time). Slides 3, 4, 5 and 6 are the main slides and each one of them should be explained by a different member of the group. Total time of the **oral presentation is 6 minutes**.
- c. While one group is explaining their topic, another group fills in a rubric evaluating the presentation based on 4 categories (preparedness, clear speech, vocabulary, and content).

5. The PPT oral presentations and the written exam will take place on **8th April** at **sixth** hour. Tutoria will be at first hour. At sixth hour, the first 30 minutes of class will be devoted to your PPT oral presentations. Groups 1, 2, 3 and 4 will stay in the CMC classroom. Groups 5, 6, 7, 8 will go to a different class. The last 30 minutes of class will be devoted to the written exam.

Group 5: Tennis Racket

How are you going to do this final project?

1. You will have to work in groups of 4 and identify the following materials of a tennis racket by using the following websites:

- **Strings (Synthetic polymer: Kevlar)**
- **Chassis (Carbon fibre)**
- **Filler (Polyurethane)**

- <http://tennis101.com/anatomyofthetenniscracquet.htm>
- <http://www.madehow.com/Volume-3/Tennis-Racket.html>
- <http://en.wikipedia.org/wiki/Kevlar>
- http://en.wikipedia.org/wiki/Carbon_fibre
- <http://www.itftennis.com/technical/equipment/rackets/history.asp>
- <http://www.pslc.ws/macrog/kidsmac/polyure.htm>

2. You will have to create a power point presentation with 6 slides. You have a model (*What's your mobile phone made of?*) up in the Moodle.

3. The content of the presentation must include the following information about the materials used in the tennis racket:

- Slide 1: cover and title. Ex. "What's a tennis racket made of?"
- Slide 2: 3 materials used in a tennis racket.
- Slide 3: Origin of the materials
- Slide 4: Applications of the materials
- Slide 5: Properties of the materials
- Slide 6: Social and environmental repercussions of using these materials

4. Oral presentations:

- a. Each group must bring their PPT on a **pen drive** (PPT format).
- b. **Every** student in the group must explain **1 slide** (each student should speak the same amount of time). Slides 3, 4, 5 and 6 are the main slides and each one of them should be explained by a different member of the group. Total time of the **oral presentation is 6 minutes**.
- c. While one group is explaining their topic, another group fills in a rubric evaluating the presentation based on 4 categories (preparedness, clear

speech, vocabulary, and content).

5. The PPT oral presentations and the written exam will take place on **8th April** at **sixth** hour. Tutoria will be at first hour. At sixth hour, the first 30 minutes of class will be devoted to your PPT oral presentations. Groups 1, 2, 3 and 4 will stay in the CMC classroom. Groups 5, 6, 7, 8 will go to a different class. The last 30 minutes of class will be devoted to the written exam.



Group 6: Diving suit

How are you going to do this final project?

1. You will have to work in groups of 4 and identify the following materials of a diving suit by using the following websites:

- **Diving suit (Neoprene)**
- **Diving cylinder (aluminium)**
- **Diver fins (rubber)**

- <http://www.pslc.ws/macrog/kidsmac/rubber.htm#isoprene>
- <http://www.ali-tek.com/>
- <http://seavenger.com/sea-diver-classic-rubber-swimming-scuba-diving-fins-p-179.html>

2. You will have to create a power point presentation with 6 slides. You have a model (*What's your mobile phone made of?*) up in the Moodle.

3. The content of the presentation must include the following information about the materials used in the diving suit:

- Slide 1: cover and title. Ex. "What's a diving suit made of?"
- Slide 2: 3 materials used in a diving suit.
- Slide 3: Origin of the materials
- Slide 4: Applications of the materials
- Slide 5: Properties of the materials
- Slide 6: Social and environmental repercussions of using these materials

4. Oral presentations:

- a. Each group must bring their PPT on a **pen drive** (PPT format).
- b. **Every** student in the group must explain **1 slide** (each student should speak the same amount of time). Slides 3, 4, 5 and 6 are the main slides and each one of them should be explained by a different member of the group. Total time of the **oral presentation is 6 minutes**.
- c. While one group is explaining their topic, another group fills in a rubric evaluating the presentation based on 4 categories (preparedness, clear speech, vocabulary, and content).

5. The PPT oral presentations and the written exam will take place on **8th April** at **sixth** hour. Tutoria will be at first hour. At sixth hour, the first 30 minutes of class will be devoted to your PPT oral presentations. Groups 1, 2, 3 and 4 will stay in the CMC classroom. Groups 5, 6, 7, 8 will go to a different class. The last 30 minutes of class will be devoted to the written exam.



Group 7: Fire fighter suit

How are you going to do this final project?

1. You will have to work in groups of 4 and identify the following materials of a fire fighter suit by using the following websites:

- **Coat and trousers (nomex, a synthetic fibre)**
- **HELMET (polyurethane)**
- **Boots (goretex)**
 - <http://en.wikipedia.org/wiki/Nomex>
 - <http://www.pslc.ws/macrog/kidsmac/polyure.htm>
 - <http://www.msa-europe.com/int/products/head-protection/fire-helmets/fl-sf-approved-to-en4432008/> (**Go to: "Download additional info"**)
 - <http://www.haix.com/international/fire-fighting-boots/haix-florian-europe>

2. You will have to create a power point presentation with 6 slides. You have a model (*What's your mobile phone made of?*) up in the Moodle.

3. The content of the presentation must include the following information about the materials used in the fire fighter suit:

- Slide 1: cover and title. Ex. "What's a fire fighter suit made of?"
- Slide 2: 3 materials used in a fire fighter suit.
- Slide 3: Origin of the materials
- Slide 4: Applications of the materials
- Slide 5: Properties of the materials
- Slide 6: Social and environmental repercussions of using these materials

4. Oral presentations:

- a. Each group must bring their PPT on a **pen drive** (PPT format).
- b. **Every** student in the group must explain **1 slide** (each student should speak the same amount of time). Slides 3, 4, 5 and 6 are the main slides and each one of them should be explained by a different member of the group. Total time of the **oral presentation is 6 minutes**.
- c. While one group is explaining their topic, another group fills in a rubric evaluating the presentation based on 4 categories (preparedness, clear speech, vocabulary, and content).

5. The PPT oral presentations and the written exam will take place on **8th April** at **sixth** hour. Tutoria will be at first hour. At sixth hour, the first 30 minutes of class will be devoted to your PPT oral presentations. Groups 1, 2, 3 and 4 will stay in the CMC classroom. Groups 5, 6, 7, 8 will go to a different class. The last 30 minutes of class will be devoted to the written exam.

Group 8: Bike

How are you going to do this final project?

1. You will have to work in groups of 4 and identify the following materials of a bike by using the following websites:

- **Bike frame (aluminium)**
- **Bicycle seat/saddle (carbon fibres)**
- **Tyres (rubber)**

- <http://en.wikipedia.org/wiki/Aluminium>
- http://en.wikipedia.org/wiki/Carbon_fiber-reinforced_polymer
- http://en.wikipedia.org/wiki/Natural_rubber
- <http://www.madehow.com/Volume-7/Bicycle-Seat.html>

2. You will have to create a power point presentation with 6 slides. You have a model (*What's your mobile phone made of?*) up in the Moodle.

3. The content of the presentation must include the following information about the materials used in the bike:

- Slide 1: cover and title. Ex. "What's your *bike* made of?"
- Slide 2: 3 materials used in a bike
- Slide 3: Origin of the materials
- Slide 4: Applications of the materials
- Slide 5: Properties of the materials
- Slide 6: Social and environmental repercussions of using these materials

4. Oral presentations:

- a. Each group must bring their PPT on a **pen drive** (PPT format).
- b. **Every** student in the group must explain **1 slide** (each student should speak the same amount of time). Slides 3, 4, 5 and 6 are the main slides and each one of them should be explained by a different member of the group. Total time of the **oral presentation is 6 minutes**.
- c. While one group is explaining their topic, another group fills in a rubric evaluating the presentation based on 4 categories (preparedness, clear speech, vocabulary, and content).

5. The PPT oral presentations and the written exam will take place on **8th April** at **sixth** hour. Tutoria will be at first hour. At sixth hour, the first 30 minutes of class will be devoted to your PPT oral presentations. Groups 1, 2, 3 and 4 will stay in the CMC classroom. Groups 5, 6, 7, 8 will go to a different class. The last 30 minutes of class will be devoted to the written exam.

Tips on how to speak in front of an audience

1. Introduce yourself and your team. Establish who is going to talk what.
2. Know your topic well. This will ease your nervousness and fear.
3. Try to speak clearly so your audience can follow you easily.
4. Use precise vocabulary we have seen in class related to materials, properties, etc.
5. To finish your PPT, say "Thanks for your attention".

Assessment

Oral Presentations on New Materials rubric

Oral Presentation Title: _____

Assessed by: _____

Name of the student assessed: _____

CATEGORY	4 points	3 points	2 points	1 point
Preparedness	Very good preparation	Good preparation.	Little preparation.	No preparation
Speaks Clearly	Very clear speaking.	Clear speaking.	Not very clear speaking.	Unclear speaking.
Vocabulary	Very precise vocabulary.	Precise vocabulary.	Not very precise vocabulary.	No precise vocabulary.
Content	Shows full understanding.	Shows good understanding.	Shows not very good understanding.	Shows no understanding.

Name of the student assessed: _____

CATEGORY	4 points	3 points	2 points	1 point
Preparedness	Very good preparation	Good preparation.	Little preparation.	No preparation
Speaks Clearly	Very clear speaking.	Clear speaking.	Not very clear speaking.	Unclear speaking.
Vocabulary	Very precise vocabulary.	Precise vocabulary.	Not very precise vocabulary.	No precise vocabulary.
Content	Shows full understanding.	Shows good understanding.	Shows not very good understanding.	Shows no understanding.

New Materials

Name of the student assessed: _____

CATEGORY	4 points	3 points	2 points	1 point
Preparedness	Very good preparation	Good preparation.	Little preparation.	No preparation
Speaks Clearly	Very clear speaking.	Clear speaking.	Not very clear speaking.	Unclear speaking.
Vocabulary	Very precise vocabulary.	Precise vocabulary.	Not very precise vocabulary.	No precise vocabulary.
Content	Shows full understanding.	Shows good understanding.	Shows not very good understanding.	Shows no understanding.

Name of the student assessed: _____

CATEGORY	4 points	3 points	2 points	1 point
Preparedness	Very good preparation	Good preparation.	Little preparation.	No preparation
Speaks Clearly	Very clear speaking.	Clear speaking.	Not very clear speaking.	Unclear speaking.
Vocabulary	Very precise vocabulary.	Precise vocabulary.	Not very precise vocabulary.	No precise vocabulary.
Content	Shows full understanding.	Shows good understanding.	Shows not very good understanding.	Shows no understanding.

New Materials

Collaborative work rubric

Assessed by: _____

Student name: _____

CATEGORY	4 points	3 points	2 points	1 point
Quality of Work	Provides work of the highest quality.	Provides high quality work.	Provides work that occasionally needs to be checked to ensure quality.	Provides work that usually needs to be checked/redone by others to ensure quality.
Problem-solving	Actively looks for and suggests solutions to problems.	Refines solutions suggested by others.	Does not suggest solutions, but is willing to try out solutions suggested by others.	Does not try to solve problems or help others solve problems. Lets others do the work.
Attitude	Never is publicly critical of the project or the work of others. Always has a positive attitude about the task(s).	Rarely is publicly critical of the project or the work of others. Often has a positive attitude about the task(s).	Occasionally is critical of the project or the work of other members of the group. Usually has a positive attitude about the task(s).	Often is publicly critical of the project or the work of other members of the group. Often has a negative attitude about the task(s).
Working with Others	Almost always listens to, shares with, and supports the efforts of others. Tries to keep people working well together.	Usually listens to, shares with, and supports the efforts of others. Does not cause "waves" in the group.	Often listens to, shares with, and supports the efforts of others, but sometimes is not a good team member.	Rarely listens to, shares with, and supports the efforts of others. Often is not a good team player.

Student name: _____

CATEGORY	4 points	3 points	2 points	1 point
Quality of Work	Provides work of the highest quality.	Provides high quality work.	Provides work that occasionally needs to be checked to ensure quality.	Provides work that usually needs to be checked/redone by others to ensure quality.
Problem-solving	Actively looks for and suggests solutions to problems.	Refines solutions suggested by others.	Does not suggest solutions, but is willing to try out solutions suggested by others.	Does not try to solve problems or help others solve problems. Lets others do the work.
Attitude	Never is publicly critical of the project or the work of others. Always has a positive attitude about the task(s).	Rarely is publicly critical of the project or the work of others. Often has a positive attitude about the task(s).	Occasionally is critical of the project or the work of other members of the group. Usually has a positive attitude about the task(s).	Often is publicly critical of the project or the work of other members of the group. Often has a negative attitude about the task(s).
Working with Others	Almost always listens to, shares with, and supports the efforts of others. Tries to keep people working well together.	Usually listens to, shares with, and supports the efforts of others. Does not cause "waves" in the group.	Often listens to, shares with, and supports the efforts of others, but sometimes is not a good team member.	Rarely listens to, shares with, and supports the efforts of others. Often is not a good team player.

New Materials

Student name: _____

CATEGORY	4 points	3 points	2 points	1 point
Quality of Work	Provides work of the highest quality.	Provides high quality work.	Provides work that occasionally needs to be checked to ensure quality.	Provides work that usually needs to be checked/redone by others to ensure quality.
Problem-solving	Actively looks for and suggests solutions to problems.	Refines solutions suggested by others.	Does not suggest solutions, but is willing to try out solutions suggested by others.	Does not try to solve problems or help others solve problems. Lets others do the work.
Attitude	Never is publicly critical of the project or the work of others. Always has a positive attitude about the task(s).	Rarely is publicly critical of the project or the work of others. Often has a positive attitude about the task(s).	Occasionally is critical of the project or the work of other members of the group. Usually has a positive attitude about the task(s).	Often is publicly critical of the project or the work of other members of the group. Often has a negative attitude about the task(s).
Working with Others	Almost always listens to, shares with, and supports the efforts of others. Tries to keep people working well together.	Usually listens to, shares with, and supports the efforts of others. Does not cause "waves" in the group.	Often listens to, shares with, and supports the efforts of others, but sometimes is not a good team member.	Rarely listens to, shares with, and supports the efforts of others. Often is not a good team player.

Main idea learnt in the oral presentations on New Materials

While you are listening to your classmates' PPT presentations, answer the following questions:

Student name: _____

1. Oral Presentation title: _____

What did you learn?

2. Oral Presentation title: _____

What did you learn?

3. Oral Presentation title: _____

What did you learn?

New Materials: Feedback

This document is anonymous and its only aim is to help us improve and become better teachers in the future. You don't need to answer in English. This survey **does not include** the **nanotechnology** session.

Thanks for collaborating!!!

Which part did you like the best? Why?

Which part was the most interesting for you?

And the most boring?

Which is the part do you remember the most?

Is there something you would have liked to know more about?

Rate the unit from 1 to 10



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