# LET'S TALK ABOUT ... ENERGY

STUDENT' WORKSHEET

Names:	Surnames:	Group: 3rd ESO	Qualification
		Date:	

# LET'S TALK ABOUT..... ENERGY



Energy is very used nowadays in different ways. We use energy to breathe, to walk, to produce the digestion process. Energy is needed to power computers, to charge mobile phones, to cook food, to go everywhere by car...

# But...What energy is?

In this unit, we are going to learn lot of things about energy. To start with, you have to do an activity to know your previous knowledge related to ENERGY. Let's go!!!

# **INFORMATION ABOUT ACTIVITIES:**

Individual activity

**Work in pairs** 

Sylvark in groups of three

Work in groups of four

# PREVIOUS ACTIVITY (SELF-ASSESSMENT ACTIVITY)

Previous activity To know your previous knowledge, choose the best answer for these questions (just one answer. If there are more than one correct answer, choose the best one). At the end of the activity you will find the correct answers. Each correct answer: 1 point. If you don't find the answers, don't worry, it's just to know your previous knowledge.

- 1. According to the main energy principle ...
  - a) Energy can be built in a nuclear power station.
  - b) Energy can't be created or destroyed; it can just be transformed.
  - c) Energy and power is the same.
  - d) Energy is measured in Newton.
- 2. One example of renewable energy is ...
  - a) Oil.
  - b) Wind energy.
  - c) Natural gas.
  - d) Nuclear energy.

- 3. A non-fossil fuel is ...
  - a) Coal.
  - b) Oil.
  - c) Waves.
  - d) Natural gas.
- 4. A solar cell is used ...
  - a) To heat a fluid, as for instance water, to achieve hot water at home.
  - b) To transform directly sun energy in electricity.
  - c) To move a turbine.
  - d) To produce wind energy.
- 5. A solar collector is used ...
  - a) To heat a fluid, as for instance water, to achieve hot water at home.
  - b) To transform directly sun energy in electricity.
  - c) To produce waves.
  - d) To produce wind energy.
- 6. Wind turbines produce some environmental problems as ...
  - a) Noise.
  - b) Visual impact.
  - c) Problems in bird migrations.
  - d) All the answers are correct.
- 7. Hydropower (hydroelectric power) usually needs to build ...
  - a) A dam.
  - b) A solar collector.
  - c) A harbour.
  - d) All the answers are correct.
- 8. Waves are produced by ...
  - a) The fetch of the wind.
  - b) The rivers.

  - c) The moon influence.d) The internal heat of the Earth.
- 9. Tides are produced by ...
  - a) The fetch of the wind.
  - b) The rivers.
  - c) The moon influence.
  - d) The internal heat of the Earth.
- 10. Geothermal energy is produced by ...
  - a) The fetch of the wind.
  - b) The rivers.
  - c) The moon influence.
  - d) The internal heat of the Earth.

- 11. Some advantages of using renewable energies are ...
  - a) Some of them can be found in many places around the world.
  - b) They can be regenerated in a small period of time.

  - c) They are free energies.d) All the answers are correct.
- 12. Energy can be measured in:
  - a) Joules
  - b) Calories
  - c) Kwh
  - d) All the answers are correct
- 13. Is not a type of energy:
  - a) Heat
  - b) Work
  - c) Electricity
  - d) Force
- 14. One way to save energy can be:
  - a) Having all the night the computer on without being used
  - b) Open the windows while the central heating is on
  - c) Use the Sun light as much as possible
  - d) Use cars as much as possible
- 15. Energy can be used to:
  - a) Cooking
  - b) Heating
  - c) Lighting
  - d) All the answers are correct

# **CORRECT ANSWERS (each correct answer 1 point):**

- 1: **b** (The main energy principle enunciates: Energy can't be created or destroyed, it can just be transformed. So, we can't build energy; we only can transform energy from one type to another)
- 2: **b** (Oil, natural gas and nuclear energy are non-renewable energy resources because nature expend lot of time (if possible) to regenerate them.
- 3: c (Coal, oil and natural gas are fossil fuels)
- 4: **b** (A solar cell transforms directly solar energy into electricity. Named solar panel as well)
- 5: **a** (A solar collector uses the solar energy to heat a fluid)
- 6: d (All the answers are correct. Wind turbines produce noise, visual impact and problems in bird migrations)
- 7: **a** (Hydropower, sometimes, need the construction of a dam to accumulate water)
- 8: a (Wind blowing across the sea surface produces waves)
- 9: c (In tides, a huge quantity of water, in seas or oceans, is going up and down because the moon influence)
- 10: **d** (Geothermal energy is produced by the internal heat of the Earth, because in some areas magma is nearer to the Earth surface than in other areas)
- 11: **d** (All the answers are correct)
- 12: **d** (All the answers are correct. Joules is the energy unit in the International System, calorie is used in heat transmissions and Kwh is used in electricity. All of them are different energy units)
- 13: **d** (Force is not a type of energy)
- 14: **c** (Use the sun light as much as possible is the only answer that save energy)
- 15: **d** (All the answers are correct)

### FINAL SCORE (SELF ASSESSMENT PREVIOUS KNOLEDGE)

er o.v	000	6,6	
Less than 3 correct answers	4-7 correct answers	8-11 correct answers	12-15 correct answers
COUL BE BETTER	SATISFACTORY	GOOD	YOU ARE AN ENERGY EXPERT

#### WHAT ENERGY IS?



The main energy principle) postulates that energy can't be created or destroyed, it just can be transformed, and so, energy can be transformed according to the needs. For example, if we need heat we can burn wood to obtain it (transforming one type of energy into another one).

Lots of studies about energy were carried out by Europeans scientists from the XVIII century. In the SI (international system) energy unit is the **Joule**, in honour to the British physicist and mathematician James Prescott **Joule** (1818-1889). Joule declared the main energy principle in 1847 as well.

Energy can be reported in several ways as for example, work, heat, light, sound, electricity, etc.

From a technological point of view, we are interested in Work. When a force acts on an object producing a motion on it, we say that this force is producing a Work. In other words, Work equation postulates:  $W = F \cdot d$ 

(**W** is work and in the SI is expressed in joules, **F** is the force and in the SI is expressed in newton (thanks to the British Isaac Newton (1643-1727)) and **d** is the distance and in the SI is expressed in metres).

So We defined the joule as the energy transferred to an object when a force of one newton acts on that object in the direction of the force's motion through a distance of one metre  $(1J = 1N\cdot1m)$ 

When we are talking about **heat**, we can use beside the joule another unit, the **calorie** (1cal = 4.18 J, or 1J = 0.24 cal.). Calorie was introduced by the French Nicolas Clément (1779-1841).

When we are talking about **electricity**, we can use beside the joule another unit, the **Kwh** (1 Kwh = 3600000 J)

Other used units: 1 KJ = 1000 J, 1 Kcal = 1000 cal. (1 Kilo means 1000)

To deepen about energy, do the rest of the activities. Some of them in pairs. Let's go!!!

### Example:

Calculate the work produced by a force of 1.000 N, which causes a displacement of 3600 meters. Express the final result in J, KJ, cal. and Kwh.

$$W = F \cdot d$$

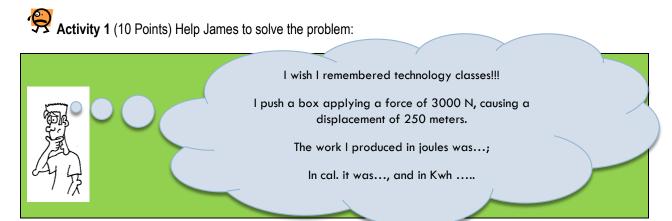
$$W = 1000 \text{ N} \cdot 3600 \text{ m} = 3600000 \text{ J}$$

$$3600000 J \cdot \frac{1 \text{ KJ}}{1000 J} = 3600 \text{ KJ}$$

$$3600000 J \cdot \frac{1 \text{ cal}}{4.18 J} = 861244.02 \text{ cal}$$

$$3600000 J \cdot \frac{1 \text{ Kwh}}{3600000 J} = 1 \text{ Kwh}$$

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#### **MORE THINGS ABOUT ENERGY**



Some energy resources used in different countries around the world are fossil fuels (coal, oil and natural gas), nuclear energy, hydropower, solar energy, wind energy, biofuels, waves energy, tidal energy, geothermal energy, biogas, waste (including USW (urban solid waste)), wood, etc. Part of them are renewable (nature can replace them on a human timescale, like solar energy), others non-renewable (they comes from energy resources that will eventually run out, like fossil fuels). In any case, We need energy to live.

Activity 2 (14 Points) The teacher will group you in pairs (one will be student 1 and the other student 2), and will give you two different piece of paper, one for each student. Ask questions to your partner and fill in the gaps with the correct word (each gap needs a word). All of them are about energy resources and their influence. Both students have the same sentence but the gap is in a different position. Follow teacher' instructions.

**IMPORTANT**: If you don't know how to write a word, you can ask your partner: "Could you spell it, please?"

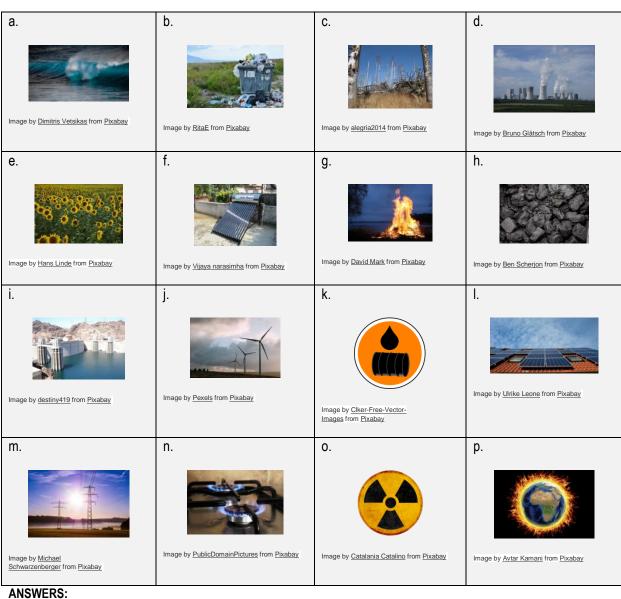
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# Activity 3 (16 Points) According to the activity 1 you have to match the words with the pictures:

1. Coal	2. Oil	3. Natural gas	4. Wave energy
5. Global warming/Greenhouse effect	6. Solar cell	7. Waste	8. Radioactivity
9. Electricity	10. Acid rain	11. Solar collector	12. Wind energy
13. Hydropower	14. Heat	15. Biofuels	16. Nuclear energy

# **PICTURES**



1.	2.	3.	4.	5.	6.	7.	8.
0	10	11	10	12	1.1	15	16

Activity 4 (18 Points) According to your answers given in the activities 2 and 3, try to write a short definition of the next words. You can use some expressions like these (example):

# **HELP: HOW TO WRITE DEFINITIONS?**

is	
are	
consist in	
is/are produced by	
destroy/destroys	
is/are used to	
	are consist in is/are produced by destroy/destroys

Example: Tidal energy is produced by the moon influence.

- a) Renewable energy resource:
- b) Coal:
- c) Oil:
- d) Natural gas:
- e) Acid rain:
- f) Global warming:
- g) Wind energy:
- h) Solar cell:
- i) Solar collector:

Activity 5 (6 Points) Imagine that you live alone in a house in the middle of a forest, without an electricity company connection. Propose three different solutions to have hot water and electricity at home.

# You can use some expressions like the example:

			energy
We	would need to install	 to obtain	electricity
			hot water

Example: We would need to install solar cells to obtain electricity.

- 1.
- 2.
- 3.

Activity 6 (5 Points) Draw a picture with the house you have proposed in the activity 5, with all the solutions given to solve the problems.

Activity 7 (5 Points) Explain the different answers given in the activities 5 and 6 to the nearest group in the class.

### **HELP: HOW TO GIVE OPINIONS?**

# **GIVING OPINIONS TO COMPARE ANSWERS**

What do you think about...?

What is your opinion about ...?

Why do/does/did ...?

What are your answers in ....?

In my opinion ...

From my point of view ...

I think ...

I answered ....

I think so.

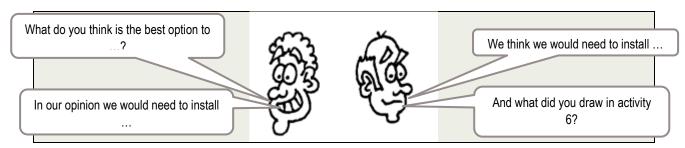
I don't think so.

I agree.

I don't agree. I disagree.

Give me a reason for that.

.



Write five solutions given by them. You can use some expressions like:

		hot water
The nearest group thinks that	 is the best option to obtain	electricity
		energy

Example: The nearest group thinks that solar cell is the best option to obtain electricity.

- 1.
- 2.
- 3.
- 4.
- 5.

Activity 8 (3 Points) Compare your solutions with the proposed by your nearest group and discuss the different options. Then write your own conclusions (Minimum three). Explain these conclusions to the rest of the class. You can use some expressions as the next ones:

We think that the best option to obtain electricity is ....

In our opinion, the best way to obtain hot water is  $\dots$ 

Example: We think that the best option to obtain electricity is using solar cells.

### **CONCLUSSIONS:**

- 1.
- 2.
- 3.

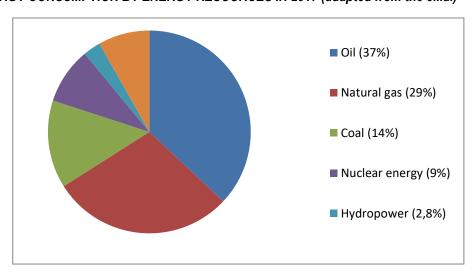
#### **ENERGY USAGE**



Not all the countries use the same quantity or the same energy resources. Some countries, usually the developed ones, use lots of energy (sometimes they have several energy reserves, like U.S.A, but others they have to import energy). Other nations that, maybe they have lots of energy resources, they use a few quantities of them, usually they are underdeveloped countries. So, one way used to classify countries is based in the consumption of energy per capita (person). Usually, developed countries use more energy per capita than the developing countries and these last, more than the underdeveloped ones.

The pie chart below shows the percentage of the different energy resources that are used to provide energy in the U.S.A. in 2017 (data adapted from the e.i.a.)

# U.S.A. ENERGY CONSUMPTION BY ENERGY RESOURCES IN 2017 (adapted from the e.i.a.)



(e.i.a.= US energy information administration, Monthy Energy Review, April 2018 eia.gov)

Activity 9 (3 Points) According to the energy usage in U.S.A., what is your opinion about it? Write three sentences. You can use this kind of expressions (Example):

# Example: We think that ..... is very used in the U.S.A.

We think that	 is / are	very used	in the U.S.A.
		not very used	

1.

2.

3.

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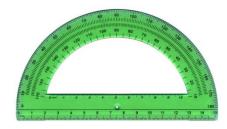
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Activity 10 (10 Points) Look at the table below. It shows the percentages of energy resources used in Spain during 2018 (adapted from Statista, es. statista.com/). Using these percentages, draw the pie chart. (Like the sector diagram that appears in reference of the energy consumption in the U.S.A. in 2017).

HELP: To pass from % to degrees, you have to use next expression:

$$degrees = \frac{\% \cdot 360}{100}$$

You will need an angle conveyor to draw the sector diagram:



To build the sector diagram, you can use Excel or any similar software as well.

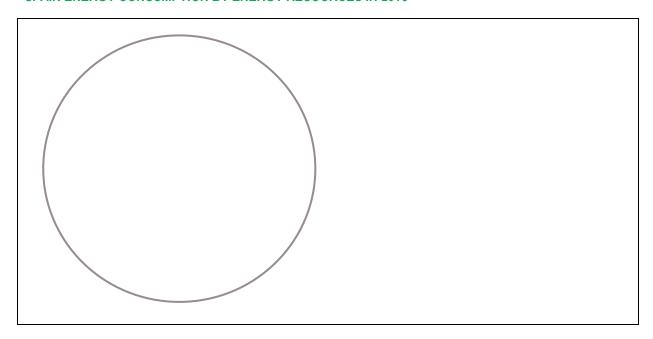
Oil	Natural gas	Coal	Nuclear energy	Hydropower	Other renewable energies
47.2%	19.2%	7.8%	8.9%	5.7%	11.2%

Data adapted from es.estatista; https://es.statista.com/estadisticas/990660/distribucion-porcentual-del-consumo-de-energia-primaria-en-espana/

Example: 
$$^{\circ} = \frac{47.2 \cdot 360}{100} = 169.9^{\circ}$$

Firstly you have to draw in the next square the colour of each energy resource and then draw the circle pie chart.

# **SPAIN ENERGY CONSUMPTION BY ENERGY RESOURCES IN 2018**



# **HELP: HOW TO COMPARE?**

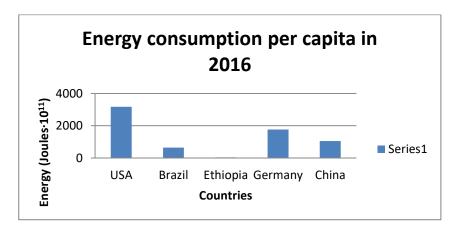
more		
 less	 than	
the same quantity of		

Activity 11 (6 Points) Compare both countries, writing three sentences. You can do it using expressions as the next example:

Example: Spain uses in percentage more oil than the U.S.A.

- 1.
- 2.
- 3.

Activity 12 (3+6 Points) You have here the bar diagram about the energy consumption per capita in 2016 in some countries. Look at the diagrams of three countries: Germany, Brazil and Ethiopia and, according to the bar diagram, write one developed country, one developing and one underdeveloped. Explain why you propose this classification (Writing HELP in activity 7. How to give opinions)



Adapted from e.i.a. (US energy information administration) and datosmacro.com

#### ANSWERS:

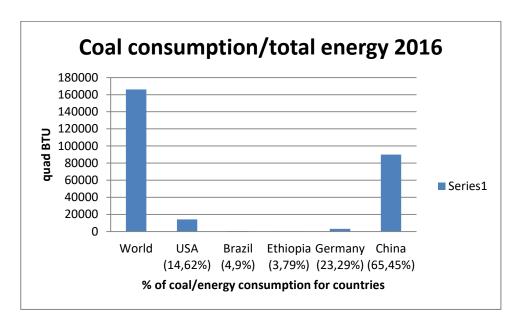
	Country (3 Points)	Reasons (6 Points)
Developed country:		
Developing country:		
Underdeveloped country:		

#### FOSSIL FUELS AND POLLUTION



To obtain the energy needed in our normal activity, we use different energy resources. Nowadays, fossil fuels (coal, oil and natural gas) are the most energy resource used around the world, but in their combustion, they produce gases that pollute the atmosphere, producing global warming, acid rain or chemical fog. Coal is the fossil fuel that produces more pollution gases and natural gas the least.

Activity 13 (5 Points) Look at the sector diagrams below. In this diagram you can observe the coal consumption in front of the total energy used in 2016 by different countries. In your opinion, according to the diagram, which of the countries could produce more atmospheric pollution? Why? (HELP: Giving opinions. Activity 7)



Adapted from e.i.a. (US energy information administration)

#### **Examples:**

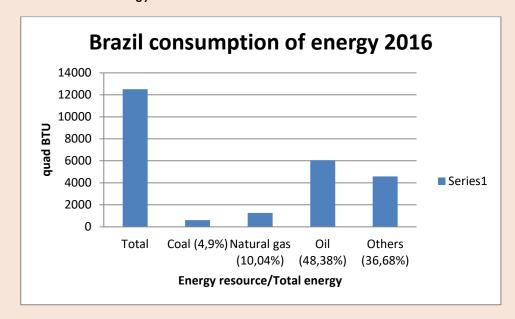
We think that...

In our opinion...

#### TAKING CARE OF OUR WORLD



Climate change is one of the problems in our society. We have to take care of our world with a rational consumption of energy and water. Some countries are promoting the use of renewable energy resources to achieve a better world. **Europe** is one area of the world with more conscience about it. Lots of countries in Europe are developing engines and technologies that take care of our environment. Is true that some European countries, because economic reasons, are not for reduce the use of fossil fuels, but in general, most of them support this idea. Most of the energetic politics in EU are promoting renewable energy resources. Other parts of the world don't think it is a problem for the Earth. Look at the sector diagram below that shows the consumption of energy resources in Brazil in 2016.

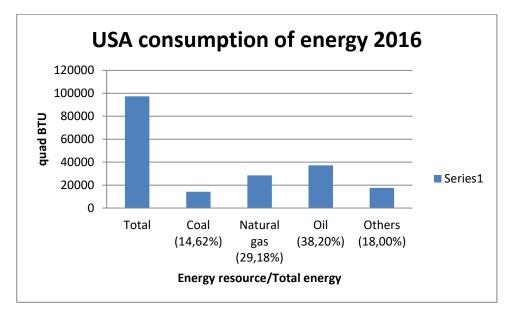


Adapted from e.i.a. (US energy information administration)

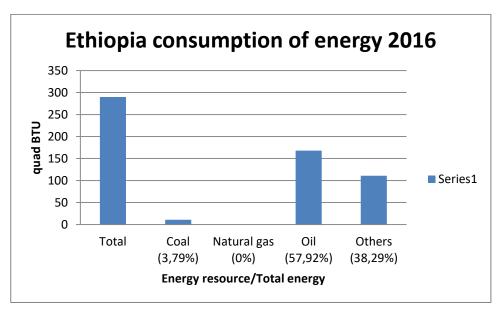
In Others (36, 68%), the diagram includes renewable energy resources. Most of Brazil cars use Ethanol (biofuel obtained from sugar cane and so a renewable energy), and for this reason, the use of renewable energy resources is important in Brazil. However, the use of grains, sugar cane or sunflower oil, etc. to produce biofuel can suppose a problem due to the increase of prices in products used to eat (farmers win more money selling his/her products to biofuel enterprises, and so, the quantity of grain used to produce food decrease causing higher prices). For this reason, it's important the biofuel production but it depends on other factors to be considered.

Activity 14 (10 Points) The sector diagrams below, show the consumption of energy resources in four countries; U.S.A., Ethiopia, Germany and China in 2016. Compare the graphics. What conclusions can you achieve comparing these graphics? Why do you think so? (HELP: Giving opinions in activity 7, and "How to compare?" in activity 10)

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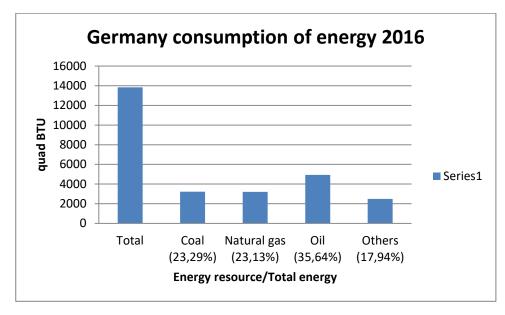


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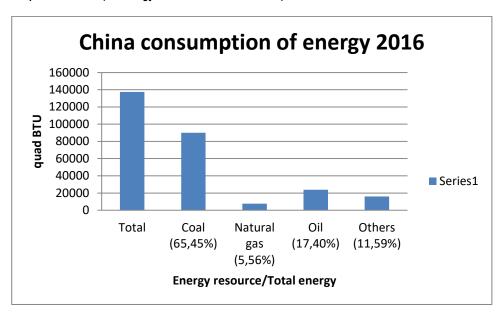


Adapted from e.i.a. (US energy information administration)

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Adapted from e.i.a. (US energy information administration)



Adapted from e.i.a. (US energy information administration)

**COMPARISONS AND CONCLUSSIONS:** 

Activity 15 (10 + 10 points) Classify the following sentences in the columns below according to their use of the energy or the water. After that, write the reasons why you wrote each sentence in a column.

- 1. A short shower is better than a bath.
- 2. Brushing our teeth with the water running.

- Brushing our teeth with the water running.
   Having all the night the computer on without being used.
   Turn off the light when it is not used.
   Use low consumes light bulbs.
   Open the windows while the central heating is on.
   Go to school that is next home by car every morning.
- 8. Use public transport.9. Use the sun light as much as possible.
- 10. Not recycling.

Being energy (or water) efficient	Bad use of the energy (or water)
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

HELP: You can use some expressions as the below:

I think that is/are not energy (water)efficient because
---

# Why is it energy (or water) efficient?

- 1.
- 2.
- 3.
- 4.

# Why is it an inefficient (bad) use of the energy (or water)?

- 1.
- 2.
- 3.
- 4.
- 5.

Activity 16 (10 Points) Write five words related to energy that you knew before these activities and five more words you didn't know and you learnt now.

Words you knew before	Words you learnt now (You didn't know before)
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

Activity 17 (20 Points) (OPTIONAL ACTIVITY; SCALE-UP ACTIVITY) Search for some information on internet about the Paris (2015) and the Madrid (2019) agreements in reference to the climate change. (HOMEWORK)

Describe the EU purposes in these meetings.

U.S.A. is out and they didn't want to sign the agreements. Looking at consumption of energy in U.S.A. in 2016, try to explain which the reasons were for U.S.A. to takes this option. You can look on internet the production of fossil fuel in U.S.A. for example.

Express your own opinion about the agreement achieves. (Help: Giving opinions. Activity 7)

Activity 18 (10 Points) Build a word search with 10 of the key words studied in this scenario. Words can be written in all the directions (diagonal as well). You can use Word or similar software. The letters have to be written in "Arial narrow 11" and must be centred in each square. Each side has 12 squares as the one below:

You have to write questions into a box, to find the words that appear in the word search. Example: if the word that appears in the word search is '*Hydrocarbon*' you can write the question: '*What is the name of a chemical compound composed of hydrogen, carbon and other components?*' (Help: remember to use questions such as: What is..? What is the name of...? How is --- produced...? What are the consequences/effects/causes of ...? What product is obtained...? etc.) Follow the example:

### **FOLLOW THE INSTRUCTIONS BELOW:**

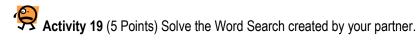
- 1. Choose a theme for the title (WORD SEARCH: ENERGY, for example).
- 2. Each student has to make a list of 10 questions in relation to the title. The answer to each question will be the words that appear in the word search.
- 3. Open a new 'Microsoft Word' document (or similar software).
- 4. Make a beautiful title with 'Word Art'.
- 5. Make a table with 12 columns and 12 rows under the title.
- 6. Select the table, centre it, and use 'Arial narrow', size 11.
- 7. Write the words in the table in different directions: across/down, diagonally, and forwards/backwards.
- 8. Complete the table with mixed letters to hide the words.
- 9. Under this first table, make another table with 1 column and 1 row. In this last table, write the ten questions you chose.
- 10. Print the final document; remember to write your name and group.

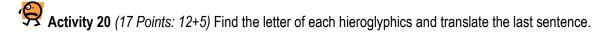
# **EXAMPLE**:

H <sub>1</sub>										
	Y									
		D								
			R							
				0						
					С					
						Α				
							R			
								В		
							ш	_	<b>O</b> <sub>2</sub>	
										N

# Questions:

- 1. What is the name of a chemical compound composed of hydrogen, carbon and other components?
- 2. Liquid fossil fuel





Ex:



1. Liquid fossil fuel:



2. Solid fossil fuel:



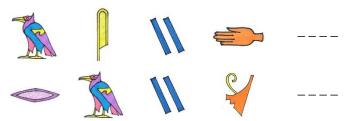
3. Gas used to cook:



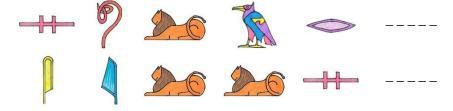
4. Environmental problem due to CO<sub>2</sub> emissions:



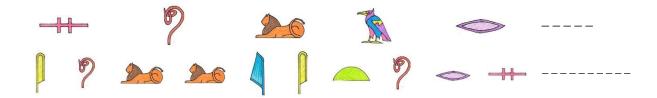
5. Environmental problem due to SO<sub>x</sub> and NO<sub>x</sub> that destroys trees and buildings:



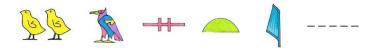
6. Are used in solar calculators:



7. Are used to heat a liquid using solar energy:



8. Refused materials that we don't need:



9. Movements of water, in sees or oceans, going up and down because the moon influence:



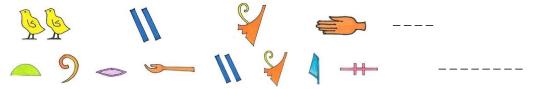
10. Are created by the wind blowing across the surface of the sea:



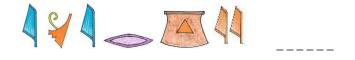
11. Renewable energy that use to need the construction of a dam:



12. To produce electricity using the wind, we need:



**SECRET SENTENCE**: (5 Points)























# **SENTENCE:**

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,	<u>@</u>
•	X

Peer' assessment. Assess pair activities. Your name: \_\_\_\_\_\_ Group:

Put a tick in the right columns in the grid below, and assess your partner's work:

	What to evaluate:	\$ 0.0	٥	(O,O)	
YOUR		COULD BE BETTER 1	SATISFACTORY 2	GOOD 3	VERY GOOD 4
PARTNER'S	Help doing the activities			-	
NAME:	Respects your solutions				
	English level (oral)				
	Follows instructions				
	Adds different ideas				
	Makes/answers questions				
	Proposes solutions				
	TOTAL				/28

Self-assessment Assess yourself:

About the scenario:

1. Make a cross in the table below, according to the things you have learned in this scenario:

What to evaluate	Could be better	Satisfactory 2	Good 3	Very good
I learnt some vocabulary related to energy.	•			-
I can describe different energy resources.				
I can explain how to take care of our world.				
I can describe different graphics.				
I'm able to give reasons, expressing my opinion.				
I can build a sector diagram.				
I enjoy working in groups.				
I can propose different energetic solutions according to places.				
Il can draw an imaginary house in the middle of a forest.				
I can identify different energy				
resources.				
I can calculate energy (work)				
I know the main energy units				/40
TOTAL				/48

2. Write your mark with a cross (a number between 1 and 10).

	1	2	3	4	5	6	7	8	9	10
١										

- 3. What have you learnt from this scenario?
- 4. What was easy for you?
- 5. What did you find difficult?
- 6. What would you find most helpful?
- 7. What did you like doing most?
- 8. What did you like doing least?
- 9. Write the most important words (key words) learnt in this scenario.
- 10. Any suggestions?

Let's talk about energy Technology

In this scenario you have...

- Used English as a way to communicate.
- Worked in pairs, respecting and analysing critically the decisions made by your partners.
- Learnt some vocabulary related to energy.
- Identified some energy resources.
- Described how some energy resources work.
- Learnt something about what can we do to take care of our world.
- Used internet to improve your knowledge.
- Created and interpreted diagrams. Used Excel and Word (or similar software).
- Identified the importance of a rational consumption of energy and water.
- Drawn and described an imaginary house in the middle of a forest, proposing solutions to energy needs.
- Learnt how to write a definition in English.
- Learnt how to compare in English.
- Learnt how to give opinions in English.
- Learnt how to build a Word Search.