PROJECT

MAKING OUR SCHOOL GREEN

IES TORRE VICENS Lleida

2ⁿᵈ ESO

- ➢ SAVING WATER
- ➢ SAVING ELECTRICITY
- ➢ SAVING HEAT
- ➢ RECYCLING AND REUSING

GROUP 1: SAVING WATER

STUDENT'S NAME	ROLE

STUDENT'S NAME	DATE	COMPLETED TASKS

Part I: How to reduce the water consumption

1. Carry out a survey of the water consumption in our school.

a) Complete the table with all the devices that consume water in our school.

Room	Water supply device	Number	DAILY water consumption (l/day)

Here you have some helpful vocabulary:

tap	toilet	classroom	workshop	gymnasium
fountain	dishwasher	laboratory	playground	canteen

b) Calculate the DAILY water consumption by following these steps:

➢ How much water does the tap provide? To find out the water flow of a tap (l/min), carry out this experiment.

1. Place a container with a known volume under the tap

2. Open the tap and time until the container is full of water.

3. Calculate the **water flow** in **l/min**.

1	2	3

> Estimate the number of minutes that the device is working per day (**min/day**)

> To calculate the DAILY consumption, you can use this formula:

water flow (l/min) x min/day = DAILY consumption (l/day)

c) The current price of water in our school is € 0.65/m^3. Calculate how much the water supply in our school costs per YEAR.

2. What are water aerators? These pictures will help you:

Water aerator	Aerated water
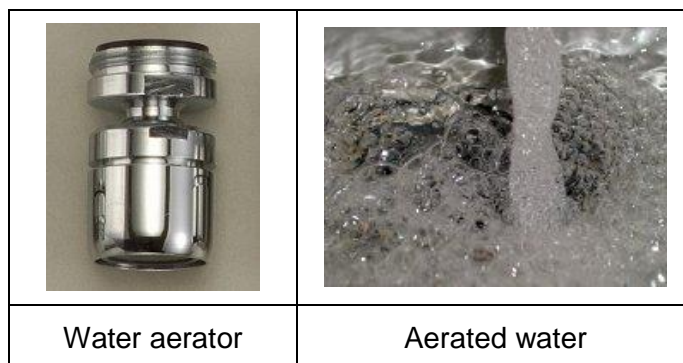
Water aerators are _____
_____.   They
save water because they mix it with _____.

Write down 5 things we can do to save water in our school:

| ACTION	BENEFITS
✓ Install water aerators in taps.	✓ You will save an important volume of water without reducing the time of use.

3. Design a **poster** to *encourage everybody in the school to save water*.

Part II: Planning our garden...

In the playground of our school there is a garden and you are in charge of planning the irrigation system, helping the plants to grow and thinking how to take advantage of the rainwater. Let's start!

1. Select the plants you will grow that suit the local climate and conditions in Lleida best. Find out the amount of water they consume and calculate the water supply you will need to water them. You have the garden's plan in the picture above.

2. Calculate the water consumption of the garden (l/day).

3. Select the best irrigation system to save water:

| *Surface irrigation* | *Sprinkler irrigation* | *Drip irrigation* |
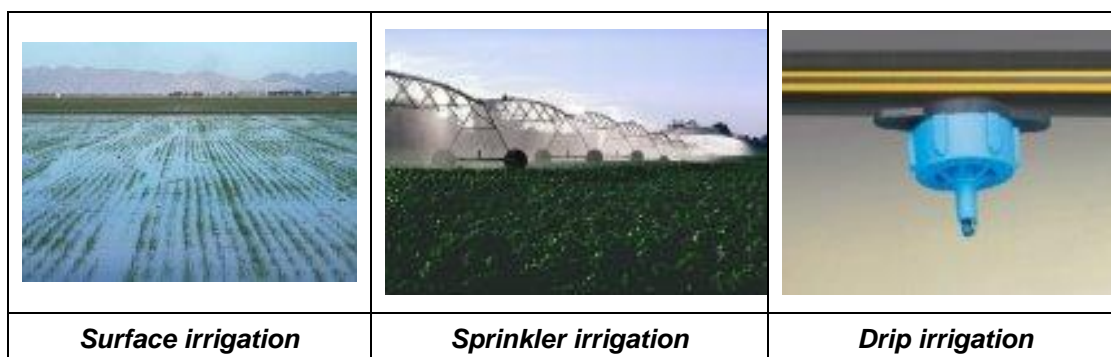
The best system to save water is _____.

4. **In Lleida it rains _____ l/m^2 on average per year**. Find out this information on the internet.

   ➢ How could we store rainwater? Here you have an aerial photo of our school to help you (Clue: think about the roof surface of our school in m^2).

   ➢ Compare the amount of rainwater stored with the amount of irrigation water the plants need. Is it enough?

5. ***Conclusion: Write down the summary of your garden design***:

   We have planned to plant ..... because ...

   The irrigation system we propose is... because...

   In order to take advantage of rainwater, we propose...

   In conclusion,...

GROUP 2: SAVING ELECTRICITY

STUDENT'S NAME	ROLE

STUDENT'S NAME	DATE	COMPLETED TASKS

Part I: How to reduce electricity consumption

1. Carry out a survey of the electricity consumption in our school.

a) Find out the power in Watts (W) of fluorescent tubes in our school. It is written on the fluorescent tube.

W

> How many W are there in 1 kW? _____

> Calculate the power in kW:

kW

b) Calculate the energy consumed by one fluorescent tube in kW·h. You can use this formula:

> Daily Energy consumption (**kW·h**) = **kW** x **hours per day**

c) Complete the table with all the electrical appliances in our school.

Room	Electrical appliance	Number	kW	Hours per day	DAILY consumption (kW·h/day)

Here you have some helpful vocabulary:

coffee machine	classroom	workshop	gymnasium
dining room	library	laboratory	playground	canteen
computers	toilet	photocopier	hall	lobby
computers room		staff room	fluorescent tube	

d) Calculate the **TOTAL DAILY electricity consumption in kW·h /day**.

Each day we consume [   ] *kW·h, that is* [   ] *kW·h per year.*

e) In the electricity bill of our school, each kW·h costs €0.101941. Calculate how much the electricity costs per day (Clue: **total daily kW·h x 0.101941**)

Each day we pay € [   ] *, that is €* [   ] *per year.*

f) How much **CO_2** (kg) is released when generating that electricity? Multiply the daily consumption by 0.454 (Clue: **total daily kW·h x 0.454**)

Each day we release [   ] *kg of CO_2 into the atmosphere, that is* [   ]
kg per year .

2. Some electrical appliances, such as monitors have a green led even when they are not working (**on standby**).

➢ Find out **how many kW·h a led consumes**.

(Remember 1kW = 1,000W = 1,000,000 mW)

➢ Calculate **how many kW·h are wasted every day** in our school.

3. Find out what an **occupancy sensor** is.

4. ***How can we reduce the electricity consumption in our school?*** Look at the number of hours per day that electrical appliances are switched on. Maybe some of them could save energy if we switched them off when they are not necessary.

Write down 6 tips to save electricity in our school:

ACTION	BENEFITS
✓ Completely switch off computers when we are not using them.	✓ We will save an important amount of electricity and heat.

5. Design a **poster** to *encourage everybody in the school to save electricity*.

Part II: What about renewable energy...?

The electricity we are using comes from the grid and most of it is generated in nuclear and fossil fuel power plants.

1. Think about renewable energy resources which could be used to produce our own electricity.

    _____, _____, _____.

2. Choose the most appropriate energy resource taking into account the climate in Lleida. Justify your choice.

    We think that the best renewable energy is _____ because__
    _____
    _____.

3. Investigate **how to produce the electricity** supply we need in our school by means of the renewable energy source you have chosen. Design and propose a solution.

    ➤ Description of the solution:

    ➤ Number of elements we need to buy:

    ➤ Price:

    ➤ Amount of energy produced (kW·h):

➤ Location: Draw your solution on the plan of our school.

4. *Conclusion: Write down the summary of your solution*.

GROUP 3: SAVING HEAT

STUDENT'S NAME	ROLE

STUDENT'S NAME	DATE	COMPLETED TASKS

Part I: How to reduce natural gas consumption

1. Carry out a survey of the temperatures of different spaces in our school.

   a) Measure the temperature in some rooms of the school and complete the following table.

	Room	Temperature (ºC)	Full / empty	Number of windows	Number of heaters	Orientation (N/S/E/W)
1	Our classroom					
2	Empty classroom					N
3	Empty classroom					S
4	Full classroom					N
5	Full classroom					S
6	Workshop					
7	Room 250					
8	Toilet					
9	Computer room					
10	Library					
11	Lobby					
12	Canteen					
13	Gymnasium					

b) Locate the rooms of the table on the aerial photo of the school (write the numbers in the suitable place on the photo).

c) Write down your conclusions. You have some help in the box below:

We've found that	full empty north-faced south-faced inner	rooms are	the coldest warmer than... colder than... the warmest
	rooms with windows		

➢ We've found that...

➢

➢

➢

➢

d) Find out the temperature differences and try to explain why there are these differences among rooms.
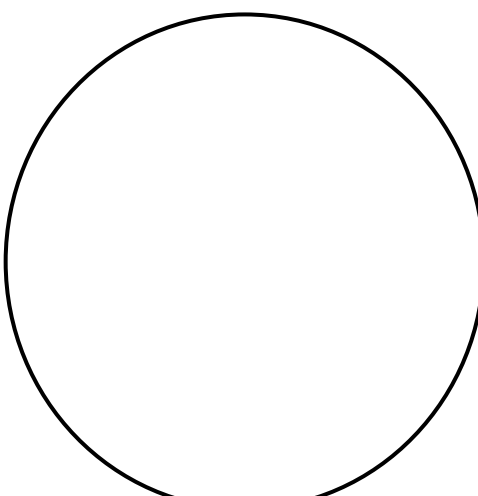
➢ _____ is the warmest room because_____

_____.

➢ _____ is the coldest room because_____

_____.

➢ Rooms that face _____ (N/S/E/W) are warmer than rooms that face _____ (N/S/E/W) because_____

_____.

➢ There is a difference of _____ ºC between an empty room and the same room full of pupils.

e) Heat is lost through doors, windows, walls and the roof. The percentages are shown in the table below:

doors and windows	40-50%
walls	20%
roof	10-20%

Draw the pie chart for those figures:

Title: _____

f) How to reduce heat loss through windows, doors, walls and roof? Do this easy matching activity:

walls	good insulation
windows	keeping doors closed
roof	double-glazing
doors	good insulation

Complete the following sentences.

➢ *Heat loss through* walls *can be reduced by* _____.

➢ *Heat loss through* windows *can be reduced by* _____.

➢ *Heat loss through* the roof _____.

➢ *Heat*_____.

g) Look at the pane/s of one window in our classroom:

➢ Is it a simple (1 pane) or double-glazed (2 panes) window?

_____.

➢ Draw the window to make clear how many panes there are.

h) What is a thermostat? Search for this word on the Wikipedia website.

2. Write down 5 things we can do to save heat in our school:

ACTION	BENEFITS
✓ Close the windows when the heating system is working.	✓ You will save energy and you will be warmer.

3. Design a **poster** to *encourage everybody in the school to save heat*.

Part II: What about renewable energy...?

In order to heat water our school uses natural gas. As you know, natural gas is a non-renewable energy resource.

1. Think about a renewable energy resource which could be used to produce our own hot water for the heating system.

    _____.

2. Investigate **how to produce the heat** supply we need in our school by means of the renewable energy source you have chosen. Find out some information through the internet. Here you have some helpful addresses:

    a) http://www.energysavingtrust.org.uk/Generate-your-own-energy/Types-of-renewables/Solar-water-heating

    b) http://www.brightenergy.biz/how_solar_works.html

    c) http://www.solarpst.com/index_Eng.asp

3. Design and propose a solution to stop using natural gas. Currently, our school consumes **2415 kW·h per month** of natural gas and the bill costs **€ 200 per month**.

    You have seen this advertisement on the internet:

Solar thermal collectors $2.17m^2$ € 400	

    ➤ In Lleida the sun provides on average **4.6 kW·h/m^2 every day**. Calculate how many kW·h/m^2 the sun provides **per MONTH** (1 month = 30 days).

    ➤ As our school needs **2415 kW·h every month**, calculate the surface in m^2 that will be necessary. (Clue: you only have to divide!)

> ➢ We know that 1 collector = _____ m^2. Calculate **how many collectors** we need to buy. (Clue: you only have to divide!)

> ➢ We know that 1 collector = € _____. Calculate the **total price**:

> ➢ We know that every month the gas natural bill costs € _____. Calculate **how long (in months)** it will take to recover the money. (Clue: you only have to divide).

> ➢ Location: Draw your solution on the aerial photo of our school.

4. ***Conclusion: Write down the summary of your solution.***

GROUP 4: RECYCLING AND REUSING

STUDENT'S NAME	ROLE

STUDENT'S NAME	DATE	COMPLETED TASKS

Part I: How much do we recycle and reuse?

1. Carry out a survey of recycling and reusing in our school.

   a) Find out where the recycling points in the school are and complete the following table.

	Room	Recycled material(s)	Reused material(s)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

staff room	toilet	classroom	workshop	gymnasium
corridor	computer room	laboratory	playground	canteen
plastic	metal	paper	glass	books
newspapers	batteries	clothes	wood	old computers

b) Locate the rooms of the table on the aerial photo of the school (write the numbers in the suitable place on the picture).

c) Write down your conclusions. You have some help in the box below:

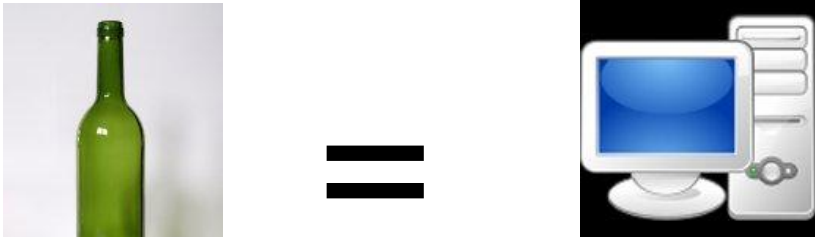| We've found that	metal plastic glass wood old computers newspapers batteries books paint	is isn't are aren't	recycled reused

➤   We've found that...

➤

➤

➤

➤

➤

➤

➤

d) Are there any signs or posters encouraging people to recycle?_____.
Where?____ _____.

e) *Recycling is an excellent way of saving energy and conserving the environment.*

Did you know that?

- ✓ 1 recycled glass bottle would save enough energy to power a computer for 25 minutes.

- ✓ 1 recycled tin can would save enough energy to power a television for 3 hours.

- ✓ 1 recycled plastic bottle would save enough energy to power a 60-watt light bulb for 3 hours.

- ✓ 70% less energy is required to recycle paper compared with making it from raw materials.

- ✓ It takes 24 trees to make 1 ton of newspaper.

- ✓ Plastic can take up to 500 years to decompose.

Draw visuals for the above statements. Here you have one example:

25 minutes

1 recycled glass bottle would save enough energy to power a computer for 25 minutes.

f) Find out how paper and glass are recycled, you can find it on the internet: http://www.recycling-guide.org.uk/science.html

Draw the flow diagrams of paper and glass recycling processes:

PAPER RECYCLING PROCESS:

GLASS RECYCLING PROCESS:

2. Write down 5 things we can do to recycle and reuse more in our school:

ACTION	BENEFITS
✓ Reuse books of last year students.	✓ You will save money because you don't have to buy new books.

3. Design a **poster** to *encourage everybody in the school to recycle and reuse.*
Here you have an example: http://www.recycling-guide.org.uk/pdfs/recyclingguide-poster.pdf

Part II: How to build a compost bin

In the playground of our school there is a garden. Currently grass and plant cuttings are wasted.

Your group is in charge of planning to build a **compost bin** to recycle kitchen and garden waste. It is very easy to build your own compost bin and use the compost to help your garden grow. Let's start!

1. Find out all the waste you could use for composting. You can use the internet: http://www.recycling-guide.org.uk/composting.html

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What to add to the compost pile:

✓ leaves

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2. Explain how to build a ***compost bin***: You can find ideas by browsing through the internet.

> ➢ Material you will use (plastic / wood...): _____.

> ➢ Size: _____

> ➢ Building process: Explain the building process step by step. You can draw pictures or use a flow diagram.

Building process of our compost bin:

> ➢ Draw your solution: