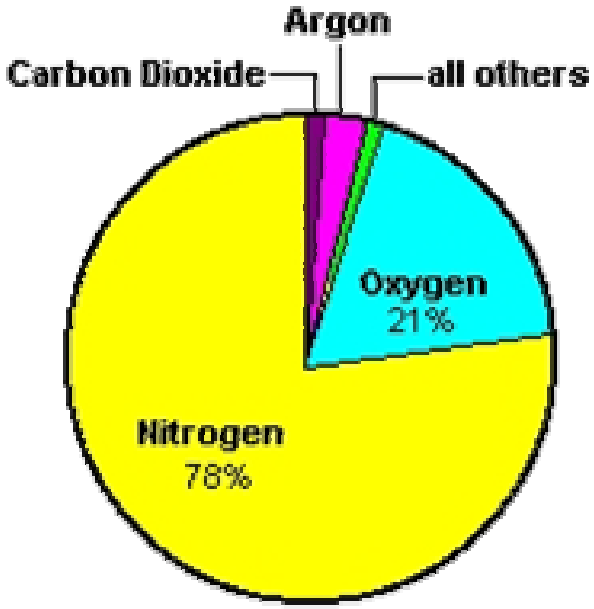
Air & Atmosphere

The **Earth's atmosphere** is a layer of gases surrounding the planet Earth and retained by the Earth's gravity. It contains nitrogen, oxygen, argon, carbon dioxide, other gases, and a variable amount of water vapour.

This mixture of gases is commonly known as air.

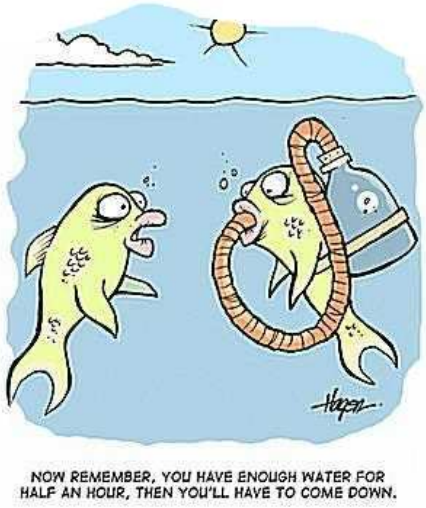


The atmosphere protects life on Earth by absorbing ultraviolet solar radiation and reducing temperature extremes between day and night.

layers

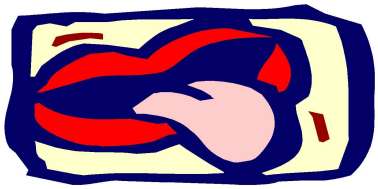
Air properties

Air occupies space. The space air occupies can be reduced, it can be compressed. The volume of air can be increased, it can be expanded.



Air hasn't got a smell, but it carries the smell of things. We smell things with our nose. We have the olfactory sense in our noses.

Air hasn't got taste.



Air hasn't got colour.

Air has weight, even though it is very light. Furthermore hot air is lighter than cold air. Look at the balance scale and see what happens.

Air inventions

Ballooning started in 1783. Human beings always wanted to achieve new challenges and the conquest of air was one of the most challenging.

Scientists already knew that hot air weighed less than cold air, so hot air is lighter than cold air. Consequently an engine that could heat air was required and also a big container to hold the hot air.

The machine must be light. They used things that don't weigh much like fabrics, ropes and wicker to make the basket.

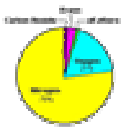
A caged duck, a sheep and a rooster were lifted in a paper and fabric balloon and few months later a French scientist, Pilatre de Rozier also flew.

Complete the chart

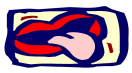
Gases in air	Properties of air	First Balloon flight
		When did ballooning start?
		Which one weighs more - hot or cold air?
		Which materials were used to make the machine?
		Who flew first in a balloon?

Air & Atmosphere

Now complete the sentences with your partners:

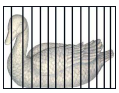


- The air is a mixture of different _____.
- _____ is the most abundant gas in the atmosphere.
- The air contains _____, _____, _____, _____ _____, _____ _____ and _____ _____.
- The atmosphere protects _____ on the Earth.

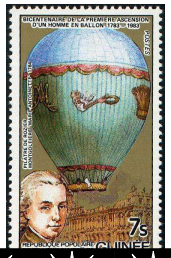


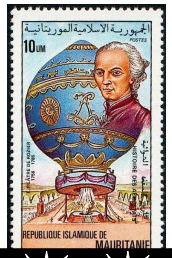
- Air hasn't got _____.
- Air hasn't got _____.
- The _____ air occupies can be **"EXPANDED"** or "compressed".
- _____ has weight, but hot air is lighter than _____ air.

- The _____ started in 1783.
- Scientists know hot air _____ less than cold air.
- Some animals were lifted in the balloon: a _____ _____, a _____ and a _____.



- _____ __ _____ was the first scientist to fly in a balloon.





CHARACTER: PILATRE DE ROZIER

- Serious, calm and polite.
- I want to fly because I like landscape views.
- I don't know because I am not a weather expert.
- I used animals because I didn't know if the balloon would float.
- Sorry, I don't understand the question. Can you repeat, please?

WEATHER FOECASTERS:

- Patient, polite and educated.
- Because hot air is lighter than cold air.
- I mean that hot air weighs less than cold air, so hot air moves up.
- Currently we are using more resistant fabrics.
- Pardon, can you say it again?

INTERVIEWER:

- Forgetful, beginner and confused.
- Why do you want to fly?
- Why does the balloon fly?
- Sorry, I don't get you. What do you exactly mean?
- Why did you put animals on the balloon?
- Do you think this could happen now?

Experiment 1

Blow up a balloon

Procedure: blow into 1 balloon three times.
Blow into another balloon five times.

What is different about the volume of the balloon?

A) The more I blow into a balloon the bigger it gets, because air expands to fill a space.
B) The balloon gets bigger because the air from my mouth is hot.
C) The volume of the balloon is the same.
D) All answers are correct.

Choose the answer and write it in your answer worksheet

Experiment 2

Does air have weight?

Procedure:

Pick up a balloon and weigh it.

Pump air into the balloon three times.

Weigh the balloon again.

Has the weight increased or decreased?

A) The weight has decreased because the air in the balloon makes it lighter.
B) The weight has increased because the air in the balloon also has weight.
C) The weight is the same.

Choose the answer and write it in your answer worksheet

Experiment 3

Is hot air lighter than cold air?

Procedure:

Cut three thin strips of paper.
Hold the strips by one edge.
Place the strips 10cm above the heater.
Turn on the heater.

Why are the strips moving?

A) As hot air is lighter it moves up and makes the strips move up.
B) The strips move because wind is produced by the heat.
C) All answers are correct.

Choose the answer and write it in your answer worksheet

Experiment 4

Blow up a balloon in a Bottle

Procedure:

Check the balloon and the bottle.
Put the balloon inside the bottle
Pull the neck of the balloon over the neck of the bottle.
Blow up the balloon.

Why can't you blow up the balloon?

A) Because the balloon hole is too big.
B) Because air inside the bottle takes up the space and this air cannot escape.
C) Because they have different volumes and also a different colour.

Choose the answer and write it in your answer worksheet

Experiment 5

Extract the air from a container

Procedure:
Hold the tube with your hand
Place it on your lips. Suck the air through the tube
Put your thumb over the end of the tube

What has happened with the water?

A) The water goes up because we create an empty space by sucking the air out.
B) The water goes down because there is less air as we have extracted it.
C) The water doesn't move.

Choose the answer and write it in your answer worksheet

Experiment 6

Stop a water bottle with a hole from emptying

Procedure:

Fill the water bottle
Lift the bottle above the container – see if the water flows out into the container
Now put your finger over the hole in the bottle top
Does the water still flow out?
Cover and uncover the hole in the bottle top and see what happens

Why does the water stop pouring?

A) Because your finger is a magic finger and it's got the power to stop water.
B) Water continues pouring from the bottle
C) As no air can get into the bottle, no water can get out because the volume is the same.

Choose the answer and write it in your answer worksheet

EXPERIMENTS

Experiment 1	Blow up a balloon	
What is different about the volume of the balloon?	Letter	Write the answer

Experiment 2	Does air have weight?	
Has the weight increased or decreased?	Letter	Write the answer

Experiment 3	Is hot air lighter than cold air?	
Why are the strips moving?	Letter	Write the answer

Experiment 4	Blow up a balloon in a Bottle	
Why can't you blow up the balloon?	Letter	Write the answer

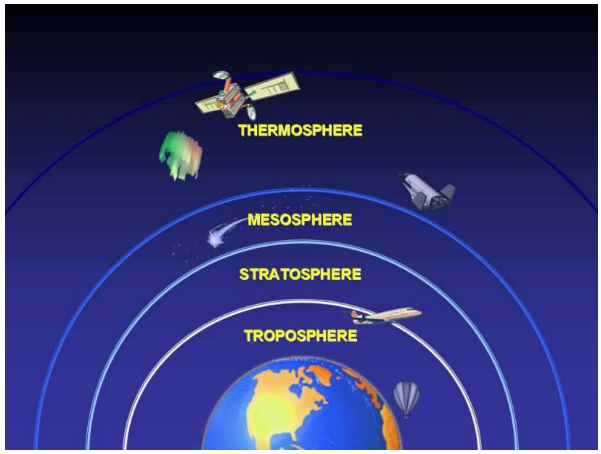
Experiment 5	Extract the air from a container	
What has happened with the water?	Letter	Write the answer

Experiment 6	Stop a water bottle with a hole from emptying	
Why does the water stop pouring?	Letter	Write the answer

2. Atmosphere

Our planet is surrounded by a layer of gases called the atmosphere.

- It is more than 1,000 km wide.
- Without our atmosphere, there would be no life on earth.
- Scientists divided the atmosphere into four layers according to temperature: troposphere, stratosphere, mesosphere, and thermosphere.



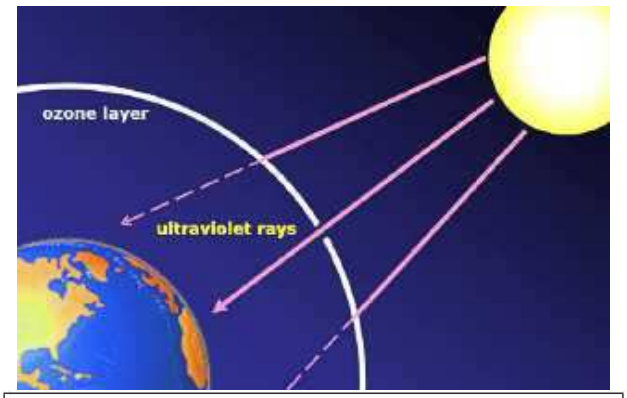
The Greenhouse Effect: Heat from the Sun warms the Earth's surface but most of it is radiated and sent back into space. Water vapour and carbon dioxide in the troposphere trap some of this heat, preventing it from escaping thus keep the Earth warm. This trapping of heat is called the "greenhouse effect".

If there is too much carbon dioxide in the troposphere then it will trap too much heat. Scientists are afraid that the increasing amounts of carbon dioxide would raise the Earth's surface temperature, bringing significant changes to worldwide weather patterns ... shifting in climatic zones and the melting of the polar ice caps, which could raise the level of the world's oceans.

* Do you know why the amount of carbon dioxide is increasing?

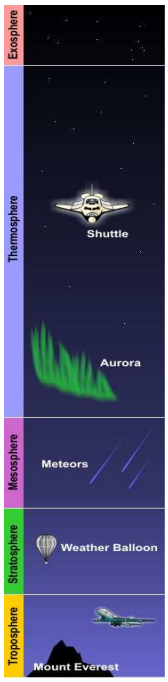
Life on our planet is possible thanks to the atmosphere, as it:

- Regularizes the temperature on the Earth's Surface, and so avoids being too cold in winter and too hot in summer.
- Shields the earth from solar rays, and other life-threatening things.
- Has atmospheric phenomena such as wind, rain, snow...these take place there.



The Ozone Layer: The stratosphere contains a thin layer of ozone which absorbs most of the harmful ultraviolet radiation from the Sun. The ozone layer is being depleted, and is getting thinner over Europe, Asia, North American and Antarctica --- "holes" are appearing in the ozone layer.

3. Atmosphere



Answer the questions following the example:

Which layer do auroras take place in?

Auroras take place in the thermosphere.....

Which layer do long haul airplanes fly in?

.....

Which layer do we live in?

.....

Which layer do most meteors burn in?

.....

Which layer do satellites and space shuttles orbit in?

.....

Complete the questions and match with the answers IN PAIRS:

Why do auroras take place in the ……..?

Why do we live in the ……..?

Why do long-haul airplanes fly in the ……..?

Why do most meteors burn in the ……..?

Why do we call ..... the weather layer?

Why do satellites and space suttles orbite in the ..... ?

Because it is above the stormy weather and the air is rarefied so it offers little resistance to the airplane.

Because the centrifugal force and the planet's gravity are in balance with the weight of the satellite

Because we need high oxygen levels and upper layers have low oxygen levels.

Due to the wind and clouds that bring rain, snow, storms, fronts, etc.

Due to the interaction of energetic particles (electrons and protons) from outside the atmosphere and atoms of the upper atmosphere

Due to the friction that occurs when they hit the upper atmosphere.

USE NUMBERS 1 2 3 4 5 6

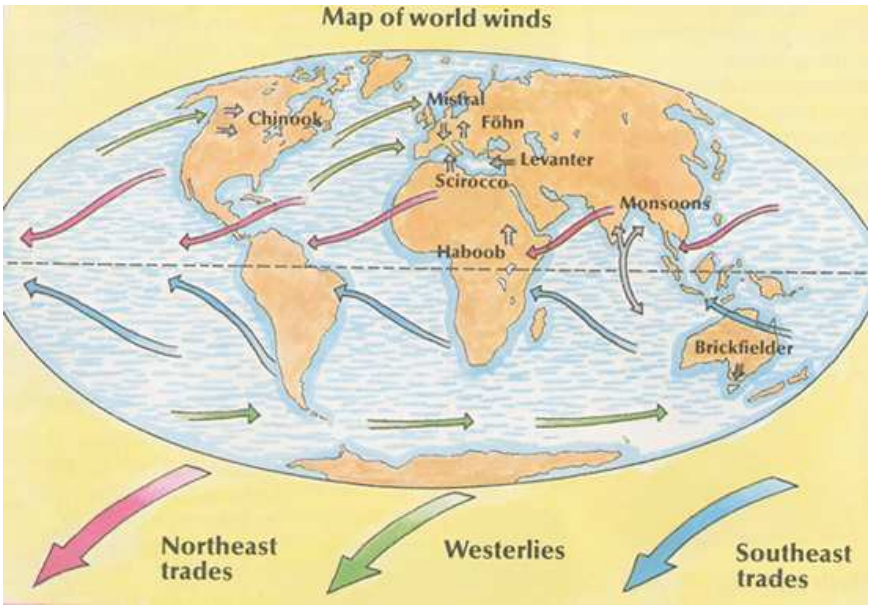
4. Wind

In which of the pictures below is wind used? And how?

Where does wind come from?
The world's atmosphere is forever on the move. Wind is air in motion. Sometimes air moves slowly, giving a gentle **breeze**. At other times it moves rapidly creating **gales** and **hurricanes**.

Gentle or fierce, wind always starts in the same way.

- As the sun moves through the sky, it heats up some parts of the sea and land more than others.
- The air above these hot spots is warmed, becomes lighter than the surrounding air, and begins to rise.
- Elsewhere, cool air sinks, because it's heavier. Winds blow because air squeezed out by sinking, cold air is sucked in under rising, warm air.



Winds will blow wherever there is a difference in air **temperature** and **pressure**.

5. Wind

What is wind?

.....

Explain how wind is produced.

.....

.....

Say three things that use wind.

.....

Do you know if we use wind turbines to produce electricity in Catalunya? Where?

.....

Match the word, the picture and the explanation.

Hurricane

Breeze

Gale

It moves the branches of the trees violently.

It moves the leaves of the trees gently.

It can pull out trees and roofs from houses.

Write true (T) or false (F)

Air moves because of differences in temperature and pressure around the world.

The Scale to measure the wind force is called the wind rose.

Sea breezes happen during the night and land breezes happen during the day.

The Coriolis Effect affects the direction of the wind.

Windmills were once used to grind wheat to make flour.

A gale is necessary to fly a kite.

Hurricanes blowing on wind turbines are good for electricity generation.

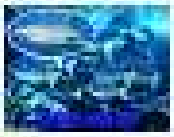
Sailing ships move thanks to the force of the wind

Air & life

Answer the questions following the presentation.

Do terrestrial animals need air?.....
What do animals need from air?.....
Where do you think it comes from? .....

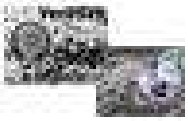
Do plants need air? .....
What do plants need from air?.....
Where do you think it comes from? .....



Do fish need air? .....
What do fish need? .....
What do you think they breathe with?.....

Do aquatic plants need air?.....
What do they need? .....
Where do you think it comes from? .....

Do insects need air? .....
Do they breathe as animals? .....
What do they breathe with? .....



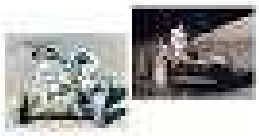
Do bacteria and yeasts need oxygen? .....
Where do bacteria live? .....
Where do yeasts live?.....

Do animals need CO_2?.....
What do you think CO_2 provides for animals?.....
Where do you think it comes from? .....

Do plants need CO_2? .....
Why do you think plants use CO_2 to?.....
How do they take it in through?.....

Complete:

Alpinists wear oxygen masks **because**.....
Vehicles or planes need.....**because**.....
Astronaut cars are electric **because** .....



6. Air pollution

Circle the things that you think pollute the air.










WE SAY THAT AIR IS POLLUTED WHEN IT IS DIRTY.

When **air is polluted our life is in danger**, as well as animal and plant lives. When breathing polluted air **harmful substances** enter in our body.

Most times pollution comes from human activities and our technical advances made to improve our life quality. In other words, while in one hand we improve our material life on the other we degrade environment.

Think about five things in your daily which pollute and three that do not. Are the polluting things really necessary?

Discuss in pairs:

*What's better improve our material life or pollute less.

Improve our material life	Pollute less
➢ I think we need …	➢ I think we should use low energy…
➢ We cannot stop using …	➢ We should/ shouldn't use…
➢ I agree, but…/ I don't agree	➢ I (don't) agree …

Make hypothesis:

If pollution continues increasing...

1 .....

2.....

3.....

4.....

Make a poster promoting public transport means.

7. Polluted areas

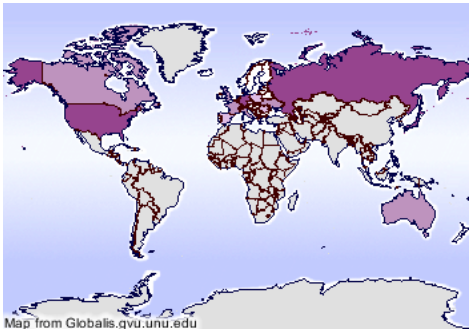
What do you think about pollution in these places?

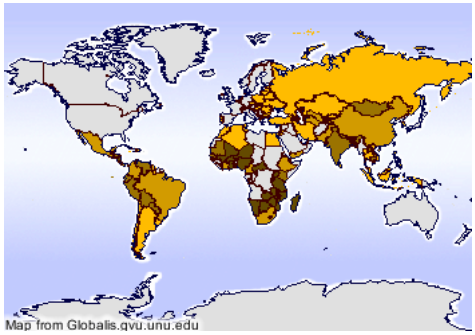
City landscape	Village Landscape
➢	➢
➢	➢
➢	➢
➢	➢
➢	➢

Do you think pollution from cities can pollute the air of villages? Why?

.....

Look at the maps below: what do you think they are about?





Which do you think pollute more, rich countries or poor countries?

.....

Which effect has air pollution on the Earth?

.....

Which is the gas that makes it happen?

.....

Can this gas produce any other effect?

.....

List three things that produce this gas.

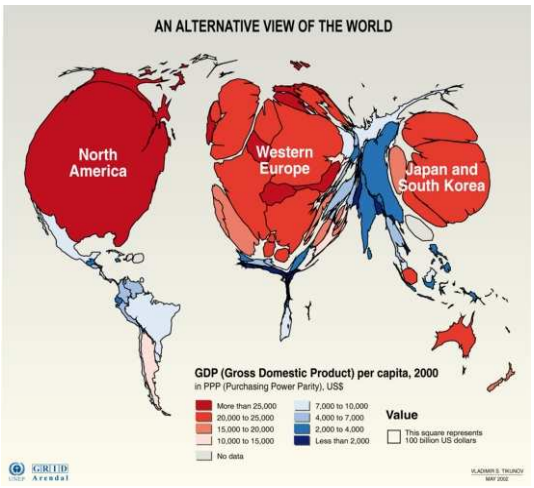
1. .....
2. .....
3. .....

7. Polluted areas

Today we think of carbon dioxide as a dangerous **green house gas** that leads to **global warming**, but throughout Earth's long history carbon dioxide has played a vital role in keeping our planet at the right temperature for complex life to survive.

Our influence is now so great that scientist have declared that a new geological era has begun.

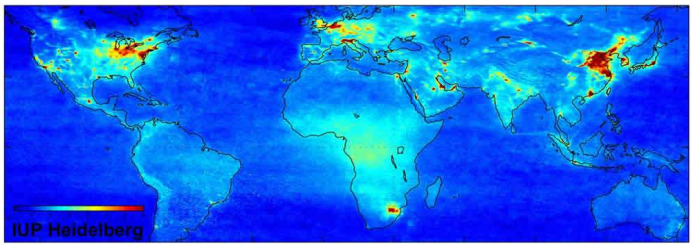
Look at the map:



What do you think it is reflecting?

Who do you think should reduce their harmful emissions?

What are the red spots in this real map?



Can you find any similarity between the maps?

.....

Burning fossil fuels to get energy for industries pollutes a lot.
What other non-polluting energy sources could be used?

.....

Can cars use non-polluting energy to function?

.....

What must we do before cars use them?

.....

Write a slogan for the poster you did last session:

8. Beating air pollution

You can make a difference every day.

- **Save electricity!**

- **Use your own energy!**

- **Recycle!**

Draw the symbol in each box:

			
Each tonne of glass recycled saves 24 litres of fuel.		Going to school on foot.	
			
Don't leave the fridge door open.		Switch off computers and televisions when you have finished with them.	
			

This is why...

- Electricity has to be generated and it largely comes from power stations.
- Walking and cycling, instead of using a car, is not just good for the planet – it is better for me, too!
- Recycling rubbish saves resources such as gas and coal from being burnt for power.

8. Beating air pollution

Explain some of the actions you take in you daily life and some that you do. You can use the previous activity to help.

Ex: In my home I use low energy bulbs to save electricity because electricity has to be generated and it largely comes from power stations.

.....
.....

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

Look at the picture and read below:

Square the natural polluting things in green and the human ones in red.
Which do you think are the two more polluting?

.....

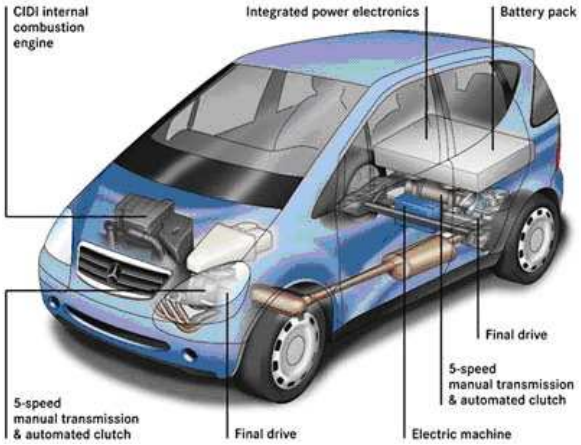
Match the definitions with the pictures above. Write the names after them.

A mountain having a crater at the summit, the CO_2 and lava expelled through it. .....
A complex of structures, machinery and equipment for generating electric energy. .....
A building or group of buildings with facilities for the manufacture of goods. .....
A burning mass of material, as a forest. .....
A mean in or by which someone travels. .....
A municipality of high rank, usually based on population. .....
A chemical derived from petroleum or natural gas. .....

New cars

The car is one of the biggest polluters. Half of the world's oil is used in vehicles.

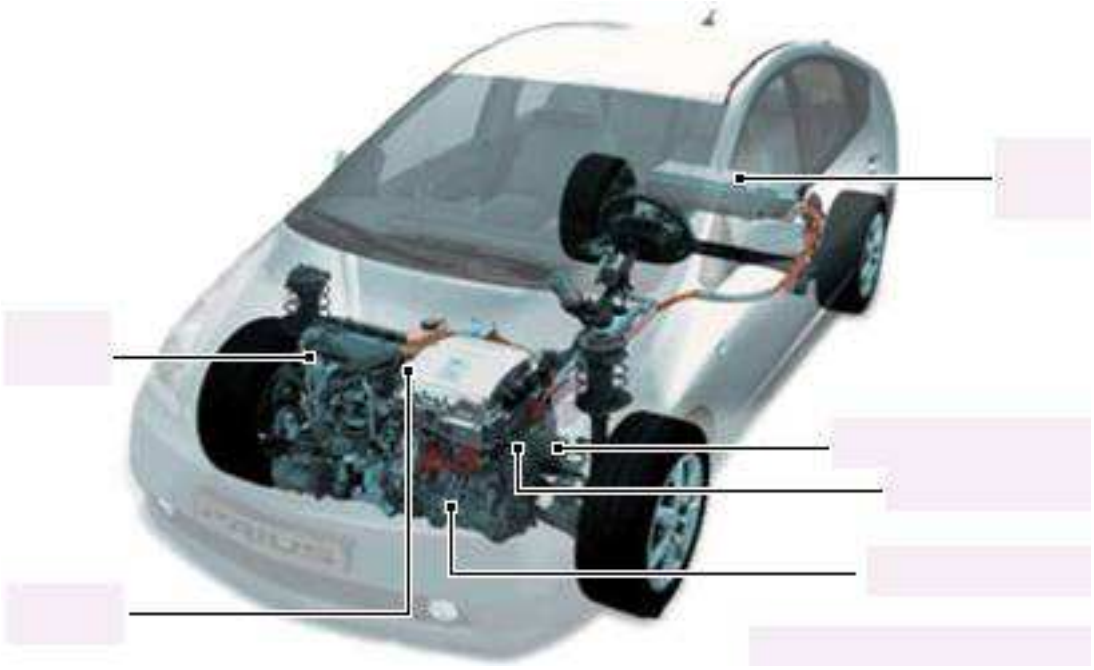
New transport is being developed that use less fuel.



New cars like this use half as much fuel. Hybrid cars can go much further than other cars on the same amount of fuel. At low speeds in city traffic, they run on electricity and at higher speeds on petrol. Most people are concerned about higher fuel costs.
They use cars that are more fuel efficient.

Not all Hybrid cars are equal. Try to label the car below. Use the words from the box.

Battery	Engine	Electric motor	Inverter	breaking system	Power split device



Cars taxes

Changing taxes to reduce pollution: Spain finally adopting CO2-dependant tax system

Finally, the Spanish government has announced the tax scheme for the matriculation tax, a tax paid when a vehicle is purchased. This new scheme, to be started in January 2008, depends on the CO2 emissions of the vehicles.

Until now, the matriculation tax was a 7 percent of the base price for cars under 1.6 litres (gasoline) or 2.0 litres (diesel). From January, the tax will be called "Green tax" and will be distributed like this:

- No tax for cars with emissions under 120 CO2 g/km like Peugeot 107

- Between 121 and 161 CO2 g/km: 4.75 percent like Renault Mégane

- Between 161 and 200 CO2 g/km: 9.75 percent like diesel MPVs

- Over 201CO2 CO2 g/km: 14.75 percent bad for SUVs

This measure has been adapted because of the alarming rising level of CO2 emissions. The Government is seriously concerned about the country's failure in accomplishing the Kyoto protocol.

What is the text about?

A) A law which controls the speed of the cars.
B) A tax on cars that depends on the CO_2 emissions of the vehicles.
C) A new model of car which speeds more than all the cars shown before.

Do you like luxury big cars? Why?

.....

Do you think it is a good measure? Why?

.....

What is the Kyoto protocol?

A) A protocol to buy a new car.
B) A protocol to enlarge the sales of expensive cars.
C) A protocol to reduce the CO_2 emissions to the atmosphere.

Do you know if any other country has a similar tax for cars? Which?

.....

What car would you like to buy?

.....