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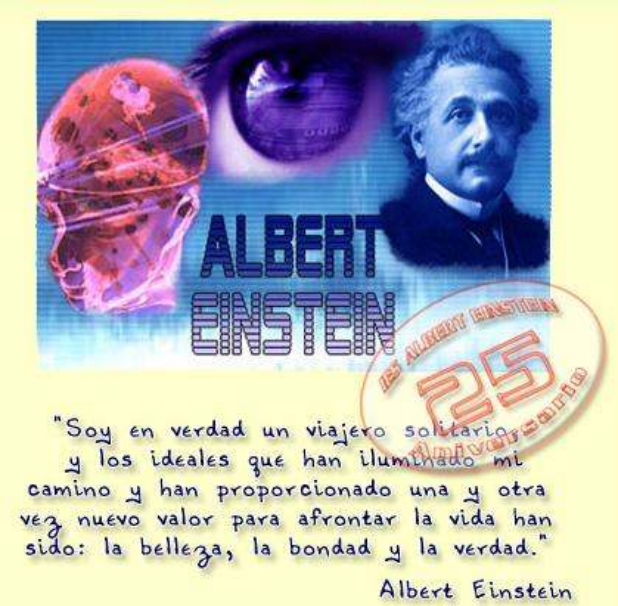
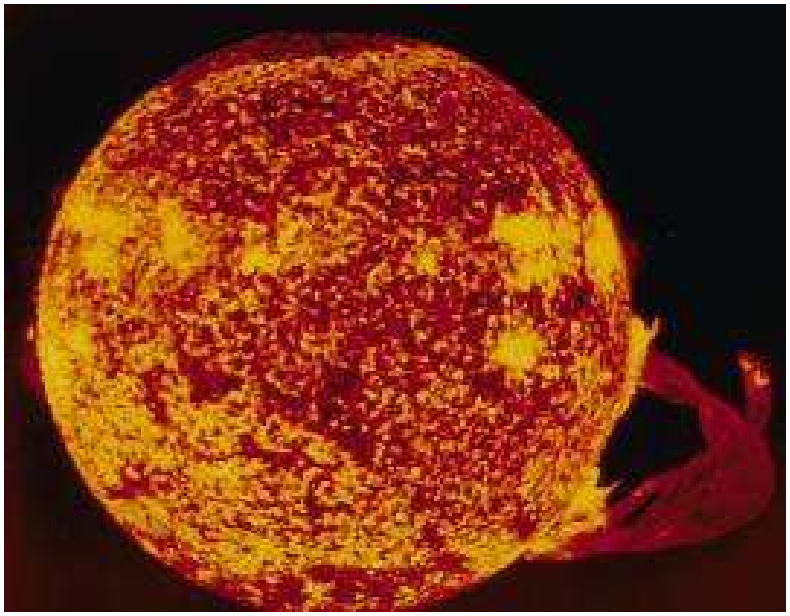


DEPARTAMENTO DE FÍSICA Y QUÍMICA

SCIENCE



C/ Salineros s/n. Sevilla 41015. Tfno. 955623746-7-8-9 Fax. 955623750

UNIT I. THE UNIVERSE

Objects that we can see in the sky are called celestial bodies.

The **Universe** is made up of various celestial bodies, such as stars, planets and satellites. **Stars** are celestial bodies that emit their own light and illuminate other celestial bodies in the universe. Stars appear small to us even though they are very big because they are millions of miles away from the Earth. The **Sun** is the closest star to the Earth.

Sometimes groups of stars form imaginary patterns called **constellations**. You can often see constellations at night when there are no clouds in the sky.

Planets are celestial bodies that do not emit their own light. Instead, they receive light from the stars. Planets are big and round and orbit the Sun. There are many planets in the Universe. Our planet is called planet Earth.

Satellites are celestial bodies that do not emit their own light, and they orbit the planets. Most planets have satellites. Earth only has one satellite called the **Moon.** Some planets have up to sixteen satellites!

1. THE SOLAR SYSTEM

The **Solar System** is made up of one star called the Sun, eight planets that move around the Sun, and other small celestial bodies.

Although the Sun is millions of kilometres away from us, it is our closest and most important star.

The Sun's rays make life on Earth possible because they give us light and heat.

The following are the eight planets that move around the Sun: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.

The Sun's rays are so intense that looking at the Sun with a telescope can damage your eyes and cause blindness.

We live on planet **Earth**. If you look at the Earth from the sky, you will see that it is round and covered mostly by water, which makes the Earth look blue. This is why we call our planet the "Blue Planet."

The Earth only has one satellite called the **Moon**. The Moon looks bright because it reflects the light of the Sun like a mirror. Although we can see the Moon better at night, we can also see it during the day. Neil Armstrong was the first human to walk on the Moon in 1969. Several astronauts have walked on the moon since then.

Finally, although we cannot feel the movement of the Earth or the Moon, it is important to understand both of them because their movements are why we have the seasons of the year and eclipses.

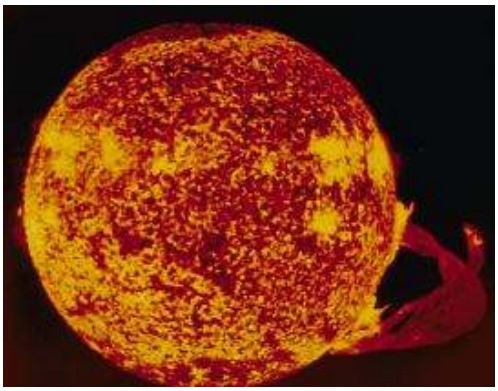
The first four planets are called the inner planets. The inner planets are Mercury, Venus, Earth, and Mars. They are relatively small and rocky in nature, similar to the Earth.

The next four planets are called the outer planets. The outer planets are Jupiter, Saturn, Uranus, and Neptune They are much larger planets and are very gaseous in nature. Pluto used to be considered a planet, but in 2006 the International Union of Astronomers reclassified Pluto as a dwarf planet.

All of the celestial bodies in our Solar System revolve around the Sun. The Sun is so big that you could fit everything in our Solar System inside of the Sun several times.

Many scientists believe that our Solar System is over 4.6 billion years old.

2. THE SUN



Life on our planet is possible because the Sun gives us large amounts of light and heat.

The Sun contains about 98% of the mass of the entire Solar System.

The Sun is a medium-sized star, also known as a yellow dwarf. It is about 1.4 million kilometres in diameter.

The Sun is the center of our Solar System. All of the planets and other objects orbit around it.

The Sun is very gaseous, and made mostly of hydrogen.

It contains darkspots that are known as sunspots.

3. METEORITES

Meteorites are often confused with meteors and meteoroids.

Meteorites are rocks from space that strike the Earth.

Meteors (also known as shooting stars) are the same kind of object as meteorites, except they are still in space.

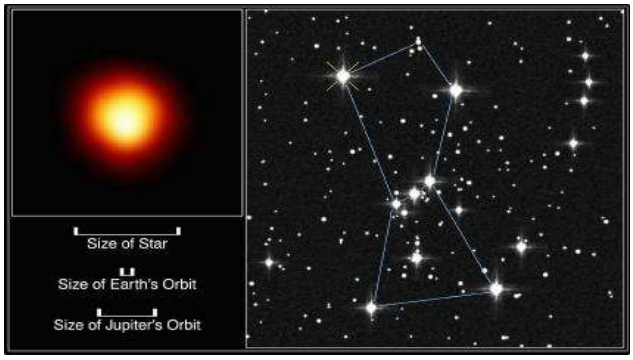
Meteoroids can be tiny particles left behind by a comet or can even be an asteroid. Meteoroids are in orbit around the Sun.

Meteorites are usually classified as stones, irons or stony irons.

Meteorites are often very large. The Barringer Crater in Arizona, which was caused by a falling Meteorite, is just over 0.5 miles across and 660 feet deep.

The picture above is an example of a Meteor shower.

4. STARS



Stars are initially formed from gas and dust. They are mainly composed of hydrogen gas.

Stars are very hot and give off huge amounts of energy in the form of heat and light.

Our Sun is a medium-sized star.

Stars have a life-span of about 10 billion years, after which they will cease to exist.

Stars are very far away from Earth. The closest Star is about 23.5 trillion miles away.

Stars pass through many phases during their lifetime. Examples of these phases are Red Giant, Planetary Nebulae, White Dwarf, Neutron or even Black Hole.

5. GALAXIES

Galaxies are a collection of gas, dust and stars.

Galaxies are often very large. For example, our Galaxy is made up of over 100 billion stars. The Sun is just one of the stars in our Galaxy. Our Galaxy is over 100,000 light-years across and 3,000 light-years deep. Our Sun is about 30,000 light-years from the centre of our Galaxy.

It is estimated that there are billions of other galaxies in the universe.

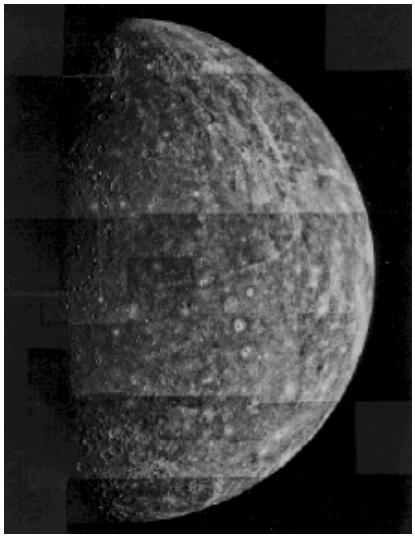
The **Milky Way** is a band of light produced by the thousands of stars that lie in the main section of our Galaxy.

Galaxies are divided into types. The major types of galaxies are spiral, elliptical, lenticular, and irregular. We are part of a spiral galaxy.

The photograph at the top is an example of a distant spiral galaxy named M100.

6. PLANETS

MERCURY



Mercury is about the same size as the Moon. Its mass (i.e., weight) is 1/20th that of the Earth. Its diameter is 2/5 that of our planet.

Mercury is the closest planet to the Sun. It is about 58 million kilometres from the Sun. It makes one complete orbit around the Sun every 87.97 days.

Mercury rotates on its axis very slowly compared to the Earth. It completes one rotation in about 58 days and 15 minutes.

Mercury is covered with mountains, craters, ridges and valleys. It has no satellites.

VENUS

Venus is the closest planet to the Earth. It is about the same size as the Earth.

Venus is the second planet from the Sun. It is about 108 million kilometres from the Sun. It makes one complete orbit around the Sun every 224.7 days.

It rotates on its axis more slowly than any other planet. It completes one rotation in about 243 days and 24 minutes. It is the brightest object in our sky, aside from the Sun and Moon. It has no satellites.

EARTH

We live on the planet Earth. It is the third planet from the Sun. It is about 150 million kilometres from the Sun.

It makes one complete orbit around the Sun every 365.27 days. It rotates on its axis a bit slower than Mars. It completes one rotation in about 23 hours and 56 minutes.

The Earth is covered mostly by water (75%). It has a total of 1 satellite called the Moon.

MARS

Mars is sometimes called the Red Planet. Its mass (weight) is 1/10th that of the Earth. Its diameter is half the diameter of our planet.

Mars is the fourth planet from the Sun. It is about 228 million kilometres from the Sun. It makes one complete orbit around the Sun every 686.98 days.

It rotates on its axis about the same speed as the Earth. It completes one rotation in about 24 hours and 37 minutes.

Mars has seasons similar to our planet, but they last much longer. It has a total of 2 satellites, also known as moons.

JUPITER

Jupiter is the largest of all the planets. Its mass (weight) is over 320 times that of the Earth. Its diameter is over 10 times that of our planet.

Jupiter is the fifth planet from the Sun. It is about 780 million kilometres from the Sun. It makes one complete orbit around the Sun every 11.86 years. It rotates on its axis faster than any other planet. It completes one rotation in about 9 hours and 50 minutes. It is one of the brightest planets. It has a total of 16 satellites.

SATURN

Saturn is the second largest of all the planets. Its mass (weight) is over 95 times that of the Earth. Its diameter is over 10 times that of our planet.

It is the sixth planet from the Sun. It is about 1.4 billion kilometers from the Sun. It makes one complete orbit around the Sun every 29.46 years.

Saturn rotates on its axis at a very fast speed. It completes one rotation in about 10 hours and 39 minutes. Saturn is known for its many rings. It has a total of 21 satellites.

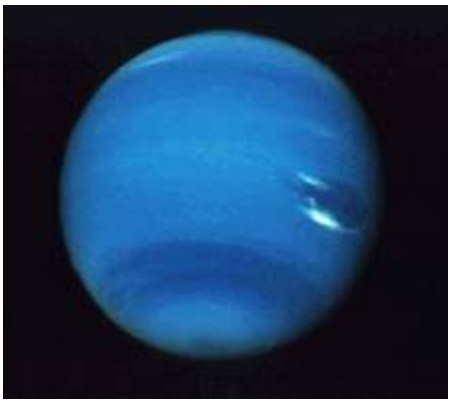
URANUS

Uranus is composed mainly of hydrogen and helium gas. Its mass (weight) is over 14 times that of the Earth.

Its diameter is 4 times that of our planet. It is the seventh planet from the Sun. It is about 2.9 billion kilometres from the Sun. It makes one complete orbit around the Sun every 84 years.

It rotates on its axis at about the same speed as Neptune. It completes one rotation in about 17 hours and 14 minutes. It can sometimes be seen with the naked eye. It has a total of 15 satellites, also known as moons.

NEPTUNE



Neptune is very similar to Uranus in size. Its mass (weight) is over 17 times that of the Earth. Its diameter is 4 times that of our planet. It is the eighth planet from the Sun. It is about 4.5 billion kilometres from the Sun. It makes one complete orbit around the Sun every 164.79 years.

It rotates on its axis at about the same speed as Uranus. It completes one rotation in about 18 hours and 26 minutes. Neptune has a weather system that is very active. Some storms with winds of up to 400 miles per hour have lasted for hundreds of years on its surface. It has a total of 8 satellites, also known as moons.

7. SATELLITES

THE MOON

The Moon is the only object in space that man has been able to visit. This is partly because the Moon is much closer to the Earth than the other planets (It is about 240,000 miles from the Earth).

It has a diameter of about 3,476 kilometers.

It takes 27.3 days for the Moon to make one complete orbit around Earth. The Moon also completes one rotation on its axis about every 27.3 days.

The Moon has many craters on its surface. The craters were formed by meteor crashes a long time ago.

The Moon causes many of the tides in the Earth's oceans due to the force of gravity between the Earth and Moon.

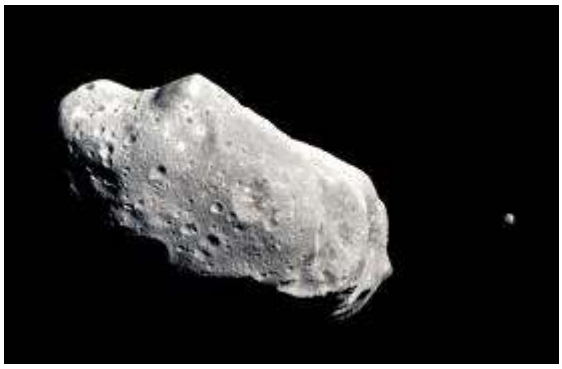
The Moon can be seen clearly with your eyes, binoculars, or a telescope.

8. COMETS

Comets are objects made up of gas, ice and dust. They travel around the Sun in an orbit. They get warmer as they approach the Sun. This causes the Comet to form a head and a tail. The head is the cloud-like mass we see in the front. The tail is the trailing part which is made up of small particles and ice.

Comets lose mass each time they pass through the inner regions of the Solar System. They are usually named after the person who discovered them. Halley's Comet (above) and Hale-Bopp Comet (right) are two famous comets.

9. ASTEROIDS



Asteroids are also known as the Minor Planets.

Asteroids orbit the Sun. Most of them are between the orbits of Mars and Jupiter. This area is called the asteroid belt.

They usually range in size from 1 kilometer to 1000 kilometers across.

They are difficult to see because of their small size.

Gaspra (bottom left) and Ida (above left) are two known Asteroids. Ceres, Pallas, Juno and Vesta are some of the other largest Asteroids.

Some asteroids have moons that orbit them. Notice the small moon that orbits Ida (above left).

ACTIVITIES

1. Describe what the universe is.

2. Describe what a star is.

3. Explain how a planet is different from a star.

4. Explain how a planet is different from a satellite.

5. What is Earth? Does the Earth have a satellite? What is the name of the star closest to the Earth?

6. Describe what celestial bodies are in the Solar System.

7. Identify the name of the planet that we live on.

8. Name what things are necessary for life to exist on a planet.

9. Explain what the Sun and the Moon are.

10. Explain why we call the Earth the “Blue Planet”.

11. How long does the Earth take to orbit the Sun?

12. How long does the Earth take to rotate on itself?

13. What is the phase of the Moon if it looks like a ball?

14. Find out which side of your home the Sun rises on and which side it sets on. Draw two pictures.

15. Do you know what a planetarium is? Tell the class.

UNIT I. THE UNIVERSE

Peter (male student): Mr. / Mrs. (last name of teacher), why is this unit so important?

Teacher: Well, do you ever look up at the sky at night?

Alexandra (female student): Yes, Mr. / Mrs. (last name of teacher), I often look up at the sky at night because I like astronomy. Could I ask you some questions?

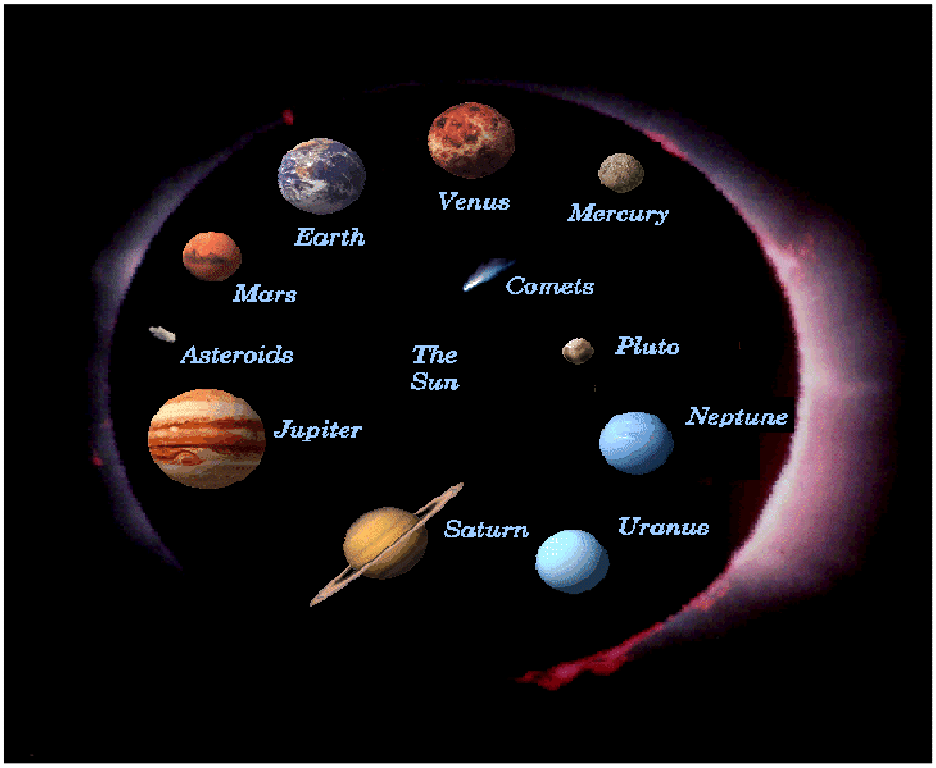
Teacher: Before I answer your questions, I want to make sure that you understand the meaning of the nouns that appear in this lesson. I also want you to do the activities so I know you have understood all of the concepts.

Every student: OK. Could we keep it short?

Teacher: Don't worry, it will be brief. After we finish the activities, we will use the computers because I want you to see an interesting website that allows you to build your own universe. Are you ready?

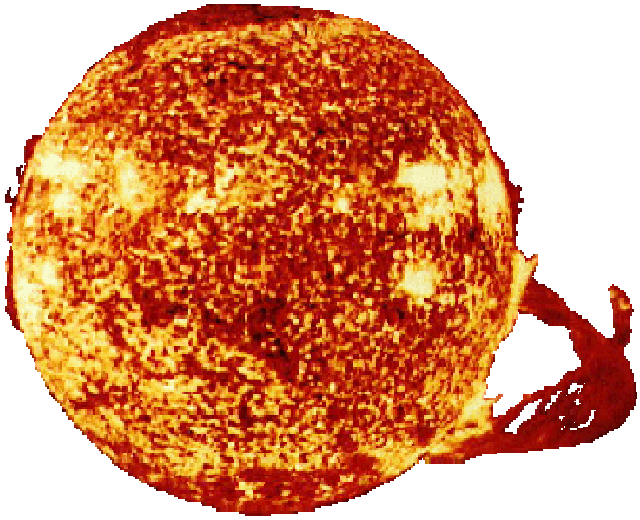
Students: Yes, let's begin.

Teacher: Look at this.



This is called our **Solar System**. Our Solar System consists of the Sun, the eight official planets, at least three "dwarf planets," more than 130 satellites of these planets, a large number of small bodies (comets and asteroids), and the interplanetary medium. There are probably many more planetary satellites that have not yet been discovered. Our solar system was born 5000 millions of years ago from an enormous cloud made of dust and gas. Now I am going to tell you about each of the objects in our Solar System:

First, the Sun:



The Sun is a star, or rather, a big ball of gas that emits its own radiation.

The temperature on the surface is around 6000 ºC.

The Sun is our source of heat, light and energy. We could not exist without the Sun. The Sun is made up of Hydrogen (80%) and Helium (20%) due to a process called nuclear fusion, where hydrogen atoms are fused together to make a Helium atom.

Second, asteroids:

Asteroids are rocky bodies that are smaller than planets and often irregular in shape and orbit around the sun.

The largest known asteroid is Ceres, which was the first asteroid to be discovered in 1801. Ceres is about 1/3 the size of our moon. It can be seen in an amateur telescope if you know where and when to look.

Third, comets

Comets orbit the sun on a very long trajectory.

Comets are among the most brilliant and most rare objects in the night sky. These soaring beacons with their beautiful tails come from the outer realms of the Solar System.

They are made of dust and ice, similar to a dirty snow ball.

Comets come from two places: The Kuiper Belt and the Oort Cloud.

1. What is the sun?

A. ? The sun is a star

B. ? The sun is a planet

C. ? The sun is another solar system

D. ? The sun is another galaxy

1. Distances in space are measured by light-years. What is a light-year?

A. ? A light-year is the distance from the sun to the earth

B. ? A light-year is a year that has more sunlight due to good weather

C. ? A light-year is the distance light can travel through space in a year

D. ? A light-year is the distance from the earth to the moon

1. Which planet is the hottest?

A. ? Earth

B. ? Venus

C. ? Mars

D. ? Mercury

1. Beginning with the closest to the sun, what is the correct order of the planets?

A. ? Mercury, Saturn, Earth, Mars, Jupiter, Venus, Uranus, Neptune and Pluto

B. ? Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto

C. ? Mars, Venus, Earth, Mercury, Jupiter, Saturn, Uranus, Pluto and Neptune

D. ? Mercury, Mars, Earth, Venus, Jupiter, Saturn, Uranus, Neptune and Pluto

2. How long does it take for the sun's heat and light to reach Earth?

A. ? 22 minutes

B. ? 10 minutes

C. ? 8 minutes

D. ? 5 minutes

3. What is the solar system?

A. ? The solar system is the sun, its corona, sun spots and flares

B. ? A solar system is made up of the sun and everything that travels around it

C. ? The solar system is all the stars in the galaxy

D. ? The solar system is the life cycle of a star, from yellow dwarf to red giant and then white dwarf

UNIT 2. THE EARTH

READ AND LEARN

There are millions of stars in the universe. One of them is the Sun. Planets revolve around stars. For example, our planet, Earth, orbits the Sun.

In this unit we will learn more about the Earth's movements and the methods we use to find our way around.

1. THE EARTH IN THE UNIVERSE

THE SHAPE OF EARTH

Earth is one of the planets in the Solar System. It is in the shape of a sphere, rounded and a bit flat at the North and South Poles.

The Earth's **axis** is an imaginary straight line that runs through its centre. The Earth rotates around this axis. This movement around the axis is called its rotation.

The top of the Earth, where the axis begins, is called the North Pole. The bottom part of the Earth, where the imaginary ends, is called the South Pole.

The **equator** is an imaginary circle that divides the Earth into two halves. The top half is called the northern hemisphere, and the bottom half is called the southern hemisphere.

THE PARTS OF THE EARTH

The Earth has three different parts:

- The **solid** part, which consists of rocks and minerals.

- The **liquid** part, which consists of water. This part occupies three times more space than the solid part.

- The **gaseous** part, called the **atmosphere**, which consists of gases like oxygen, hydrogen, and nitrogen.

Thanks to our water and atmosphere, living things can survive on Earth.

2. THE MOVEMENTS OF THE EARTH

ORBIT AND ROTATION

The Earth has two movements: **rotation** and **orbit.**

When the Earth rotates around its imaginary axis, the movement is called **rotation**. The Earth takes 24 hours, or one entire day, to rotate on itself. This movement is why we have days and nights.

The Earth is a planet that moves around the Sun. This movement around the Sun is called **orbit**. The Earth takes 365 days and 6 hours to make one full orbit of the Sun.

After four years, the extra 6 hours from each orbit add up to 24 hours, which equals one full day. For this reason, every four years, we have a leap year, or a year with 366 days. We add this extra day to the month of February, which has 29 days in a leap year.

We have different **seasons** due the Earth's orbit and its inclination toward the Sun.

THE SEASONS

The four **seasons** are: **winter, spring, summer** and **autumn.**

- **Winter** is the coldest season of the year, and it begins on December 21. The longest night of the year occurs on this date. After December 21, the days grow longer.

- **Spring** begins on March 21. On that date, the day and the night last the same amount of time. The days continue to grow longer, the nights become shorter, and the temperature begins to rise.

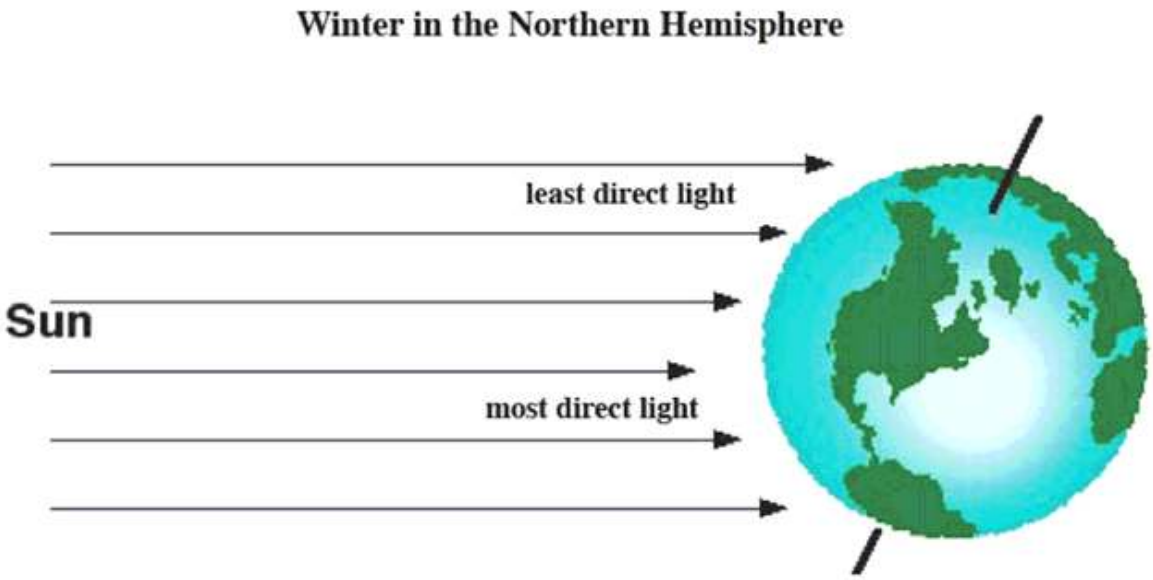
- **Summer** is the warmest season and begins on June 21, which is the longest day of the year. After that date, the days become shorter. But, during the summer, the days are longer than the night.

- **Autumn** begins on September 23. On that date, the day and the night are also the same amount of time. After that date, the nights are longer than the days and the temperature begins to fall.

LET'S DO MORE

The Earth's orbit produces the different seasons. But because the axis of the Earth is inclined, when it's summer in the northern hemisphere, it's winter in the southern hemisphere. And, when it's winter in the northern hemisphere, it's summer in the southern hemisphere. The same things occur with spring and autumn.

Earth's Tilt



1. Identify what season we are in now in the northern hemisphere. What season is it in the southern hemisphere now?

2. There are different types of climate all over the Earth. We can find warmer climates near the equator. Where you think we can find colder climates on Earth? Think of the two points that are the furthest from the equator.

3. THE MOON

Before students can understand the reason for phases, they need to understand:

- The Moon orbits the Earth
- The Moon orbits at an angle with respect to the Earth's orbit around the Sun
- The Moon doesn't shine on its own; it reflects sunlight

PHASES- CAUSES

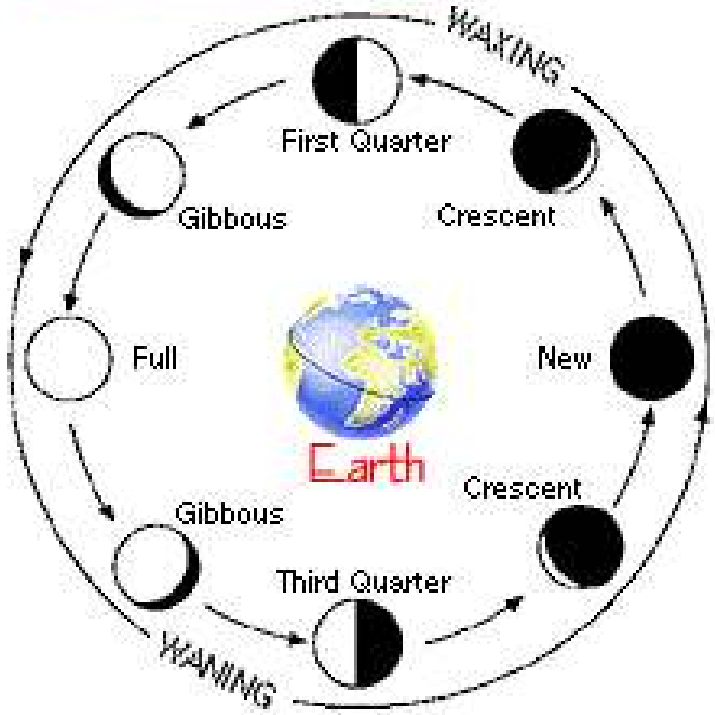
The Sun shines on the Moon.

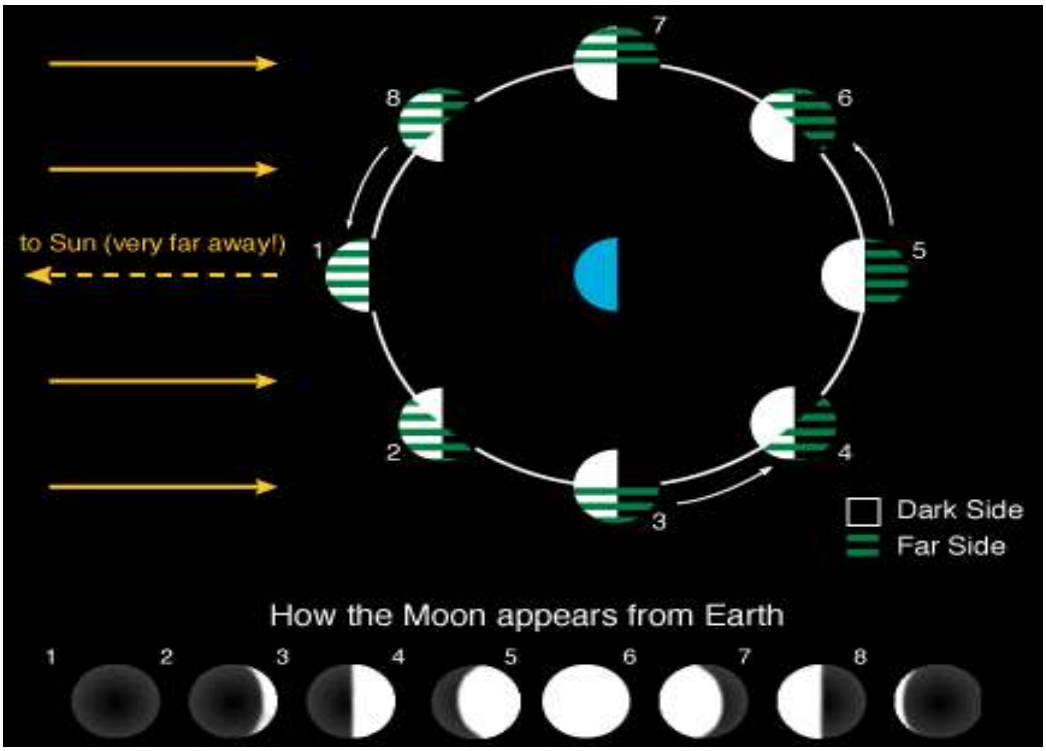
- When the Moon is between the Sun and the Earth it is not visible because the sunlight reflects off the far side of the Moon instead of its near side. We call this phase New Moon.

- When the Earth is between the Moon and the Sun, the entire moon is visible because the sunlight reflects off the Moon's near side. We call this phase Full Moon.

- Between the New Moon and the Full Moon, we can see parts of the daytime side of the Moon.

The Moon as seen from Earth





4. ECLIPSES

Occasionally the sun and the moon line up, which causes an eclipse.

- Eclipses happen every year.
- In order to see a solar eclipse, you need to be in a particular geographic region of the Earth.

SOLAR ECLIPSES

- Occur when the Moon blocks the light from the Sun

- Only occur during a New Moon

- Three types: Annular, Partial, and Total

TOTAL SOLAR ECLIPSE

- Observers in the “umbra” shadow can see a total eclipse. It is safe to view the Sun.

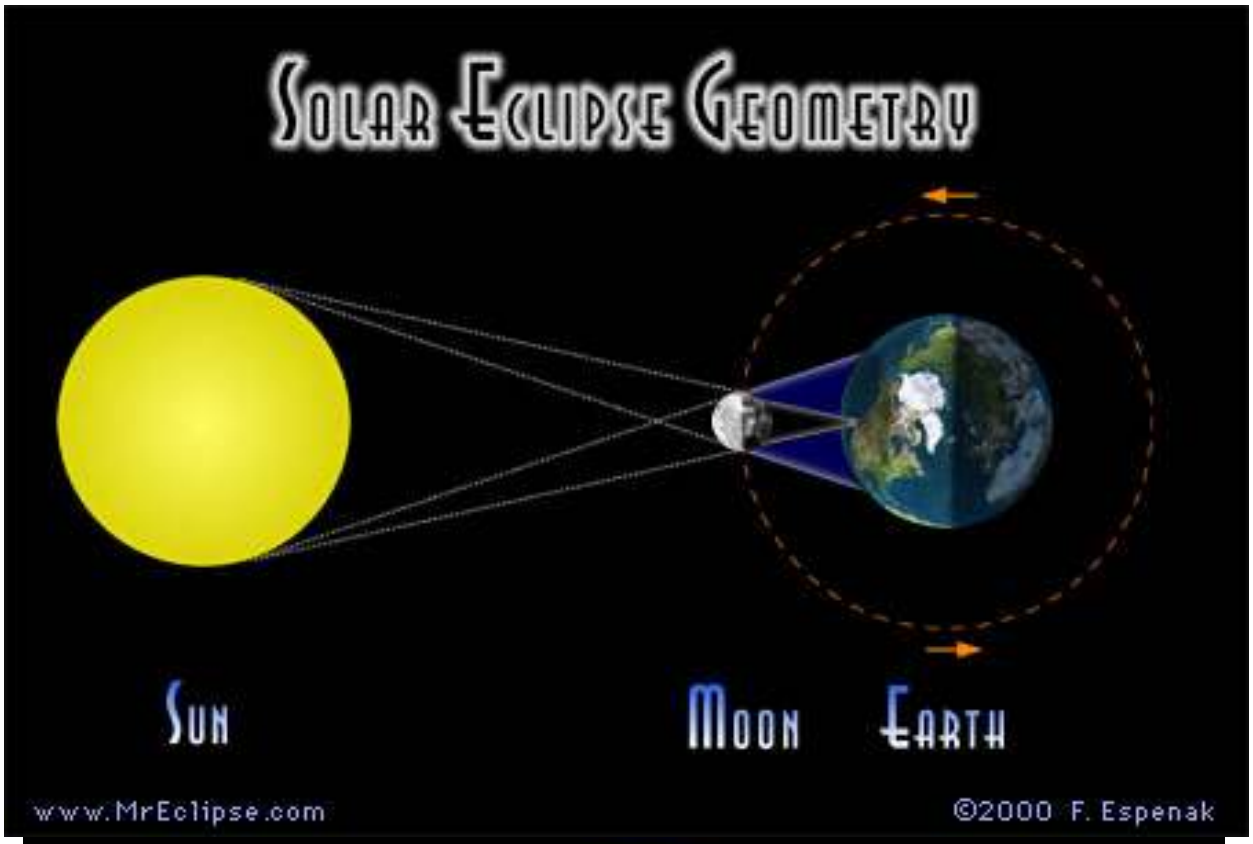
- Those in “penumbra” see a partial eclipse. It is not safe to look directly at Sun. It only lasts a few minutes.

- The Path of Totality is about 10,000 miles long but only 100 miles wide.

ANNULAR SOLAR ECLIPSE

- When the Moon is too far to completely cover the Sun, the umbra doesn’t reach the Earth.

- The Sun looks like a donut around the Moon.


Solar Eclipse Geometry
Sun
Moon
Earth
www.MrEclipse.com
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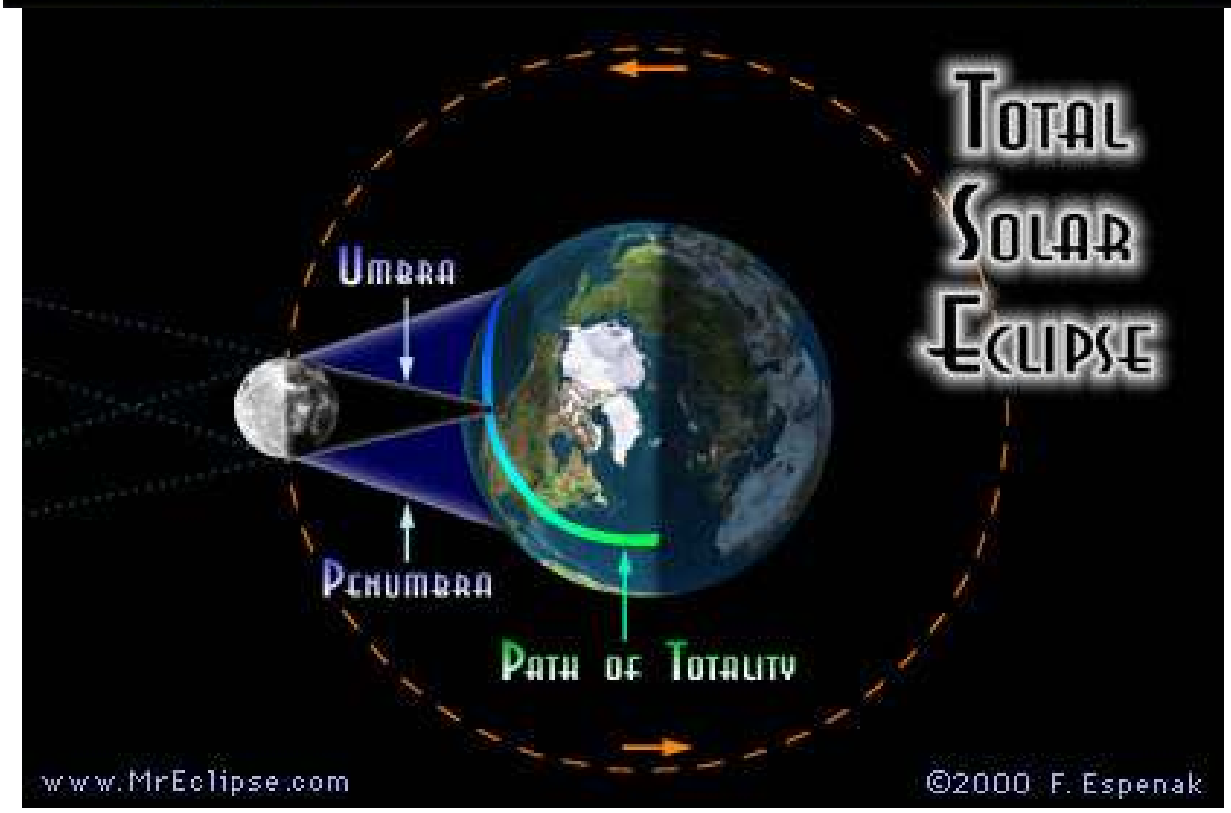
Total Solar Eclipse
Umbra
Penumbra
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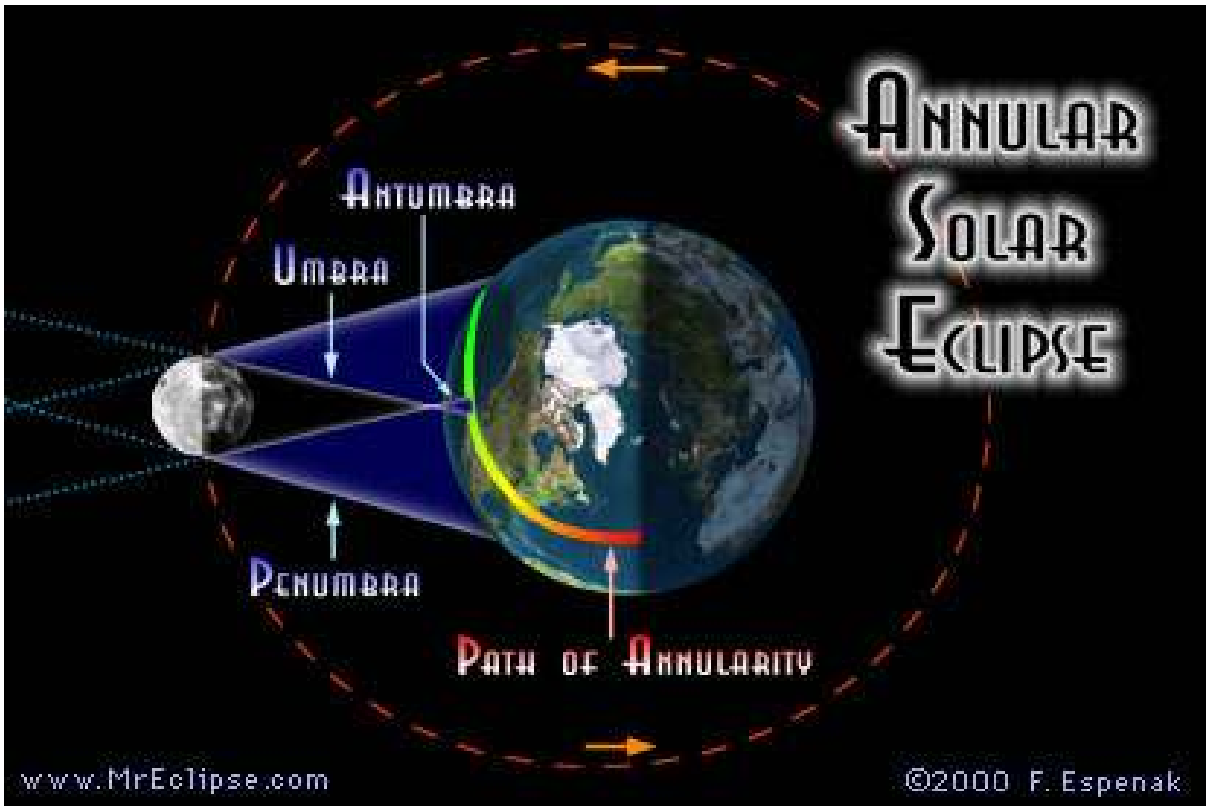


LUNAR ECLIPSES

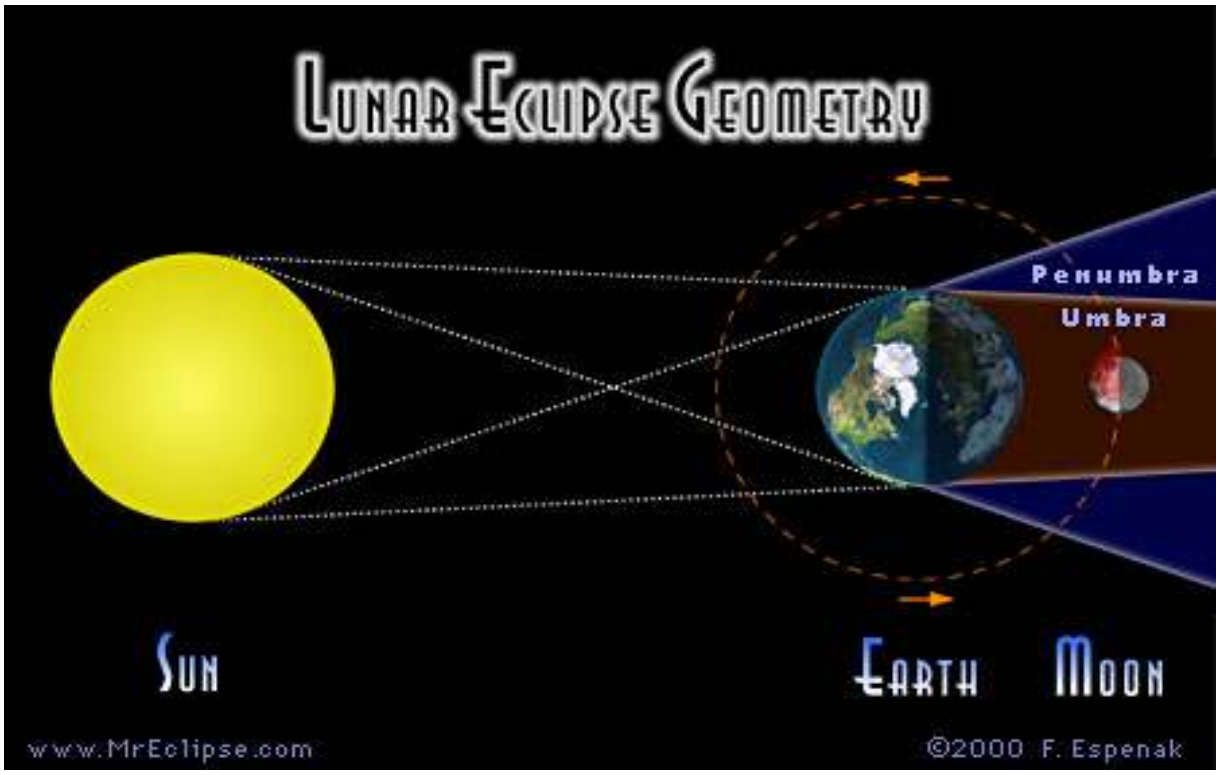
- Occur when the Earth blocks the light from the Sun so it does not reach the Moon.

Three types of Lunar Eclipses

1. Penumbral lunar eclipse: the Moon only passes through the penumbra of Earth's shadow.

2. Partial lunar eclipse: part of the Moon passes through the umbra of Earth's shadow.

3. Total lunar eclipse: the entire Moon passes through the umbra of Earth's shadow
Do you know who on Earth will be able to see a lunar eclipse?



5. FINDING OUR WAY ON EARTH

It's important to understand where we are in relation to other places, so we know where we are going and do not lose our way.

The cardinal points

The cardinal points allow us to navigate our way around the Earth.

The cardinal points are: north, south, east and west. For each cardinal point, we use its initial: N, S, E, and W.

If we know where one cardinal point is situated, we can easily find the other points and understand where we are.

We always place north at the top and south at the bottom on maps. East is to the right and west is to the left.

How we find our way

The Sun, the North Star, moss and an instrument called a compass can all help us find our way.

The position of the Sun helps us find our way during the day. In the morning, the Sun always appears in the east. In the afternoon, it always disappears in the west.

If we extend our right arm toward the sun on a sunny morning, it will indicate east. If we extend our left arm, it will indicate west. We will be facing north and behind us is south.

Let's say we have a single building with windows on each side facing a different cardinal point. During the day, the Sun will never come in through the windows on the north side. Early in the morning, the sun will come in through the windows on the east side. At midday, the sun will come in through the windows on the south side. Then, very late in the afternoon, the sun will come in through the windows on the west side.

The North Star is a star that always indicates north. It can help us find our way at night. It is situated in the Ursa Minor constellation.

Moss only grows on the north side of trees and rocks. It grows there because the Sun does not heat that side.

A compass is a box with a magnetized needle inside. This needle rotates, but the coloured end of it always indicates north.

ACTIVITIES

1. Is the Sun a star or a planet? Why?

2. Which season of the year are we in now? How is this season different from summer?

3. Have you noticed where the Sun comes up in the morning in relation to your bedroom window? Have you noticed on which side of your house the sun goes down in the afternoon?

4. Do you remember how planets and stars are different? Copy and complete these sentences:
* Stars and planets are celestial.....
* Stars emit their own....., but .....do not.

5. Explain whether you think the Milky Way is larger or smaller than the Solar System. Why?

6. Draw the Earth with its imaginary axis and equator.

7. Is Spain in the Northern or Southern hemisphere?

8. Copy and complete this sentence:

We have a leap year every four .....because of the extra 6 .....that the Earth needs to orbit the Sun each year.

9. Explain why we have different seasons each year.

10. Copy and complete these sentences:
    * Winter is from December .....to March 20.
    * Spring is from March 21 to .....20.
    * Summer is from June 21 to September.....
    * .....is from September 23 to December 20.

11. Identify in which season(s) the days and the nights last the same amount of time.

12. Imagine that you are lost one night and the sky is very clear. You know that your house is situated to the north. Explain how you could find your way to your house.

13. On a sunny day, go outside and try to find the four cardinal points.

REVISION ACTIVITIES

1. Put the following in order, from smallest to largest. Start with the Earth.

Earth- Milky Way- Solar System- Universe

2. Copy a picture of the Earth and draw its imaginary axis, the Equator, the North Pole and the South Pole.

3. Identify the true statements.
   - The Milky Way has a spiral shape.
   - The tail of a comet is made of gas.
   - The planets in the Solar System do not orbit the Sun.

4. List the various movements of the Earth.

EXTENSION ACTIVITIES

1. What do you think would happen if the Earth was in the ninth place from the Sun instead of the third place?

2. Explain in your own words why we have day and night.

3. Identify the dates when the following two events occur:
   - The longest night of the year.
   - The longest day of the year.

4. What do you think would happen if the axis of the Earth wasn't inclined with regard to the Sun?

5. Write the names of the cardinal points and explain what they are used for.

6. Make a compass:
   - You need a darning needle, a magnet, a cork and a glass with water.

Method:

Leave the needle in contact with the magnet for one day, until you see that the needle is magnetized. Then, cut a circle of cork and push the needle through it. Put it in the glass of water and let it move freely until it stops. The needle will point north-south.

7. Write the names of:
   - The top point of the Earth, where the imaginary axis exits.

- The imaginary line that divides the Earth into two halves.
- The name of each of the halves.
- The bottom point of the Earth, where the imaginary axis exits.

UNIT 3. MATTER

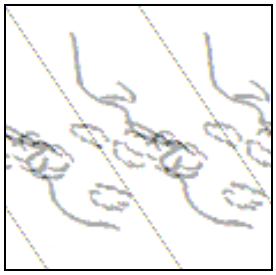
1. READ THIS TEXT

We define matter as everything that occupies a space and can be weighed. Everything is made of matter – rocks, pens, books, the human body – everything is made of matter.

Glass

Plastic

Bones



Breath

2. EXPERIMENT

1. Take a plastic syringe and

Plunger Barrel Exit hole Needle

Remove the needle.

2. Lift the piston to the brim.

3. Block the exit hole with your finger.

4. Try to push the piston down, keeping the hole blocked

What's the matter and why?

The piston doesn't go down because the air inside the syringe occupies a space and stops the piston from moving.

3. MAGNITUDES AND UNITS

Read this text:

A) *"Everything that we can measure is called magnitude. How long, how high or how wide a table is, is a length, that's the distance between two points that you can measure. That's a magnitude".*

B) *"When we are studying matter we use some basic magnitudes such as length, surface area, volume, mass, density or temperature".*

Measuring length

Measuring is essential to Science. It's important to use the correct units when measuring things. We can use a ruler or a measuring tape to measure length. The units that we usually measure length with are:

Millimetres
Centimetres
Metres
Kilometres

Metric System: Centimetres

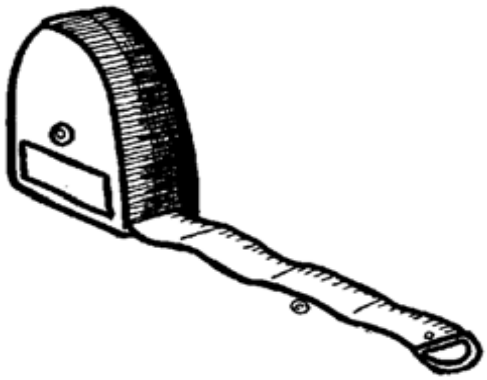
The metric system is a way to measure. In the metric system, we use centimetres to measure how long an object is.

Centimetres

The prefix centi- means a hundredth part. This means that 100 centimetres is the same as 1 meter.

100 centimetres = 1 meter

Use a tape measure to measure the height of two classmates.



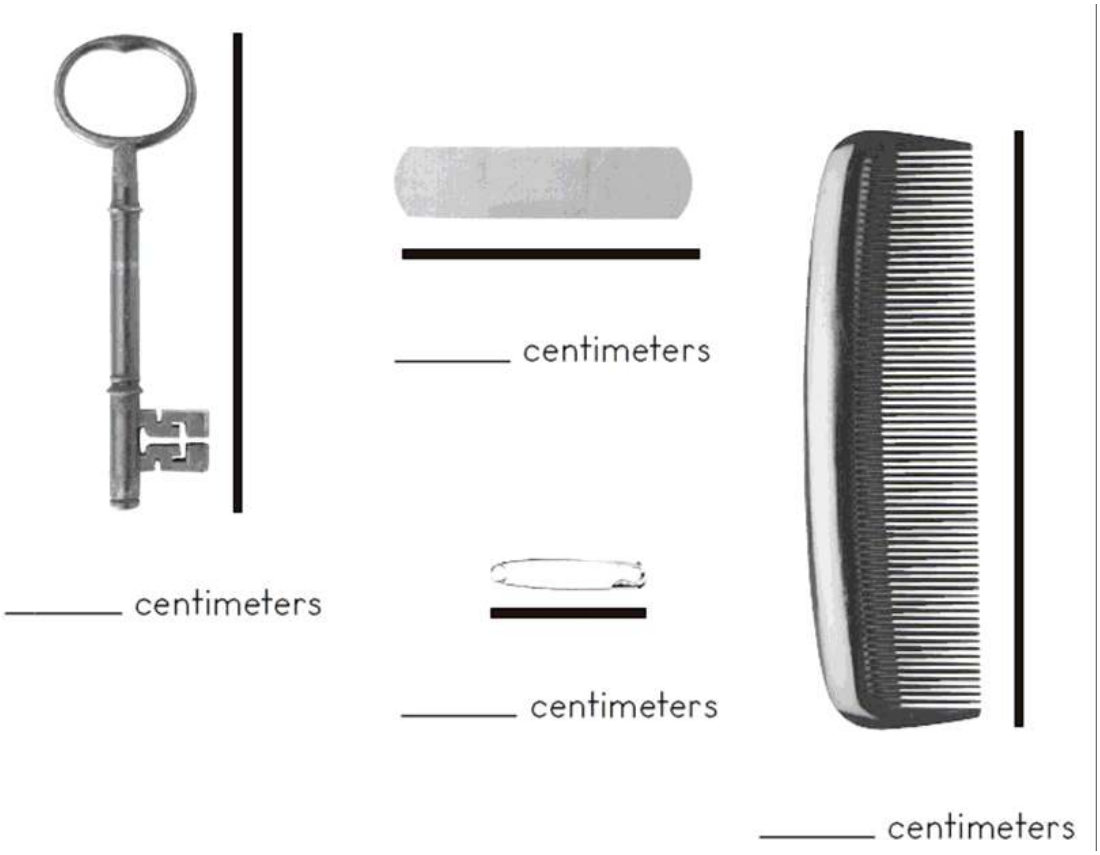
Name.....

.....meter .....centimetres

Name.....

.....meter .....centimetres

Use a centimetre ruler to measure the following objects:



Meters and Centimetres

Decide which unit of measurement to use for the following objects. Draw a line from the object on the left to the word on the right.

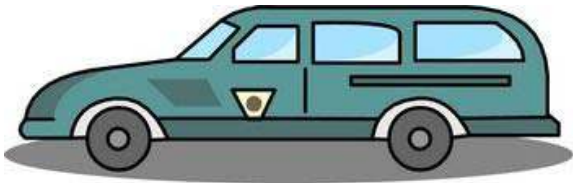
meters

centimeters

meters

centimeters

meters



meters

Measuring volume

The graduated cylinder is used to measure volumes of liquid. The units that we usually measure volumes of liquid with are:

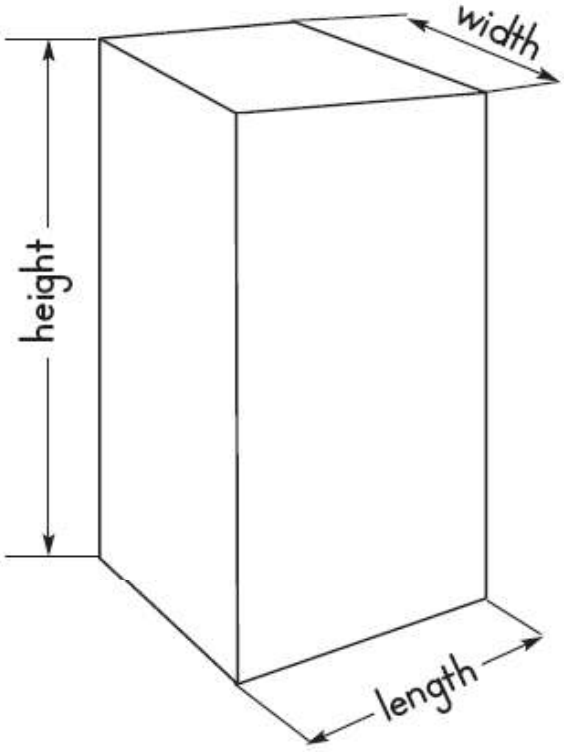
Litres
Centilitres
Millilitres

Height, Length, and Width

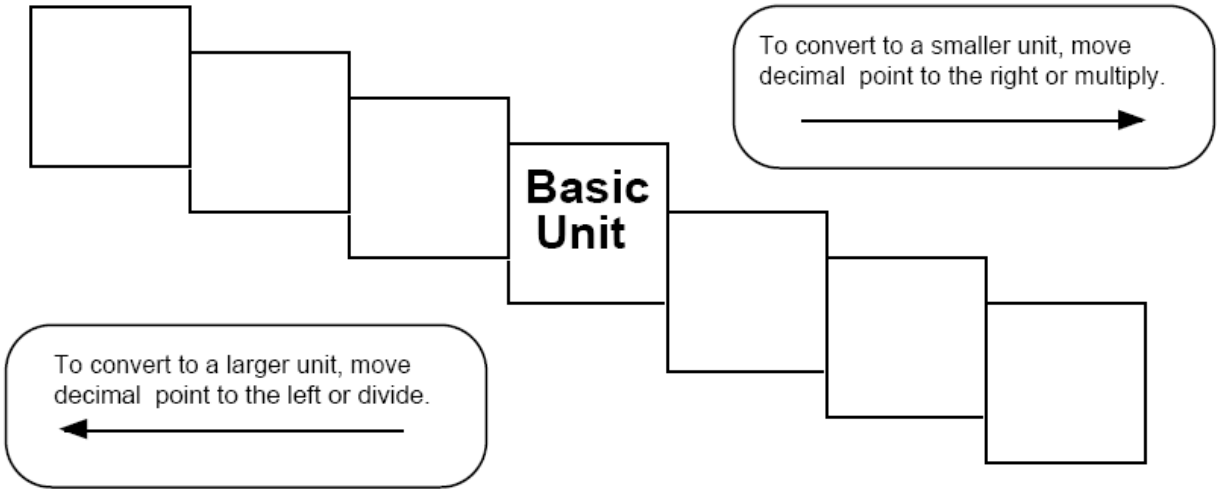
The height of the chair is .....

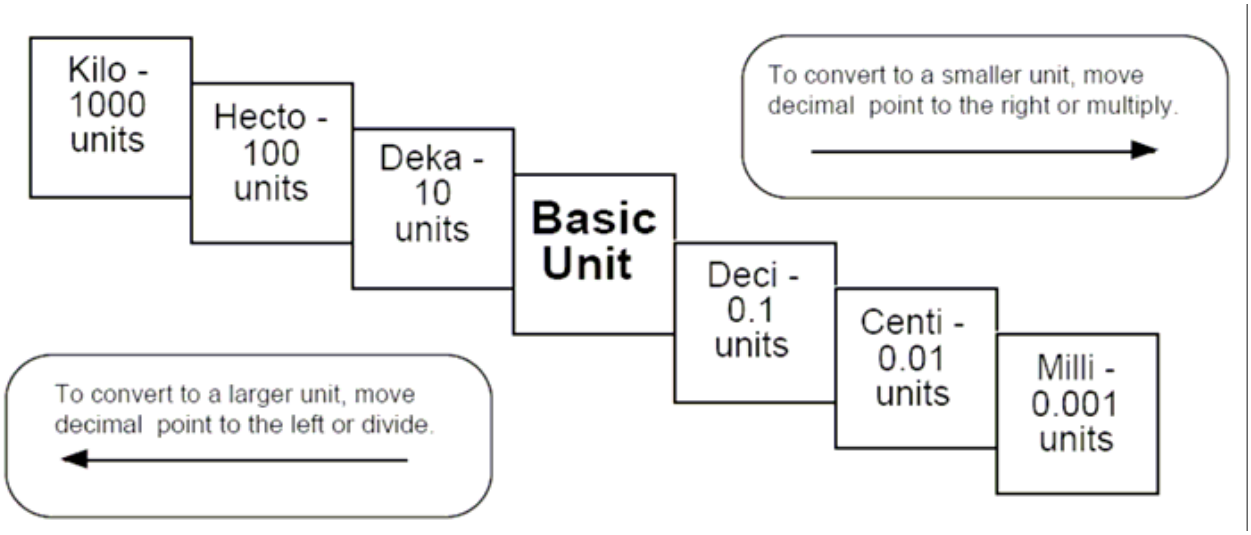
The width of the chair is .....

The length of the chair is .....



4. CONVERSION PRACTICE. THE LADDER METHOD





1. Try these conversions, using the ladder method.

1000 mg = _____ g
1 L = _____ mL
160 cm = _____ mm
14 km = _____ m
109 g = _____ kg
250 m = _____ km

2. Write the correct abbreviation for each metric unit.

1) Kilogram _____

2) Meter _____

3) Gram _____

4) Millilitre _____

5) Millimetre _____

6) Litter _____

7) Kilometre _____

8) Centimetre _____

9) Milligram _____

3. Try these conversions, using the ladder method.

1) 2000 mg = _____ g

2) 104 km = _____ m

3) 480 cm = _____ m

4) 5.6 kg = _____ g

5) 8 mm = ____ cm

6) 5 L = _____ mL

7) 198 g = _____ kg

8) 75 mL = _____ L

9) 50 cm = ____ m

10) 5.6 m = ____ cm

11) 16 cm = _____ mm

12) 2500 m = _____ km

13) 65 g = _____ mg

14) 6.3 cm = _____ mm

15) 120 mg = _____

4. Convert each measure to mm.

1. 92 cm 1 mm = _____ mm

2. 61 cm = _____ mm

3. 51 cm = _____ mm

4. 2 mm 735 m = _____ mm

5. Convert each measure to cm.

1. 70 mm = _____ cm

2. 73 cm 10 mm = _____ cm

3. 946 m 6 km = _____ cm

4. 317 m = _____ cm

6. Convert each measure to m.

1. 7 km = _____ m

2. 79 m 3300 cm = _____ m

3. 12 km = _____ m

4. 9800 cm 872 m = _____ m

7. Convert each measure to km.

1. 8000 m = _____ km

2. 38 km 8000 m = _____ km

3. 12000 m = _____ km

4. 3,000 m 243 km = _____ km

8. Convert each measure to cm and m.

1. 8,389 cm 9,000 mm = _____ m _____ cm

2. 1,109 cm = _____ m _____ cm

3. 727 m 1,554 cm = _____ m _____cm

4. 2,238 cm = _____ m _____ cm

9. Metric Weight. Convert each measure to mg.

1. 76 cg 3 mg = _____ mg

2. 83 cg = _____ mg

3. 9 cg 976 g = _____ mg

4. 32 cg = _____ mg

10. Metric Weight. Convert each measure to cg.

1. 90 mg 34 cg = _____ cg

2. 80 mg = _____ cg

3. 266 g 9 kg = _____ cg

4. 3 kg = _____ cg

11. Metric Weight. Convert each measure to g.

1. 8,000 mg = _____ g

2. 611 g 6,000 mg = _____ g

3. 696 g 8,000 mg = _____ g

4. 200 cg = _____ g

12. Metric Weight. Convert each measure to kg.

1. 3,000 g = _____ kg

2. 673 kg 9,000 g = _____ kg

3. 12,000 g = _____ kg

4. 567 kg 5,000 g = _____ kg

13. Metric Capacity. Convert each measure to mL.

1. 58 cl = _____ ml

2. 2 ml 75 cl = _____ ml

3. 21 cl = _____ ml

4. 3 ml 8 L = _____ ml

14. Metric Capacity. Convert each measure to cL.

1. 70 ml = _____ cl

2. 30 ml 6 cl = _____ cl

3. 1 kl 110 L = _____ cl

4. 80 ml = _____ cl

15. Metric Capacity. Convert each measure to L.

1. 6,100 cl 723 L = _____ L

2. 10,000 ml = _____ L

3. 10 kl = _____ L

4. 11 kl 11,000 ml = _____ L

16. Metric Capacity. Convert each measure to kL.

1. 12,000 L = _____ kl

2. 5,000 L 491 kl = _____ kl

3. 7,000 L = _____ kl

4. 2,000 L 70 kl = _____ kl

17. The Meter (Video).

http://www.metricamerica.com/SI-Metric/meter.wmv

18. The Kilogram (Video).

http://www.metricamerica.com/SI-Metric/kilogram.wmv

19. The Litre (Video).

http://www.metricamerica.com/SI-Metric/liter.wmv

5. THE DENSITY

Read this text

"Volume is the total space occupied by a body. We're going to use the cubic metre (m3). It's the volume that a cube with one metre edges occupies".

The volume (v) of liquids or solids can be measured by graduated cylinders.

On the other hand, the mass (m) is the amount of matter in a body. It's measured in kilograms and grams. All materials have mass.

We use a balance and some weights to measure mass. We put the body on one side of the scale. Then we put the weights on the other side of the scale. When the two sides are balanced, the mass of the body is equal to the sum of the masses of the weights.

We can measure the volume of a solid with water and a graduated cylinder. Pour some water into the graduated cylinder. Write down the volume of the water in the cylinder. Now put the solid body into it. Look at the volume in the cylinder. Write it down. The second volume is the sum of the water and the volume of the solid body. Subtract the volume of the water from the volume of the water plus the volume of the solid body. The result is the volume of the solid body.

And finally, the density (D) is the relationship between mass and volume.

If we compare two bodies with the same mass but different volumes, the body with less volume is denser than the body with more volume. For example, 1 kg of iron occupies less volume than 1 kg of paper.

Activities

1. Look at the pictures of the scales. Which sentences are correct?

a. The iron ball has more mass than the strips of paper
b. The paper has more volume than the iron ball
c. The iron is denser than the paper
d. The cork is less dense than the iron

2. Complete the sentences. Use the words “mass”, “volume” or “density”

a. _____ is the relationship between mass and volume
b. _____ Indicates the amount of matter in a body
c. _____ is the space that a certain amount of matter occupies
d. _____ and _____ are general properties of the matter

If we can measure the mass and the volume of the object and divide them, we’ll be able to know its density, that’s:

$$Density = \frac{Mass}{Volume}$$

Example

Osmium is a very dense metal. What is its density in g/cm3 if 50.00 g of the metal occupies a volume of 2.22cm3?

Placing the mass and volume of the osmium metal into the density setup, we obtain:

D = mass = 50.00 g = = 22.522522 g/cm3 = 22.5 g/cm3

Volume 2.22 cm3

Density is the main characteristic of matter because if two things have the same density, they must be made of the same matter. We can find information about the densities of various elements in the following table:

SUBSTANCE	DENSITY (g/m^3)
Gold	19,35
Iron	7,8
Aluminum	2,7
Lead	11,4

SUBSTANCE	DENSITY (g/m^3)
Water	1
Oak tree	0,65
Gasoline	0,8
Mercury	13,6

Activities

1. We pour water into a graduated cylinder. Then we place a stone in the cylinder as well.

a. What is the capacity of the measuring cylinder in cm^3?
b. What is the volume of the stone in cm^3?

2. We pour water into a measuring cylinder. Then we put a stone into it. The mass of the stone is 225 gr.

a. What is the capacity of the measuring cylinder in cm^3?
b. What is the volume of the stone in cm^3?
c. What is the density of the stone in g/cm^3?

3. We put a solid body that weighs 10 g into a measuring cylinder. Then we put a solid body that also weighs 10 g but has a different shape into a different cylinder. The first measuring cylinder has a volume of 70 cm^3. The second has a volume of 80 cm^3.

a. Draw the two measuring cylinders.
b. Which of the two bodies has the highest density?

4. We pour some water up to 150 cm^3 into a 200 cm^3 graduated cylinder. Then we put a stone in the cylinder with a mass of 80 g. The level of the water goes up to 180 cm^3.

a. What is the volume of the stone?
b. What is the density of the stone?

5. A 250 cm^3 measuring cylinder contains up to 120 cm^3 of water. We put twelve coins into the cylinder that weigh 129 g each and the level of the water goes up to 200 cm^3.

a. What is the volume of the coin?
b. What type of metal is it? (See the table of density)

UNIT 4. THE STATES OF MATTER

1. THE STATES OF THE MATTER

Matter can be in three states: solid, liquid or gas. A piece of iron or stone is matter in the solid state. Water, oil and alcohol are matter in the liquid state. Air is matter in the gaseous state.

A. The Solid State

Solid bodies have fixed volume and shape, or rather, their shape and volume don't change when we put them in a different container.

B. The Liquid State

Liquids have a fixed volume, but they haven't got shape. Water in a bottle has the shape of the bottle. If we pour water out of the bottle into a measuring cylinder, water takes the shape of the measuring cylinder and has the same volume.

BRUCE LEE said: "Empty your mind. Be formless. Shapeless. Like water. If you put water in your cup, it becomes the cup. If you put water in a bottle, it becomes the bottle. If you put water in a tea pot, it becomes the tea pot. The water can flow or can crash. Be water, my friend".

C. The Gaseous State

Gases haven't got fixed shape or volume. If we burst a balloon, the air that was in the balloon expands into the whole room. However, before we burst the balloon, the air has the shape and the volume of the balloon. After we burst the balloon, the air has the shape and volume of the room.

ACTIVITIES

1. Complete the sentences:

A. Liquids and gases are not rigid. They adapt to the_____of the container that they are in.

B. Solids and liquids are similar because they have a fixed_____but liquids don't have a fixed_____ although solids do.

2. Match the physical state to the properties:

1 Solid state	A Constant volume
2 Liquid state	B It has shape
3 Gaseous state	C Variable volume

3. Complete the following diagram with words: fixed/ variable

	Volume	Shape	Mass
Liquids			
Solids			
Gases			

2. THE PROPERTIES OF GASES

The most relevant properties of gases are:

A. They have no fixed shape or volume. The particles that form the gases can move freely and fast because there is a lot of space between them. Their variable volume means that gases tend to occupy the entire space they are in.

B. They have very low density because the particles are much more disperse than the particles in liquids and solids.

C. Contrary to what happens with liquids and solids, gases can be compressed and expanded very easily because there is a lot of space between the particles.

D. They create pressure against the walls of a container because their particles are constantly moving and they knock against the wall.

ACTIVITY

Write true or false next to the sentences about gases:

1) Gases move freely _____
2) The particles of gases aren't more dispersed than the ones of liquids and solids _____
3) Gases have a fixed volume and shape _____
4) Gases can be compressed but they can't expand _____
5) Gases can be compressed and expanded _____
6) There is very little space between the particles _____
7) Their particles are constantly moving _____
8) Gases have a very low density _____

3. CHANGES OF STATE

A change of state means the way particles are joined within matter have changed.

	SOLID	LIQUID	GAS
Arrangement of particles	They are in a fixed state	They are free to move within the liquid	They are free to move anywhere
Number of particles	Several in a certain volume	Several in a certain volume	Few in a certain volume
Separation of particles	They are close together	They are close together	They are far from each other
Forces between the particles	They are very strong	They are very strong	They are very weak

The changes of state have different names, depending on the initial and final states:

SELF-ASSESSMENT

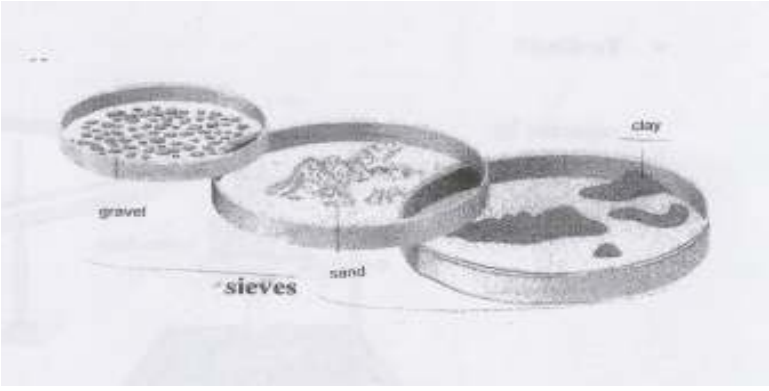
1. I can measure objects.
2. I can distinguish between mass and volume.
3. I can identify the three states of matter.
4. I know the most important properties of gases.
5. I can understand how the particles interact.

4. PURE SUBSTANCES

Question: How can we recognize if a material system is a homogenous mixture or a pure substance?

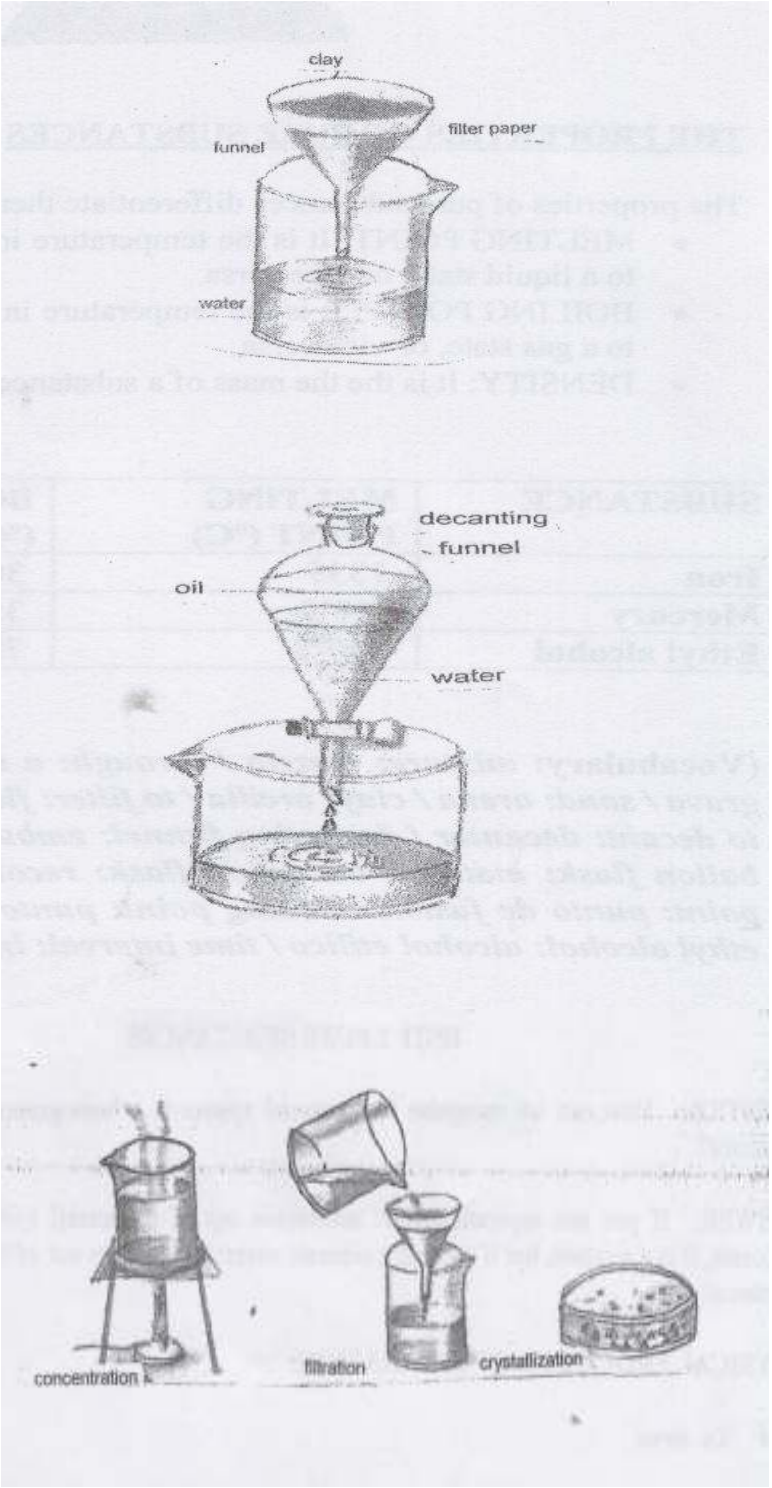
Answer: If you can separate several substances out of a material system through physical processes, it is a mixture. If you can't separate them, it is pure.

4.1. PHYSICAL PROCESSES OF SEPARATION



A. To sieve

Separating a mixture by size



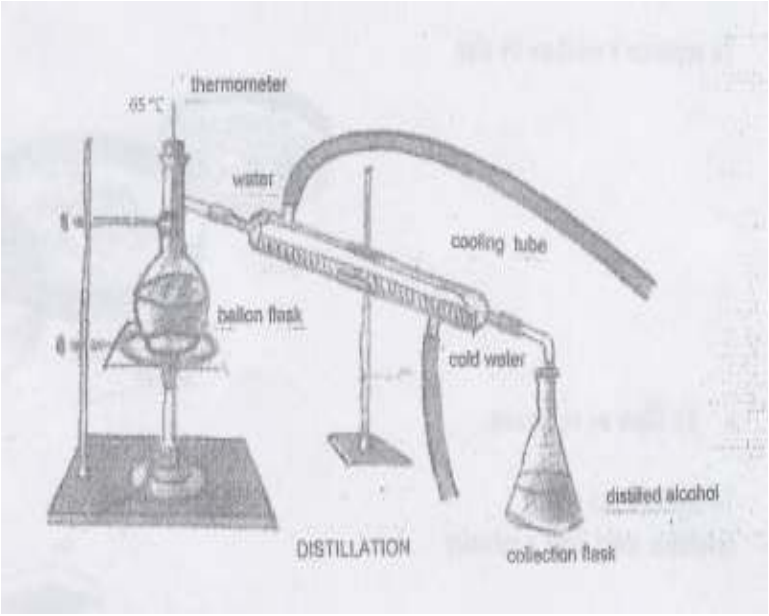
B. To filter or to screen

Separating out an insoluble solid from a mixture

C. To decant

To separate by density

D. To crystallize



E. To distill

Separating by boiling point.

4.2. THE PROPERTIES OF PURE SUBSTANCES

Each pure substance has unique properties that distinguish it from other pure substances:

Melting point. It is the temperature at which a pure substance turns from a solid state to a liquid state, or vice versa.

Boiling point. It is the temperature at which a pure substance turns from a liquid state to a gaseous state, or vice versa.

Density. It is the mass of a substance divided by volume of the same substance.

SUBSTANCE	MELTING POINT (ºC)	BOILING POINT (ºC)	DENSITY (g/cm^3)
Iron	1539	3000	7,8
Mercury	-38,9	356	13,6
Ethyl alcohol	-117,3	78,5	0,79

ACTIVITIES

1. Decide which physical processes of separation could be used for the following mixtures:

Answer		
_____	1 Mixture of gravel and sand	A To distil
_____	2 Water with clay (muddy water)	B To crystallize
_____	3 Mixture of water and oil	C To sieve
_____	4 Separating out salt from sea water	D To filter or screen
_____	5 Separate a mixture of alcohol	E To decant

2. Complete the following sentences:

To separate two insoluble liquids, I would _____
To separate two soluble liquids, I would _____

3. Write true (T) or false (F) next to the following sentences:

_____ a) The melting point of iron is 3000 ºC
_____ b) The density of mercury is greater than the iron
_____ c) Mercury has a melting over 0 ºC
_____ d) At -200 ºC ethyl alcohol is in the solid state
_____ e) Iron has a density of 78 g/cm3
_____ f) If room temperature is 500 ºC, iron and mercury are both in the liquid state
_____ g) The density of iron and ethyl alcohol is in the gas state.
_____ h) If room temperature 100 ºC, ethyl alcohol is in the gas state.
_____ i) The melting point of any substance is always lower than its boiling point
_____ j) The melting point of any substance is always equal or grater than 0 ºC.

4. We heat a solid substance for 10 minutes. The temperature of the substance over the course of this time is:

TIME (minutes)	0	1	2	3	4	5	6	7	8	9	10
TEMPERATURE (ºC)	22	31	45	45	45	60	65	85	85	85	96

a) With this information, draw a graph with the changes of state of this substance.
b) What is the melting point?
c) What is the boiling point?
d) What time interval is there between the mixture solid and liquid states?
e) What time interval is there between the mixture liquid and gas states?

SELF-ASSESMENT

1. I know all of the physical processes of separation.
2. I can distinguish between sieving and filtering.
3. I can distinguish between decanting and distilling.
4. I can distinguish between crystallizing and distilling.
5. I know the three most important properties of pure substances.
6. I know how to draw a graph to identify the changes of state of a pure substance.

5. THE STRUCTURE OF MATTER

Read this text: Imagine that you have a piece of iron. If you cut it in half and continue cutting the halves in half…..

Have they got the same properties: melting point, boiling point, density, colour, etc.?

YES ☐ NO ☐

Can you continue cutting indefinitely?

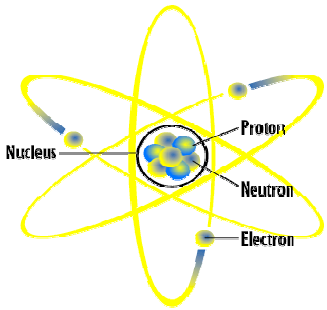
YES ☐ NO ☐

The smallest particle of iron that keeps all its properties is called an **Atom**. This happens with all the substances in nature.

5.1. ATOMS

All matter that surrounds us is made up of atoms. Everything is made up of atoms (solids, liquids and gases). Atoms are tiny particles. They are too small to see even with a microscope. An atom is the smallest particle of matter which keeps all of its properties.

5.2. ATOMS INSIDE AND OUT



Atoms were considered to be the smallest particles. Although we can't see atoms with our eyes or with a microscope, scientists discovered them from various experiments. They later discovered that atoms are made up of even smaller particles called protons, neutrons and electrons. The atoms of each element have certain numbers of protons, neutrons and electrons. This makes the atoms of different elements act in different ways.

Electrons

Electrons move around outside the nucleus very quickly. They are negatively charged. It's impossible to take this negative charge away.

Much of the total size of an atom is due to its electrons because they occupy a large area of space although the space is mostly empty. The volume of the electrons' orbit determine how large the atom is.

Electrons are tiny. They have virtually no mass.

The Nucleus

The nucleus is located in the centre of the atom. The nucleus is made up of particles called protons and neutrons that are held together in the centre of the atom.

The nucleus is tiny compared to the rest of the atom. It's smaller than a ping-pong ball in the middle of a football stadium. The atom is 10,000 times bigger than the nucleus.

Protons

Protons are located in the nucleus of the atom. They are positively charged. They have a mass similar to the hydrogen atom.

Neutrons

Neutrons form the nucleus of the atom along with the protons. They don't have an electric charge, or rather, they are neutral. They have a mass similar to protons.

Finally, the nucleus contains protons and neutrons. It has a positive charge because of the protons. Most of the atom's mass is concentrated in the nucleus.

5.3. PROPERTIES OF THE ATOM

The charge of the electrons has the same value as the charge of the protons; however, the electron charge is negative whereas the proton charge is positive. The number of protons always equals the number of electrons in a neutral atom.

The number of neutrons isn't fixed, but there are usually more neutrons than protons. The number of protons in an atom is called the Atomic Number. The number of neutrons and protons added together is called the Mass Number.

ACTITIVITIES

1. Write true (T) or false (F) next to the following sentences:

_____ a. If I cut a piece of paper into smaller and smaller bits, its density changes.
_____ b. I can't continue cutting and cutting a ball of iron indefinitely.
_____ c. The physical state of a substance depends on the type of atoms that form it.
_____ d. If we break a piece of gold into smaller parts, the boiling point changes.
_____ e. All of the material around us is formed from atoms except material in the gas state.
_____ f. The smallest particle of iron that retains the properties of iron is an atom.
_____ g. Atoms are very small particles, but we can see them with a very powerful microscope.
_____ h. When a substance changes from a solid state to a liquid state, its atoms also change.

2. Complete the following table:

ATOM	MASS	NUMBER OF ELECTRONS	NUMBER OF NEUTRONS	NUMBER OF PROTONS
Hydrogen			0	1
Sodium			12	11
Iron	56	26		
Sulphur	32		16	
Lead		82	125	
Oxygen	16			8
Phosphorus		15	16	
Copper	63			29

3. Match the words on the left column with the sentences on the right column:

Answer

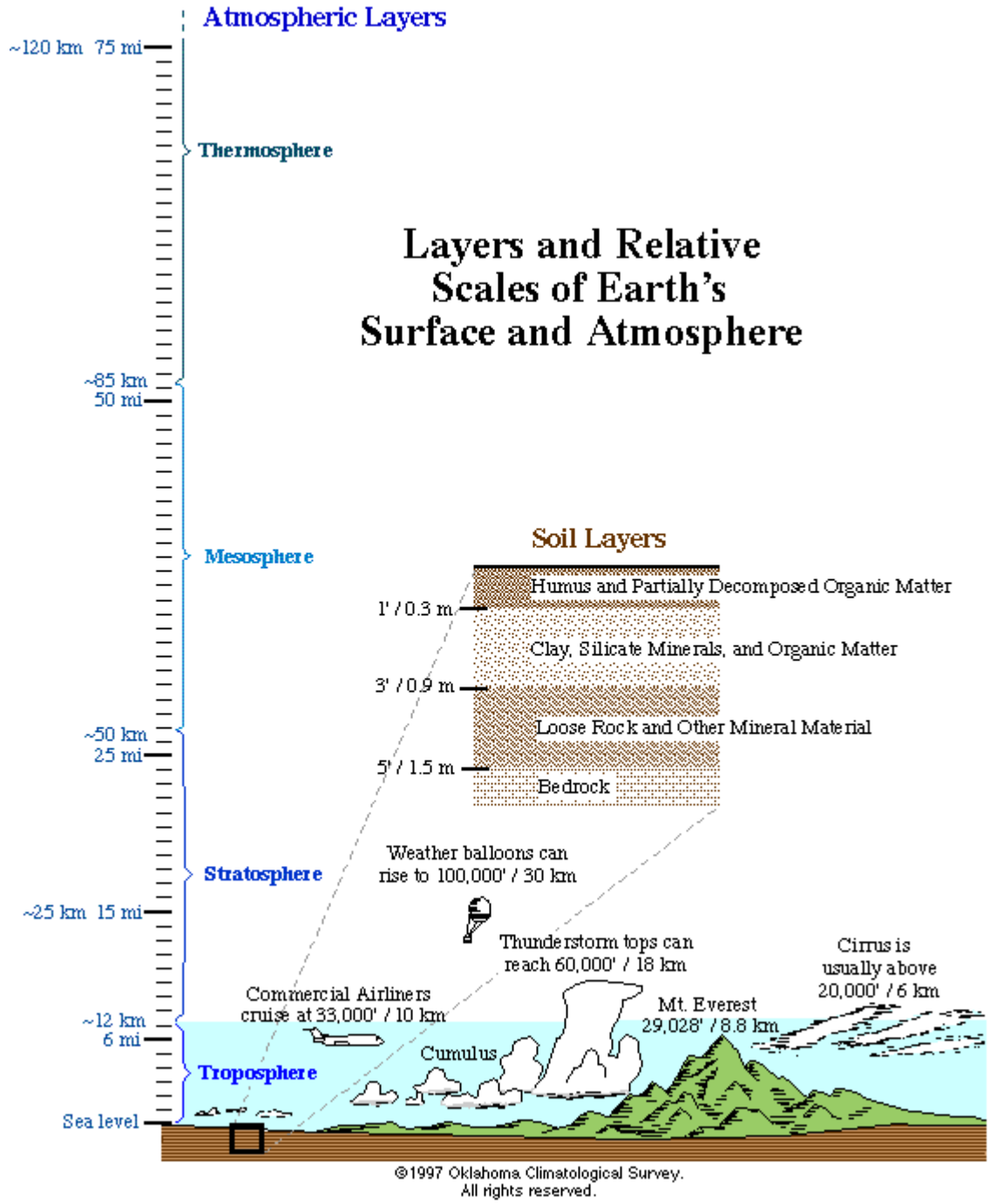
_____ 1. Proton
_____ 2. Nucleus
_____ 3. Atom
_____ 4. Neutron
_____ 5. Electron
_____ 6. Atomic number
_____ 7. Mass number

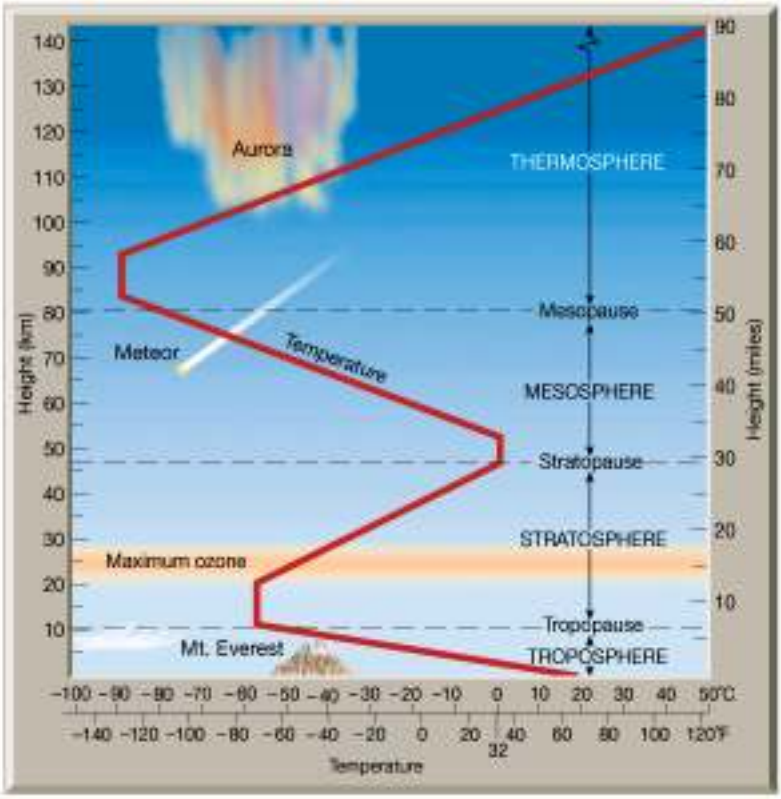
A. They aren't in the nucleus of the atom.
B. They have a mass similar to the hydrogen atom.
C. They haven't got electric charge.
D. It's in the centre of the atom.
E. It's in the smallest particle of matter which keeps all its properties.
F. Their number in the nucleus is equal to or higher than the number of protons.
G. Their number is always equal to the number of electrons.
H. It's the addition of the number of neutrons and the number of protons
I. It's the name of the number of protons in an atom.
J. They move around the outside of the nucleus very quickly.

SELF-ASSESMENT

1. I can name two characteristics of an atom.
2. I can name the three components of an atom.
3. I can name three characteristics of electrons.
4. I can name three characteristics of protons.
5. I can name three characteristics of neutrons.

UNIT 5. THE ATMOSPHERE





The Earth's atmosphere is a layer of gases that surrounds our planet and is retained by the Earth's gravity. The atmosphere reaches over 600 km from the surface of the Earth.

Compared to the diameter of the Earth, the atmosphere is very thin. The thickness of the atmosphere is a balance between the gravity of the Earth and energetic molecules that want to rise and move towards space. The molecules become excited as energy from the Sun hits the Earth.

The Earth's atmosphere is about 600 km high, but the 16 km of atmosphere nearest the Earth's surface are the densest (about 80% of the atmosphere's mass). There is no exact place where the atmosphere ends; it slowly becomes thinner and thinner until it merges with outer space. So, there is no definitive boundary between the atmosphere and outer space.

The atmosphere, solar energy and our planet's magnetic fields make life on Earth possible. The atmosphere absorbs energy from the Sun. The water cycle takes place in the atmosphere. The atmosphere is also the reason why we have a moderate climate.

1. ORIGINS OF THE ATMOSPHERE

The original atmosphere was probably similar in composition to the Gas Giant planets; however, that atmosphere disappeared into space and was replaced by gases that came out of the Earth's crust.

This change in composition of the Earth's atmosphere took place 1500 million years ago. In the new atmosphere, all of the oxygen was produced by photosynthetical living beings like cyan bacteria (blue green algae). Most of the carbon dioxide disappeared.

ACTIVITIES

1. The Earth's atmosphere is a layer of gases that surrounds the planet Earth and reaches over the surface of the Earth.

a) 60 km	b) 600 Km	c) 1200 km	d) 3000 km

2. Compared with the diameter of the Earth, the atmosphere is approximately….

a) 1/2	b) 1/4	c) 1/10	d) 1/20

3. The thickness of the atmosphere is a balance between the energetic molecules that want to rise and move towards the space and……

a) Energy from the Sun	b) The gravity of the Moon	c) The gravity of the Earth	d) All are correct

4. What is the height where the atmosphere is densest?

a) 16 km	b) 600 km	c) 30 km	d) 80 km

5. Complete the following sentence:

There is no exact place where the atmosphere ends, it becomes _____ and _____ until it merges with _____. So, there is no _____ between the atmosphere and outer space.

6. Why is possible life on Earth?

7. What does the atmosphere do with the energy from the Sun?

8. Where does the water cycle take place?

9. Why do we have a moderate climate on Earth?

10. How does the atmosphere protect life on Earth?

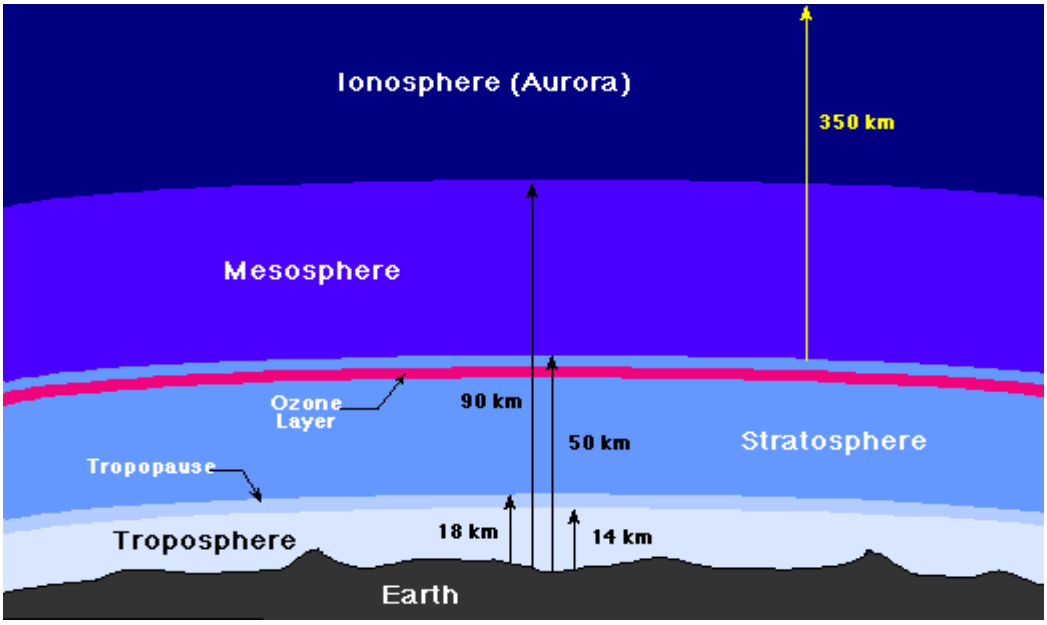
11. What was the composition of the original atmosphere?

12. When did oxygen appear in the current atmosphere?

13. What kind of living beings created the oxygen in the current atmosphere?

2. LAYERS OF THE EARTH´S ATMOSPHERE

We can distinguish four layers in the atmosphere using thermal characteristics (temperature changes), chemical composition, movement and density. The four layers of the atmosphere are called the Troposphere, the Stratosphere, the Mesosphere and the Ionosphere.



3. THE TROPOSPHERE

The troposphere is the lowest layer of the atmosphere. The troposphere starts at the surface and can reach between 8 km (at the poles) to 16 km (at the equator) above the surface with some variation due to weather factors. On average the troposphere is 12 km thick.

The troposphere ends when the temperature no longer changes with respect to height. This area is known as the tropopause.

The average temperature in the troposphere is between 15 ºC near the surface and -57 ºC at the tropopause.

The troposphere is where all of the weather takes place, such as storms, heavy winds, hurricanes, etc. It is the region where packets of air rise and fall. Winds increase with height up to the jet stream (a heavy quick horizontal wind).

There is a thin buffer zone between the troposphere and the next layer, called the tropopause.

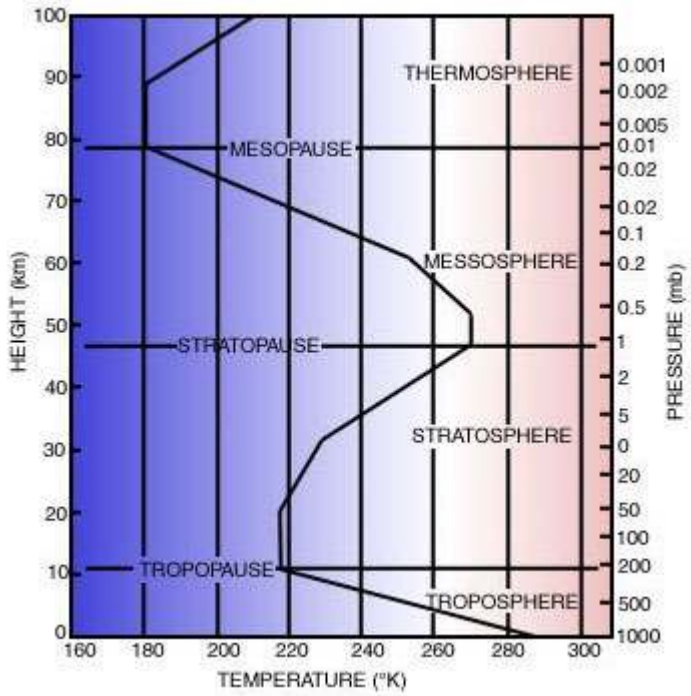
The troposphere is the densest part of the atmosphere, but the concentration of gases decreases with height up to the tropopause.

4. THE STRATOSPHERE

Above the troposphere is the stratosphere, where the air flow is mostly horizontal. The stratosphere starts just above the troposphere and extends from 8 –16 km to a height of 50 km.

Compared to the troposphere, the stratosphere is drier and less dense.

The temperature in this region increases gradually with height, from -57 ºC to -3 ºC, due to the absorption of ultraviolet radiation. The thin ozone layer in the upper stratosphere has a high concentration of a particular form of oxygen called ozone.



5. OZONE LAYER

The ozone layer is responsible for absorbing ultraviolet radiation from the Sun. It prevents ultraviolet radiation from reaching the surface of the Earth where it can harm living things. Man-made chlorofluorocarbon compounds (CFCs) may be making holes in the ozone layer, which is very dangerous for human life on Earth.

The stratopause separates the stratosphere from the next layer.

Ozone (O_3) is a relatively unstable molecule made up of three atoms of oxygen. Although it represents only a tiny fraction of the atmosphere, ozone is essential for life on Earth.

Depending on where ozone resides, it can either protect or harm life on Earth:

- Most ozone resides in the stratosphere where it helps protect the Earth's surface from the Sun's harmful ultraviolet radiation. If the ozone in this layer deteriorates, we will be at a greater risk for skin cancer, cataracts and impaired immune systems.

- In the troposphere (the atmospheric layer closest to the Earth´s surface), ozone is a harmful pollutant that causes damage to lung tissue, respiratory systems and plants.

6. THE MESOSPHERE

The mesosphere starts just above the stratosphere and reaches a height of 85 km. In this region, the temperatures again fall as low as -93 degrees Celsius as the altitude increases. The chemicals are in a more excited state since they absorb energy from the Sun. The mesopause separates the mesosphere from the ionosphere or thermosphere.

7. THE THERMOSPHERE OR IONOSPHERE

The thermosphere begins just above the mesosphere at 80-85 km and reaches a height of 600 km. The temperature increases as altitude increases due to the Sun´s energy. Temperature in this region can reach as high as 1727 ºC. Chemical reactions occur much faster here than on the surface of the Earth. This layer is known as the upper atmosphere.

In the thermosphere, many atoms are ionized (have gained or lost electrons so they have a net electrical charge). The thermosphere is very thin, and it is where the aurora takes place. It is also responsible for absorbing the most energetic light from the Sun, and for reflecting radio waves, making long distance radio communication possible.

The structure of the ionosphere is strongly influenced by the charged particle winds from the Sun (solar wind), which is inclined by level of solar activity.

8. BEYOND THE ATMOSPHERE

The exosphere starts at the top of the thermosphere and continues until it merges with interplanetary gases or space. Hydrogen and helium are the main components of this part of the atmosphere and are present at extremely low densities.

The exosphere ranges from 600-1000 km and has about 10000 free moving particles that may migrate into and out of the magnetosphere or the solar wind.

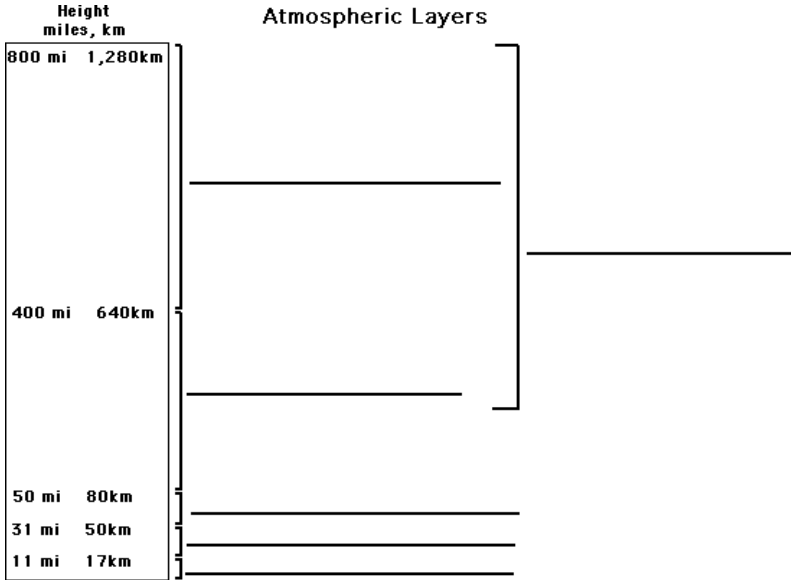
ACTIVITIES

1. Match each layer of the atmosphere to its corresponding characteristic:

Answer

_____ 1. Ionosphere	A. Important because of its ozone layer.
_____ 2. Stratosphere	B. It's the closest to the Earth.
_____ 3. Troposphere	C. Radio and television waves are reflected in this layer.
_____ 4. Mesosphere	D. It's formed by horizontal gas layers.
	E. It reaches a height of 400 km.
	F. It has an average thickness of 12 km.
	G. Most of the gases that form the atmosphere are located here.
	H. It's where meteorological phenomena take place.
	I. It mainly composed of ions.
	J. It reaches a height of 50 km.

2.



9. COMPOSITION OF THE ATMOSPHERE

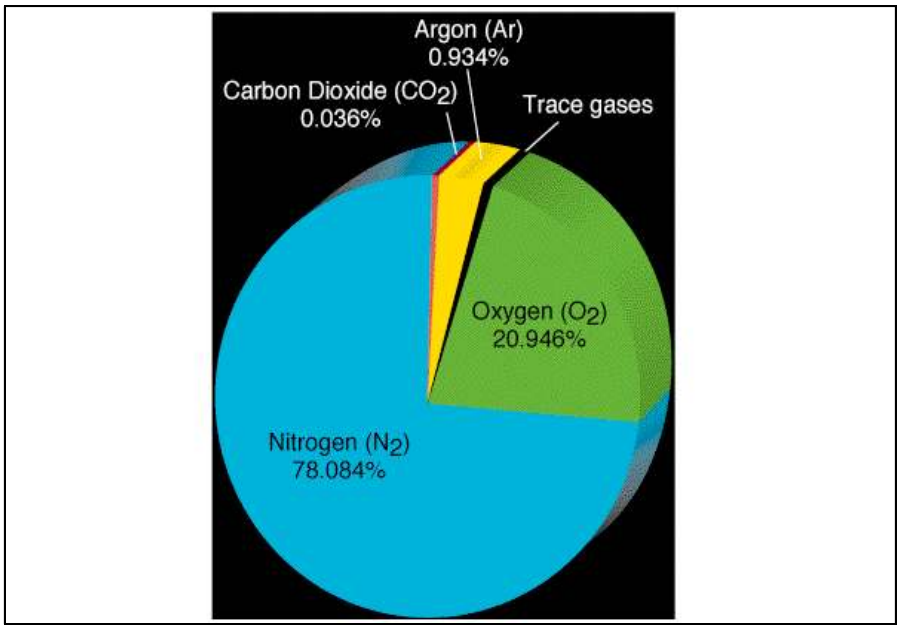
The atmosphere is composed of 78% nitrogen, 21% oxygen, 0,93% argon, 0,03% carbon dioxide and tiny amounts of other gases. In addition to these gases, water vapour is also found in the atmosphere. This mixture of gases is commonly known as air.

The terrestrial atmosphere is not a gas; it is a mixture of gases.

The most important atmospheric gases are:

1. Nitrogen (N_2)	It is a gas that does not combine easily with other elements. It is not very reactive.
2. Oxygen (O_2)	It is a very reactive gas. Many reactions use it to produce energy (combustion). Plants give off oxygen through the process of photosynthesis.
3. Carbon dioxide (CO_2)	It's the product of respiration in animals. Plants take in

	carbon dioxide through the process of photosynthesis.
4. Ozone (O_3)	It's formed by three oxygen atoms.
5. Water vapour (H_2O)	It comes from the evaporation of marine and continental waters. It also comes from the transpiration of plants.



ACTIVITIES

1.
Answer

_____	1. Oxygen	A. It's essential for the photosynthesis of plants.
_____	2. Water vapour	
_____	3. Ozone	
_____	4. Carbon dioxide	
_____	5. Nitrogen	

2. Choose the right option

The percentages of the gases in the atmosphere today are:

□ 10% Nitrogen, 50% Oxygen, 40% Carbon Dioxide
□ 20% Nitrogen, 70% Oxygen, 10% Carbon Dioxide
□ 58% Nitrogen, 31% Oxygen, 11% Argon
□ 78% Nitrogen, 21% Oxygen, 1% Argon

10. THE ATMOSPHERE IN DANGER

10.1. THE DESTRUCTION OF THE OZONE LAYER

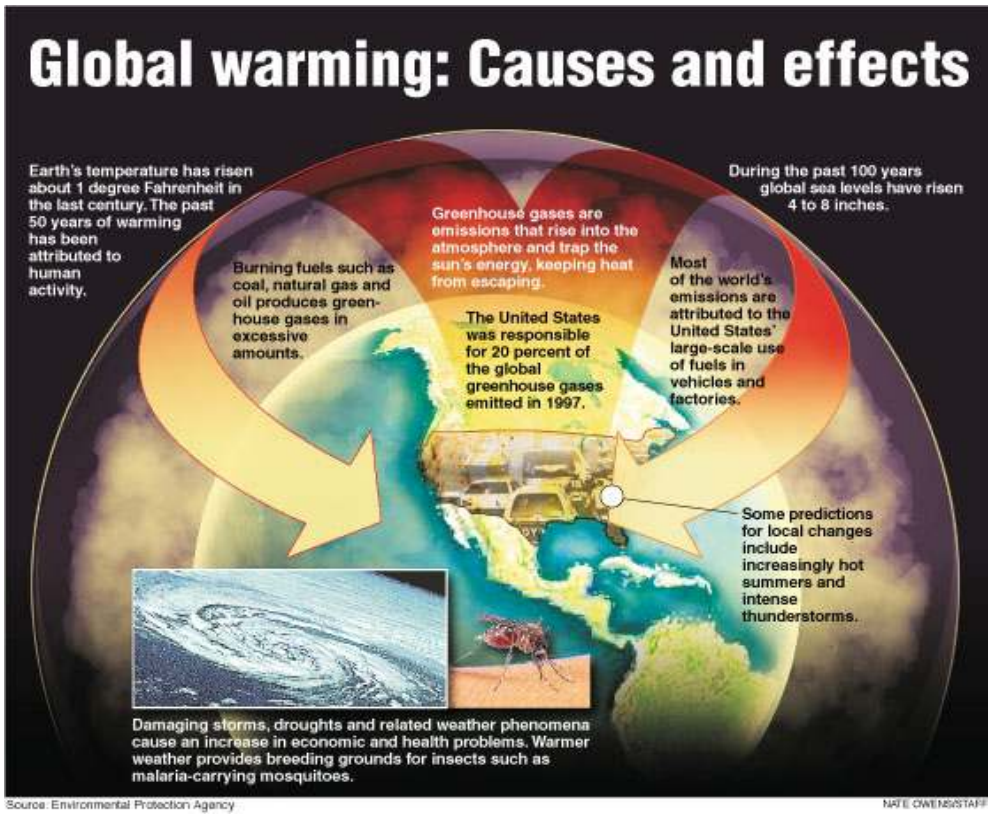
Modern man uses many chemicals in the production of goods. One type of chemical that is used in many coolants (used in refrigerator and air conditioning machines, as well as some aerosols) is called chlorofluorocarbon gases (CFC gases).

These types of chemicals have created a hole in the ozone layer that is located mostly over Antarctica.

This hole is making living things more susceptible to the Sun's harmful ultraviolet rays. We don't want the hole to get bigger so it's very important to decrease the amount of CFC gases that we put into the atmosphere.

10.2. GLOBAL WARMING AND THE GREENHOUSE GASES

Greenhouses (small glass houses) are used to grow plants. Greenhouses work by trapping heat from the Sun.

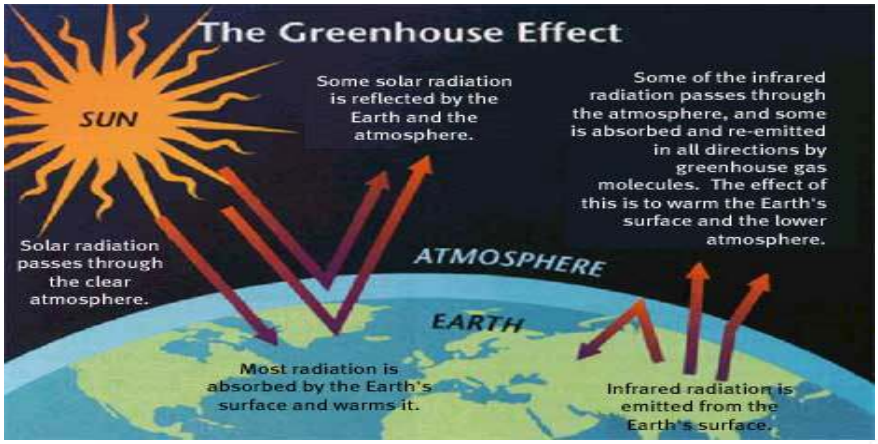


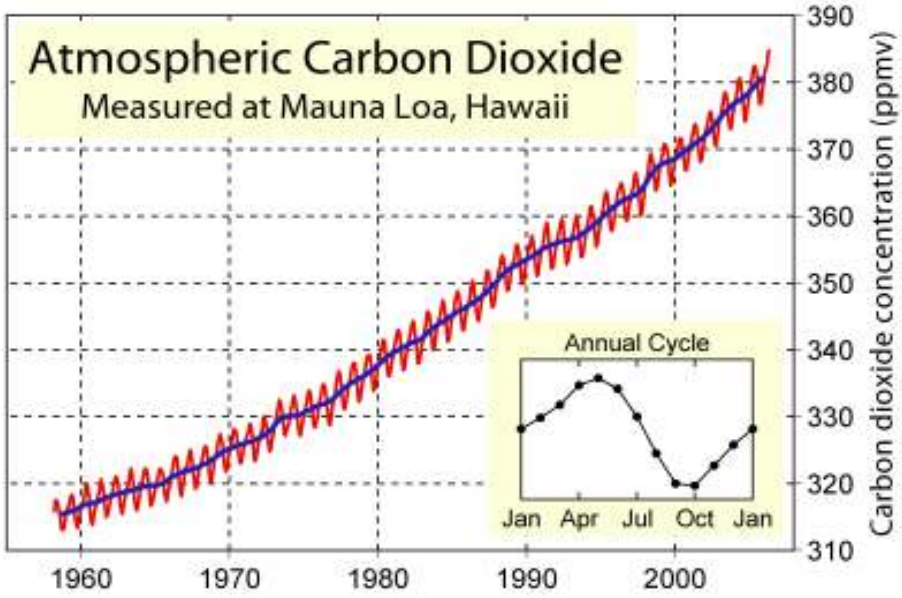
Greenhouse gases (carbon dioxide and water vapour), in general, trap heat in the Earth's atmosphere. Without these gases, heat would escape into space and the Earth's temperature average would be -18 ºC, and the Earth would not be warm enough for humans to survive.

Modern man uses a lot of coal and gas resources on the Earth as energy sources. Gasoline and coal can be burned in combustion reactions involving oxygen. The products of the reaction are carbon dioxide and water vapour. Carbon dioxide, however, is known as a greenhouse gas.

A greenhouse gas is a gas that traps the Sun's rays in the Earth's atmosphere. So when the Sun's rays strike the Earth and bounce off the surface of the Earth, if they hit a molecule of carbon dioxide while leaving the Earth, the Sun's ray will bounce back toward Earth. This means that instead of each Sun's ray hitting the Earth once, the Sun's ray hits the Earth twice.

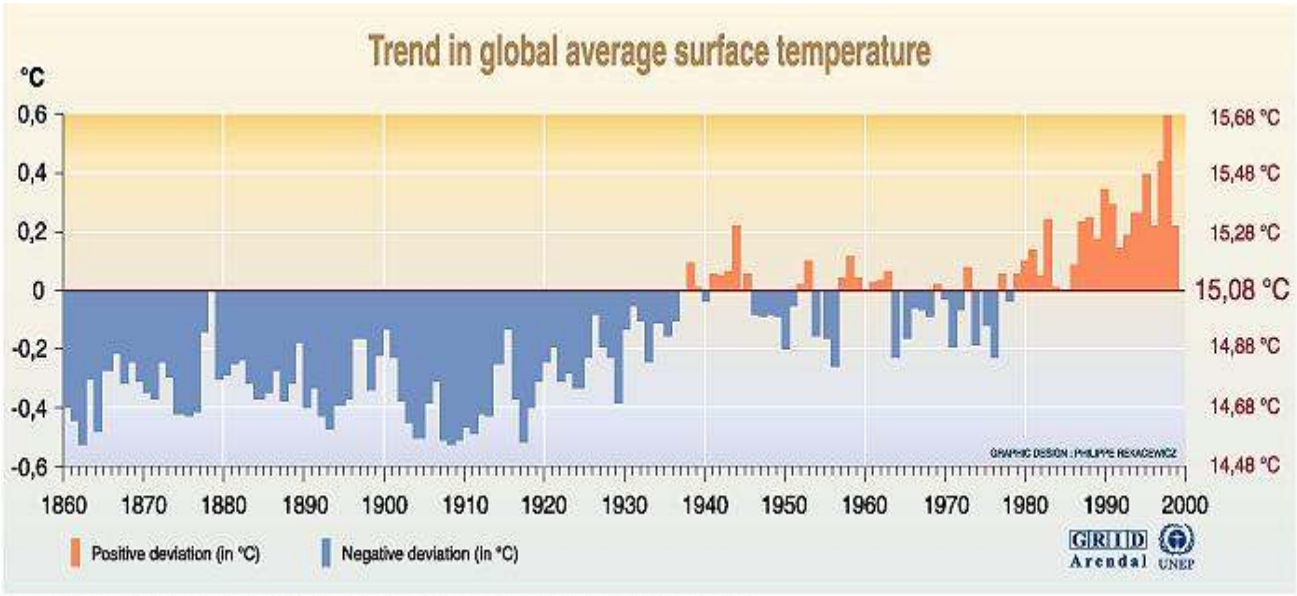
Greenhouse gases, in general, trap heat in the Earth's atmosphere. And the more times a ray hits the Earth's surface, the hotter the Earth will get. Man is currently using so much coal and gas for energy that the level of carbon dioxide is increasing worldwide. This has caused an increase in worldwide temperatures and is a very serious world problem.





10.3. CONSEQUENCES BY INCREASING IN GLOBAL TEMPERATURE

The Earth has warmed about 1,8 ºC in the last 100 years. And the four warmest years of the 20th century all happened in the 1990s. The consequences of this fact could be:



Source: School of environmental sciences, climatic research unit, university of East Anglia, Norwich, United Kingdom, 1999.

1. Rising sea level: Over the last 100 years, the level of the sea has risen about 15-20 cm worldwide. The sea has risen because glaciers and sea ice are melting. Also warmer temperatures in the sea make it rise even more. Heat makes water expand and it takes up more space.

2. Frequency and intensity of extreme weather events: Floods, droughts, heat waves, hurricanes.

3. Changes in the amount of precipitation: Rain, snow, hailstorm.

4. Changes in the places where we plant crops.

5. Glaciers melting: Many glaciers in the world are now melting.

6. Species extinction.

7. Appearance of new diseases.

8. Human health: Heat stress caused by very warm temperatures and high humidity.

UNIT 6. THE HYDROSPHERE

The hydrosphere is defined as "*The set of waters that cover part of the terrestrial surface"* or *"The external zone of the planet in which water is in the gaseous, liquid or solid state; the ocean, seas, rivers, streams, lakes, glaciers, underground waters and atmospheric water vapour, as in clouds*".

The hydrosphere covers about 70% of the surface of the Earth. The hydrosphere, like the atmosphere, is always in motion.

ACTIVITIES

1. Circle the correct answer. The hydrosphere is formed by:

a) Magma
b) Wet air
c) Water
d) More superficial layer

2. Circle the correct answer. The hydrosphere covers:

a) A fourth part of the Earth approximately
b) Three-fourths of the Earth
c) Almost the totality of the planet
d) Half of the planet

3. Circle the correct answer. The hydrosphere can be:

a) Only in solid state
b) Only in liquid state
c) Only in gaseous state
d) In the three states of matter

4. Circle the correct answer. The chemical compound which is more abundant in the hydrosphere is:

a) CO_2 (carbon dioxide)
b) O_3 (ozone)
c) H_2O (water)
d) NH_3 (ammonia)

5. Circle the correct answers. Two of the following sentences are false:

a) The hydrosphere in solid state forms glaciers and other things.
b) The continental waters are salty like the marine waters.
c) We only find the hydrosphere in liquid state in the oceans.
d) The water in gaseous state is in the atmosphere too.

1. THE WATER CYCLE

The water cycle is the continuous circulation of water on, in, and above the surface of the Earth. This includes the atmosphere, land, surface water and groundwater.

There is no beginning or end because it's a cycle. So it can start anywhere but it usually begins in the oceans and seas.

Water can change states between liquid, vapour and ice at various places in the cycle. These processes can happen in a few seconds or over millions of years.

Heat from the Sun powers the water cycle. This heat evaporates water from the Earth's surfaces (oceans, seas, lakes, rivers. streams, reservoirs). Plants free water to the air by transpiration.

The water vapour condenses forming tiny droplets. These droplets form clouds. When the clouds meet cool air over land, precipitation happens as rain, snow or hail, and water returns to the land or sea.

Some of the precipitation soaks into the ground; some of the underground water is trapped between rocks. This is called groundwater.

So Earth's waters are always in movement and changing states (vaporization, condensation, melting, sublimation or freezing).

As water moves through the cycle, it changes state between liquid, solid and gas phases. Water moves from compartment to compartment, such as from river to ocean, or ocean to atmosphere by physical processes like runoff or evaporation.

ACTIVITIES

1. Are the following sentences true (T) or false (F)?

1) Water in rivers evaporates and goes into the seas. _____

2) Water evaporates and forms clouds made of tiny droplets. _____

3) The plants, by transpiration, free water vapour to the atmosphere. _____

4) Water from the clouds always falls to the ground as rain. _____

5) The snow on the mountains turns into liquid water. It flows into rivers. _____

6) The water cycle has got a beginning and an end. _____

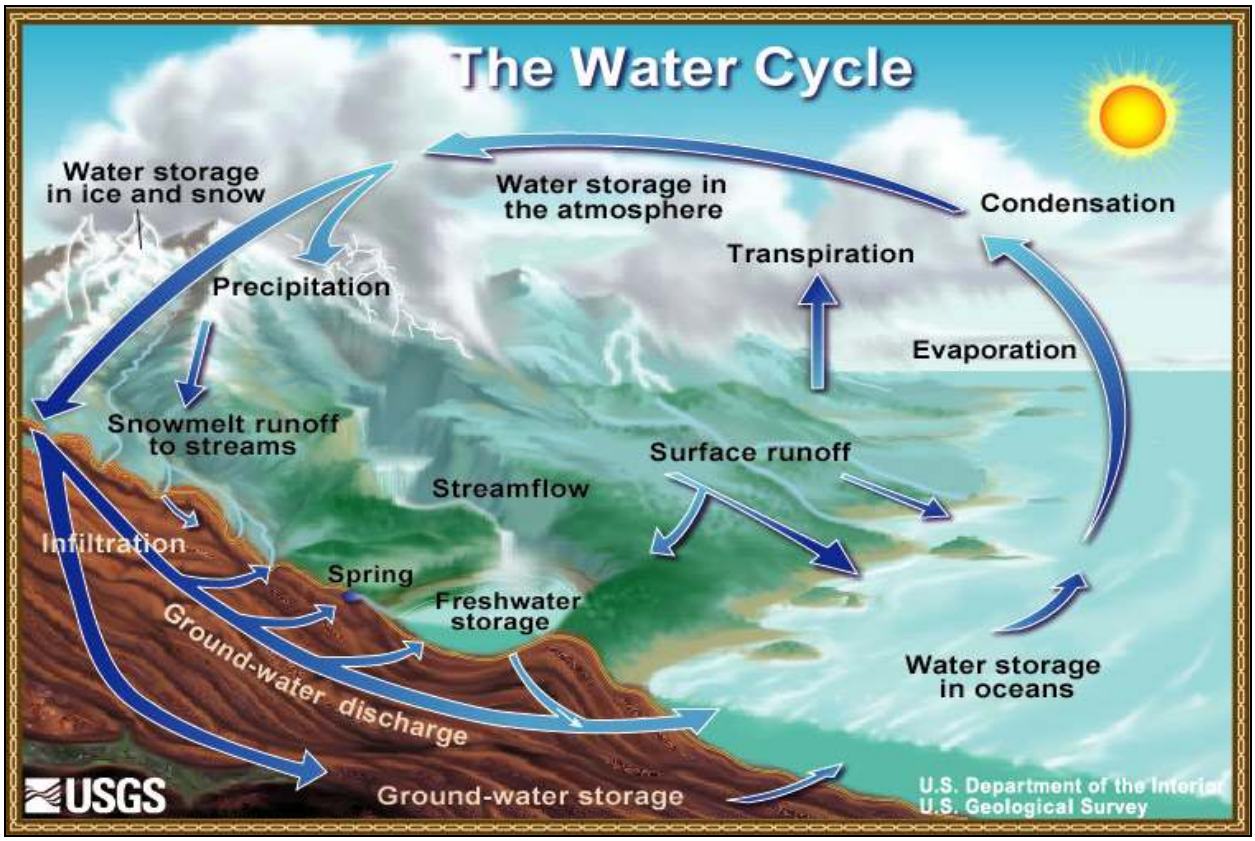
7) The groundwater is the underground water trapped between rocks. _____

8) Plants also evaporate water by transpiration. _____

9) As water moves through the cycle, it doesn't change physical state. _____

10) Earth's waters are always in movement. _____

11) Water only changes physical state once. _____



2. Look at the picture above and match words on the left column to their characteristics on the right column:

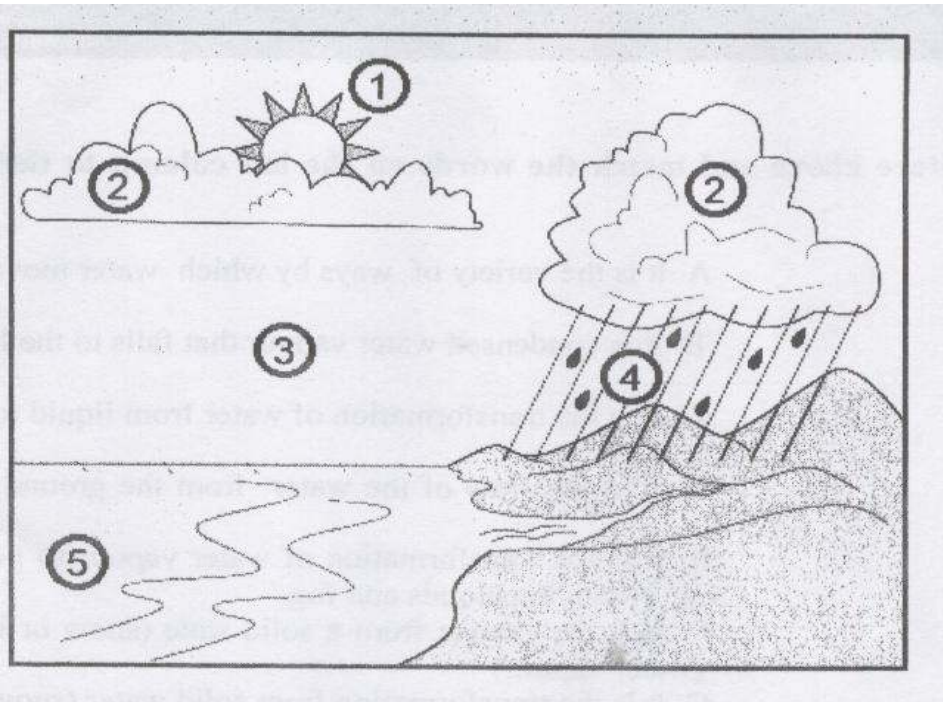
Answer

_____ 1. Precipitation
_____ 2. Infiltration
_____ 3. Runoff
_____ 4. Subsurface flow
_____ 5. Snowmelt
_____ 6. Evaporation
_____ 7. Condensation
_____ 8. Sublimation
_____ 9. Spring
_____ 10. Stream flow
_____ 11. Groundwater
_____ 12. Water storage areas
_____ 13. Stream
_____ 14. Evapotranspiration

A. It's the variety of ways by which water moves across land.
B. It's condensed water vapour that falls to the Earth's surface.
C. It's the transformation of water from liquid to gas state.
D. It's the flow of the water from the ground surface into the ground
E. It's the transformation of water vapour to liquid water droplets in the air producing clouds and fog.
F. It's the change from a solid state (snow or ice) directly to a gas state (water vapour).
G. It's the transformation from solid water (snow or ice) to liquid water.
H. It's the place in which water is stored.
I. It's the water that is inside the soil and rocks of the Earth's crust
J. It's the transfer of water vapour to the atmosphere from vegetation and ground surfaces through evaporation and transpiration
K. It's the flow water in streams, rivers and other channels.
L. It's the natural flow of water from the ground or from the rocks.
M. It's small stream of water flowing naturally form the Earth.
N. It's a body of water flowing in a watercourse.

3. Fill in the blanks:

The _____ evaporates _____ from lakes and oceans. As the air rises, it cools. The water vapour condenses into tiny droplets of _____. The droplets crowd together and form a _____. Wind blows the _____ towards the land. The tiny droplets join together and fall as precipitation to the _____ The water soaks into the ground and collects in _____ The _____ that never ends has started again!



Use the diagram to identify the different parts of the water cycle:

1	2	3	4	5

4. Draw a conceptual map with these concepts:

Hydrosphere	Lakes
Oceans	Underground water
Ices	Polar caps
Continental water	Water vapour
Glaciers	Seas
Rivers	Clouds

5. Water in continents. Match the following sentences and concepts:

Answer

_____ 1. Rivers, streams and free-flowing waters.	A. It's the 0,3% of all continental waters.
_____ 2. Glaciers	B. It's the 0,7% of all continental waters.
_____ 3. Lakes	C. Most fresh water is here
_____ 4. Groundwater	D. It's the 20% of all continental waters.
	E. It can flow freely along the surface.
	F There are two types: some of them are on the high mountains others are on the polar caps.
	G. Water soaks into the ground and forms deposits and reservoirs.
	H. Water accumulates in the land depression.

6. Ways of saving of water. Write true (T) or false (F) next to the following sentences:

How can you save water?

1) Use the washing machine and the dishwasher every time you have something dirty. _____
2) Use the fridge when you want cold water. _____
3) Water your plants when it's sunny and hot _____
4) Have a shower, not a bath. _____
5) Have a bath, not a shower. A bath consumes, approximately, 200 l of water. _____
6) Use the washing machine and the dishwasher when they are full. _____
7) Put a bottle full of water inside the toilet tank. The quantity of the water that goes into the toilet is smaller. _____
8) Leave the taps open when you wash your hands or you clean your teeth. _____
9) If you wash the dishes, fill the sink with water and use this water. _____
10) Water your plants early in the morning or at night, the water evaporates less. _____
11) If you want cold water, open the tap a long time. _____
12) If you wash the dishes, leave the tap open all the time. _____
13) Don't leave the taps open when you are cleaning your teeth or washing your hands. _____
14) Have your taps and toilets in good conditions, you can waste a lot of water. _____
15) Reduce the volume of water of your taps. _____

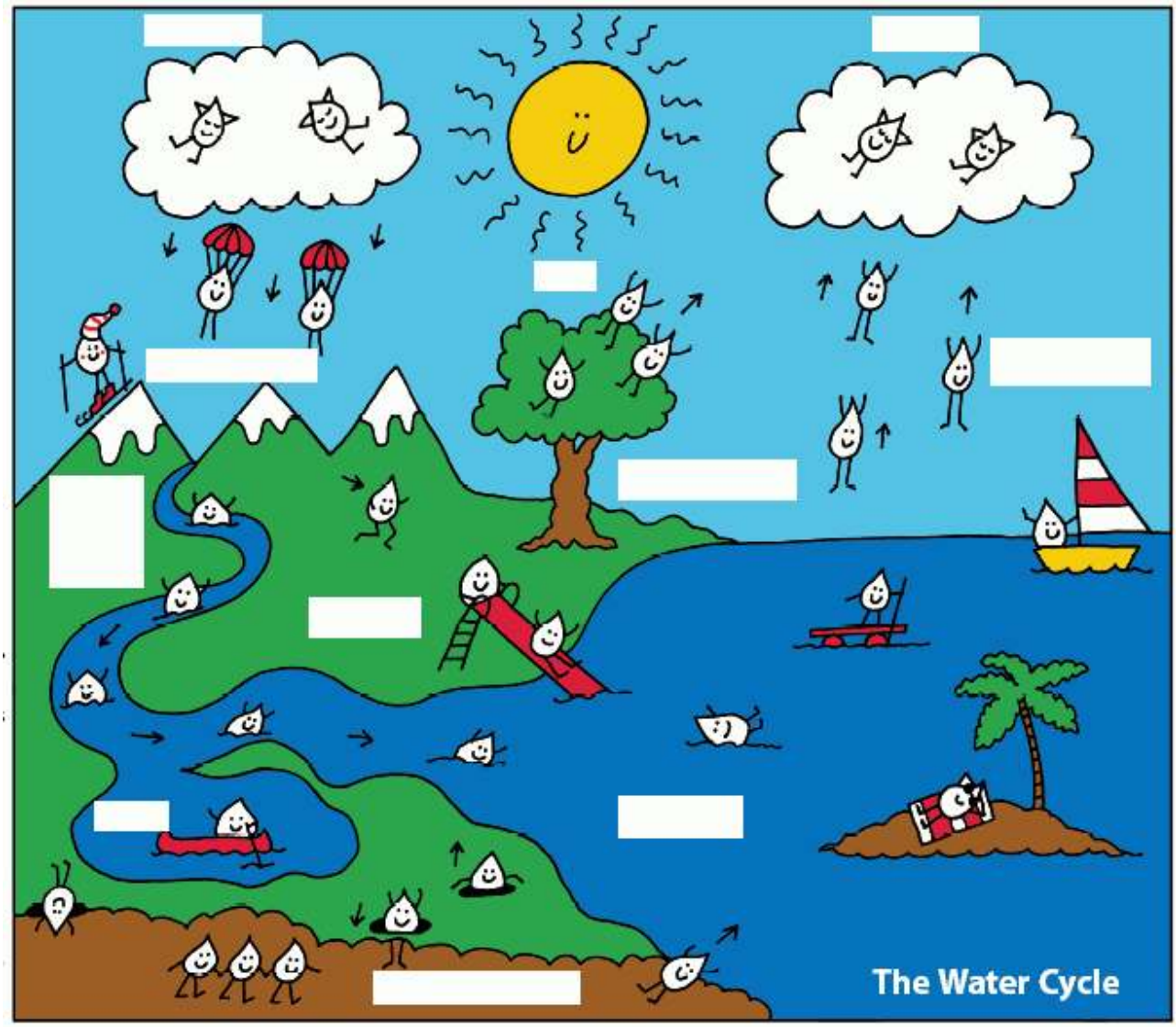
7. Water Cycle Word Search.

Cloud	condensation	energy	evaporation
hail	ice crystal	lake	ocean
precipitation	rain	river	runoff
sea	snow	stream	sun
water cycle	water droplet	water vapour	wind

M V R A P E J N S T R J L F P M
G L I P H W V I B Y A Q A F U L
C N V R A A T A A C D N K O A W
V U E E I T Q G P G W N E T Z P
L W R C L E E Z J O N M S D M P
F A H I C R W T N M R Y B D N F
O T E P T D T S B A R A K Q F Z
C E V I B R Y R M C C O T Z S S
E R W T C O N D E N S A T I O N
A V A A L P T C C L Y C Q H O E
N A B T T L I P S G X L K T E N
W P B I C E B J R I Q O O J R B
F O M O Q T R E J O G U U M A R
D R O N Y T N C J W F D A I I U
W Q T H N E V W Y N H E W Z N N
T I F E R W I H U C R M N L I O
W D N S E A J S K T L R N G Z F
X H Q D Q Y M J S H W E D F P F

8. Use the diagram to identify the different parts of the water cycle (II).

Clouds
Sun
Evaporation
Transpiration
Ocean
Ground Water
Runoff
Lake



9. Choose the right option.

1) Where is most water found on Earth?

A. in glaciers
B. in lakes
C. in rivers
D. in oceans

2) What source of energy evaporates the most water from Earth's surface?

A. volcanoes
B. the sun

C. lightning
D. wind

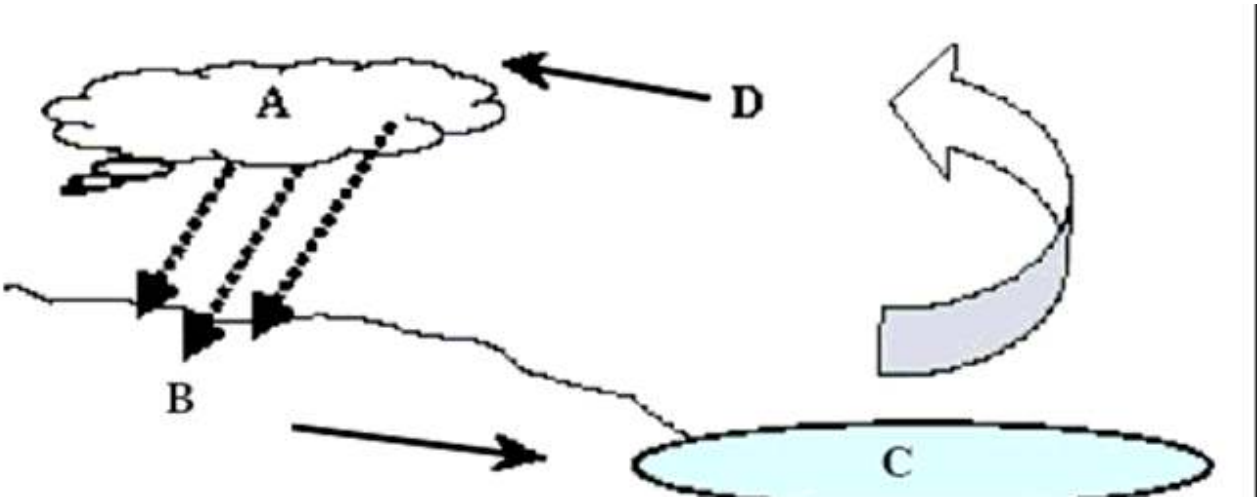
3) What is water doing when it is changed to water vapour?

A. evaporating
B. condensing
C. precipitating
D. freezing

4) What is water vapour doing when it changes to water?

A. evaporating
B. condensing
C. precipitating
D. freezing

10. Use this model of the water cycle to answer the next three questions.



1) Where is water evaporating into the air?

A. from A to B
B. from B to C
C. from C to D
D. from D to A

2) Where is water condensing?

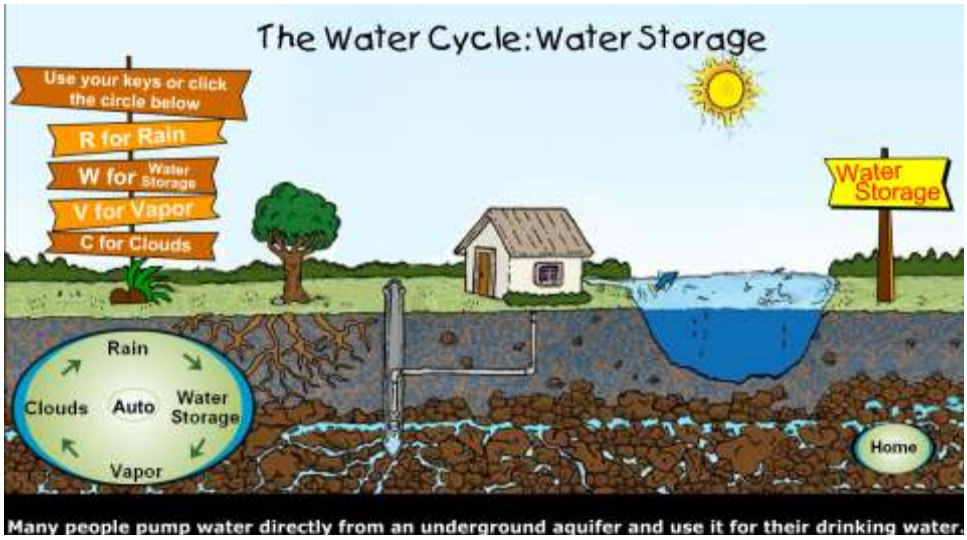
A. from A to B
B. from B to C

C. from C to D
D. from D to A

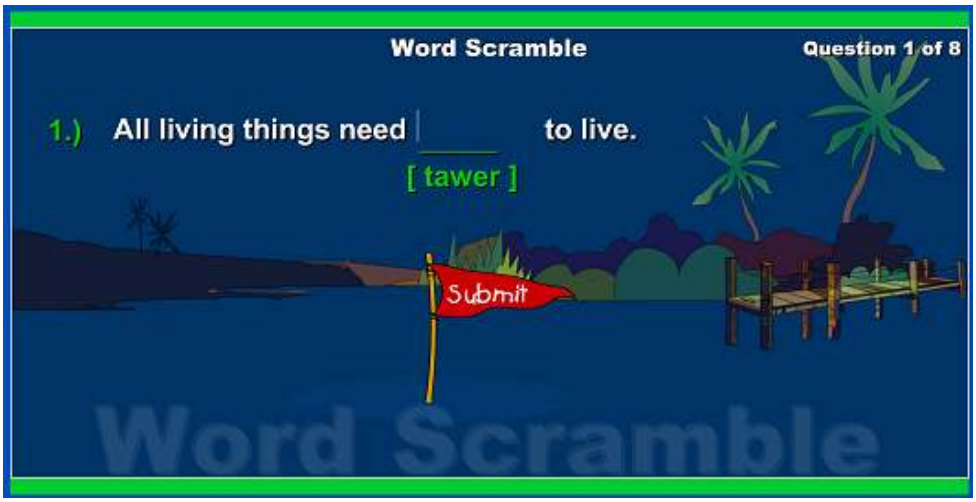
3) Where is precipitation occurring?

A. from A to B
B. from B to C
C. from C to D
D. from D to A

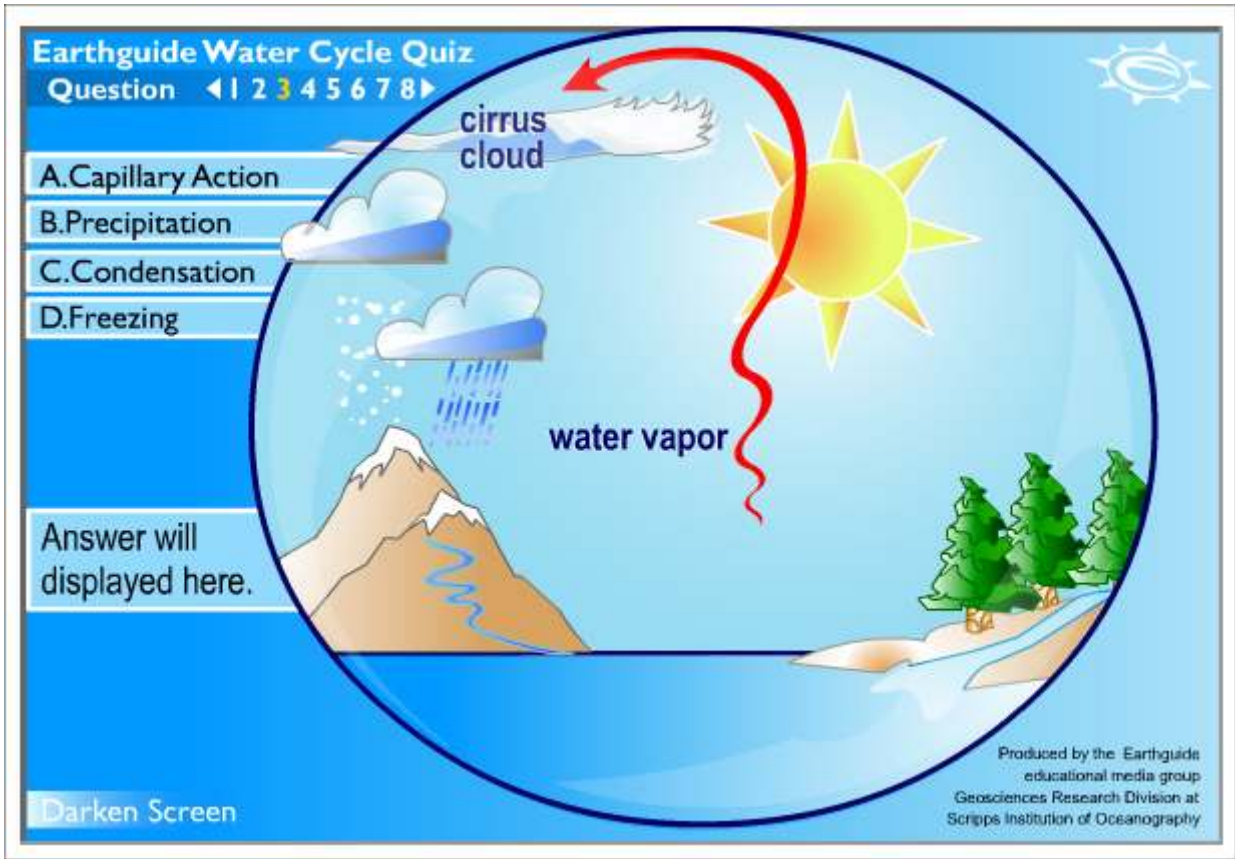
The Water Cycle
http://www.epa.gov/safewater/kids/flash/flash_watercycle.html



Interactive Word Scramble Game
http://www.epa.gov/safewater/kids/flash/flash_wordscramble.html



Water cycle quiz
http://earthguide.ucsd.edu/earthguide/diagrams/watercycle/watercycleq.html



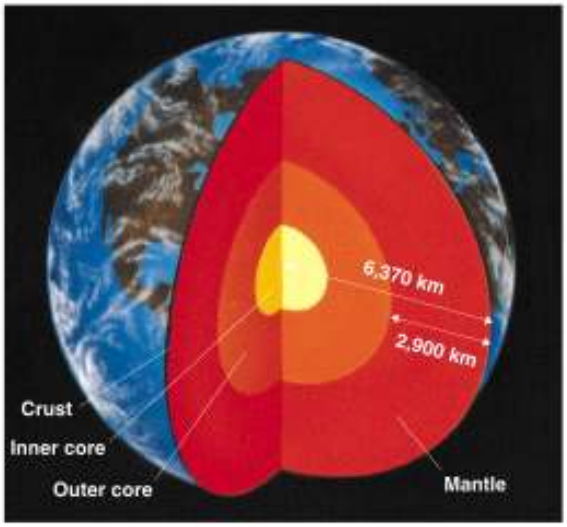
UNIT 7. THE GEOSPHERE

The **geosphere** is made up of three layers:

• The **crust** is the Earth's outer layer. It is made up of solid materials.

• The **mantle** is the Earth's middle layer. It is extremely hot. In some parts, there is **magma** (red-hot liquid rock).

• The **core** is the Earth's inner layer. It is also extremely hot. It is divided into the liquid outer core and the solid inner core.



ACTIVITIES

Read the definitions and label the Earth Diagram.

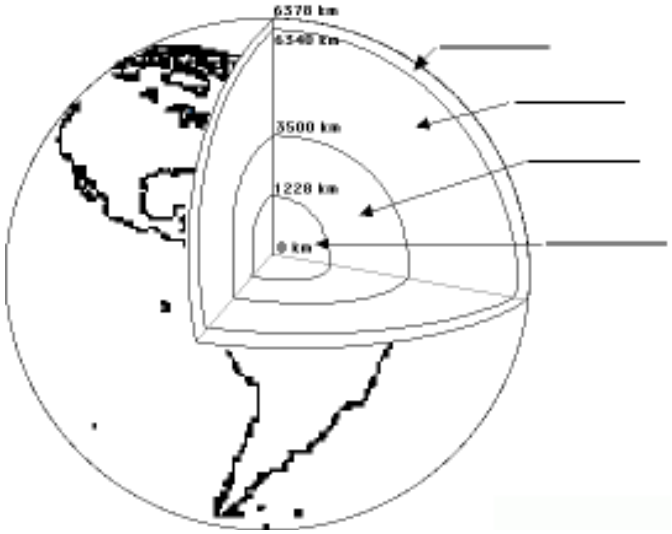
1. DEFINITIONS

• **Crust**. The rigid, rocky outer surface of the Earth, composed mostly of basalt and granite. The crust is thinner under the oceans.

• **Inner core**. The solid iron-nickel centre of the Earth that is very hot and under great pressure.

• **Mantle**. A rocky layer located under the crust (it is composed of silicon, oxygen, magnesium, iron, aluminium, and calcium). Convection (heat) currents carry heat from the hot inner mantle to the cooler outer mantle.

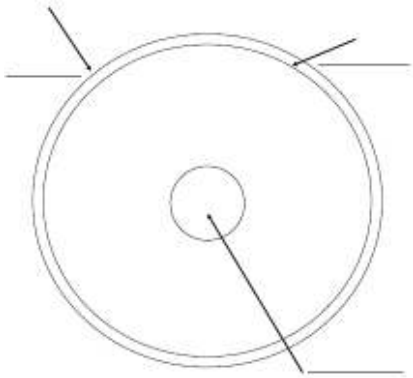
• **Outer core**. The molten iron-nickel layer that surrounds the inner core.



2. LAYERS OF EARTH

ACTIVITIES

Label the three layers of Earth. Then write 2 interesting facts about each layer.



3. ROCKS AND MINERALS

Rocks are natural materials which make up the Earth's crust.

Rocks are made up of minerals. Minerals are pure. We cannot break them down into other substance. There are hundreds of minerals, such as diamond and other precious stones. We can identify each mineral by its density, colour, hardness and shine.

4. TYPES OF ROCK

Rocks can be classified into three types depending on how they are formed:

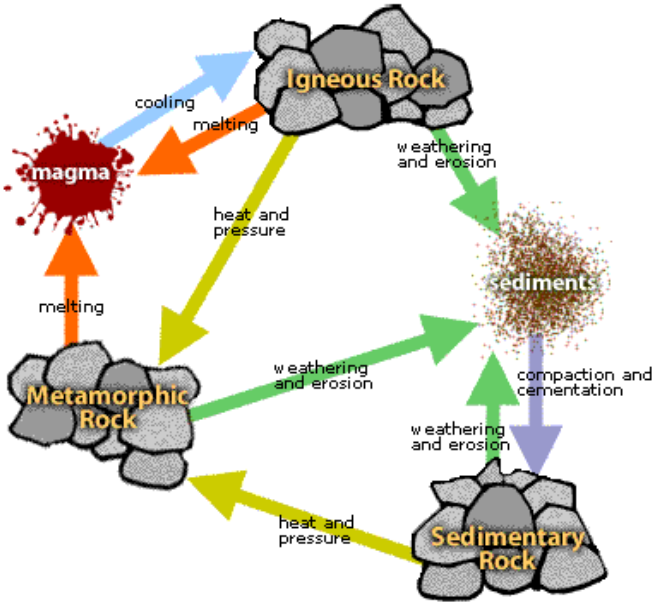
• **Sedimentary rocks** are formed from pieces of other rocks or pieces of living things. Coal and gypsum are sedimentary rocks.

• **Igneous rocks** are formed when magma cools are solidifies. Granite and basalt are igneous rocks.

• **Metamorphic rocks** are formed when sedimentary or igneous rocks are exposed to great heat or pressure and thus change in composition.

5. THE ROCK CYCLE. "TURNS IN TO"

The rock cycle is similar to the water cycle, but it uses rocks instead. When reading this chart the arrows are read like "turns in to." For example: Igneous rock turns in to sediment (because of weathering and erosion).



ACTIVITIES

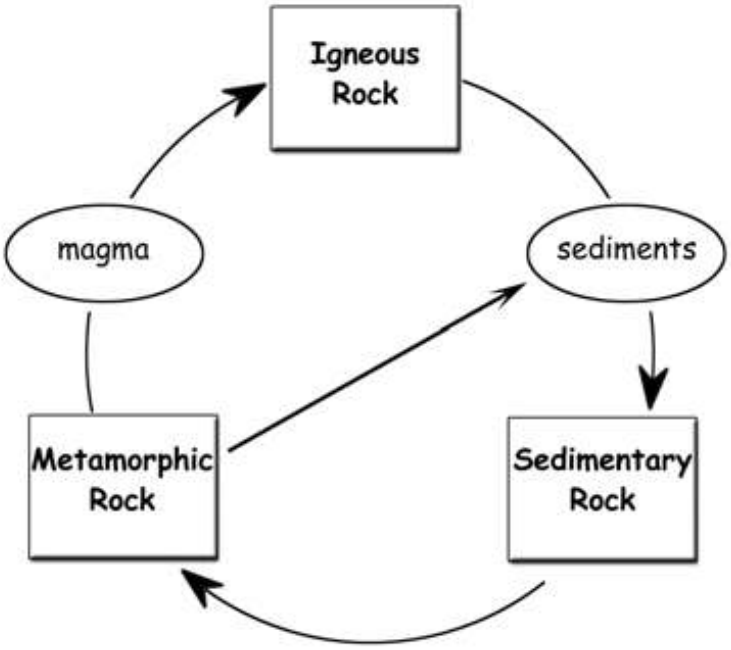
1. Complete the table by ticking the appropriate statements. The three kinds of rocks.

Statement	Igneous	Sedimentary	Metamorphic
formed from moltenlava or magma			
formed by the action of heat and pressure			

formed when substances settle in water and are compressed over millions of years sandstone is an example			
basalt is an example			
limestone is an example			
marble is an example			
pumice is an example			
often contain fossils			
have small crystals when they cool quickly			

2. Complete the diagram by adding labels in the correct place. The rock cycle.

Use words from this list: **grains compact and stick together; weathering & erosion** *(used twice);* **heat & pressure; cooling & crystallisation; melting**



3. Draw an arrow from the description on the left to the appropriate word on the right.

1) A naturally occurring, nonliving solid with a definite structure and composition.

2) A mixture of minerals, mineralogist, glass, or organic matter.

3) Processes by which rocks form and change.

4) A hard silicate mineral.

5) An igneous rock made up of mica, feldspar, quartz.

a) rock
b) mineral
c) quartz
d) granite
e) rock cycle

6. WEATHERING

The action of wind and water is called **weathering:**

• **Erosion** is the removal of soil and rocks by wind and water. For example, the sea's waves gradually erode a cliff.

• **Transport** is the movement of eroded material. For example, rivers, seas and the wind carry sand.

• **Sedimentation** is the accumulation of eroded material from other places. For example, mud settles at the bottom of a river.

ACTIVITIES

1. Write each word in the box under the correct heading.

weathering; igneous; melting; cooling; erosion; sedimentary; compaction cementation; deposition; heating; metamorphic

Processes in the rock cycle	Kinds of rocks

2. Complete each sentence

a) Erosion is the removal of rocks by _____ .

- volcanic activity - wind and water

b) Transport is the _____ of eroded material.

- movement - eruption

c) Sedimentation is the _____ of eroded material.

- destruction - accumulation

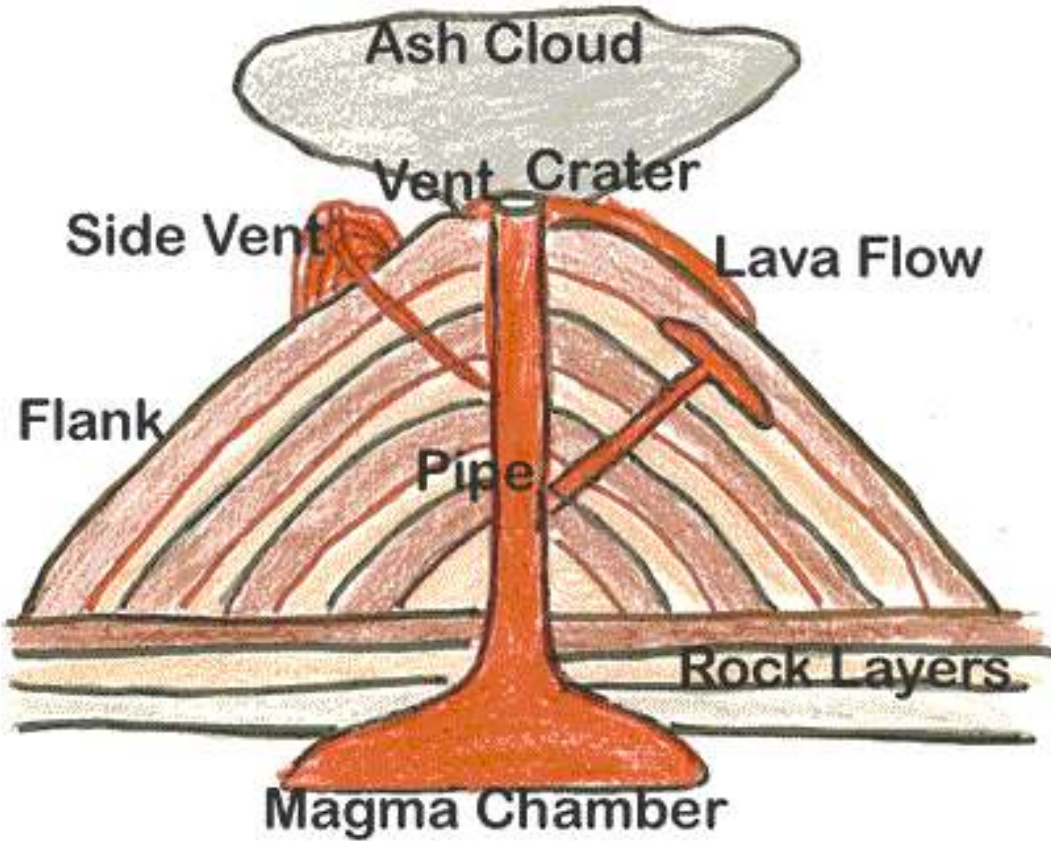
7. VOLCANOES

Volcanoes form in places where there is **magma** (red-hot liquid rock) just under the surface. When a volcano erupts, internal forces push the magma up through a central pipe, the volcanic **chimney.** It emerges through a circular opening called a **crater.** Magma is called **lava** when it reaches the Earth's surface. Lava moves down, destroying everything in its path. Layers of lava form a volcanic **cone.**

7.1. PARTS OF A VOLCANO

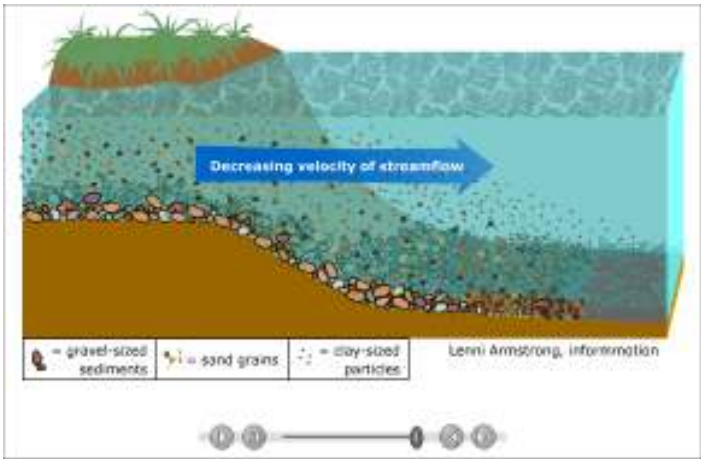
Volcanoes are mountains that have hot lava and magma inside. Below the Earth's crust is a solid body of rock called the mantle. Pressure and extremely high temperatures melt the rock. This melted rock is called **magma**. Magma is stored in a **magma chamber**. The magma pushes up to the Earth's crust through a conduit or **pipe** in the volcano. It can also branch off to side vents and create parasitic cones.

When the magma reaches the surface it is called lava. Lava comes through the main vent when the volcano erupts. This can create a **crater** at the top of the volcano. Lava flows down the **side or flank** of the volcano. When the lava cools, it turns into rock. Each eruption creates another layer of rock that builds up the volcano.

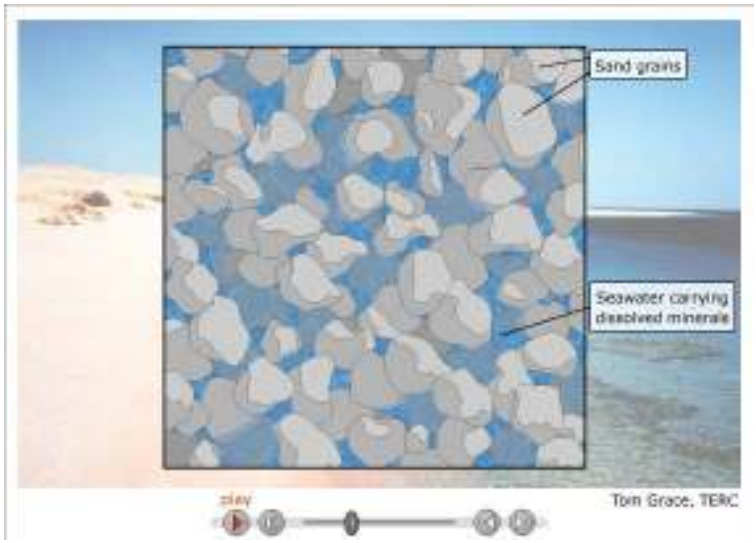


ACTIVITIES

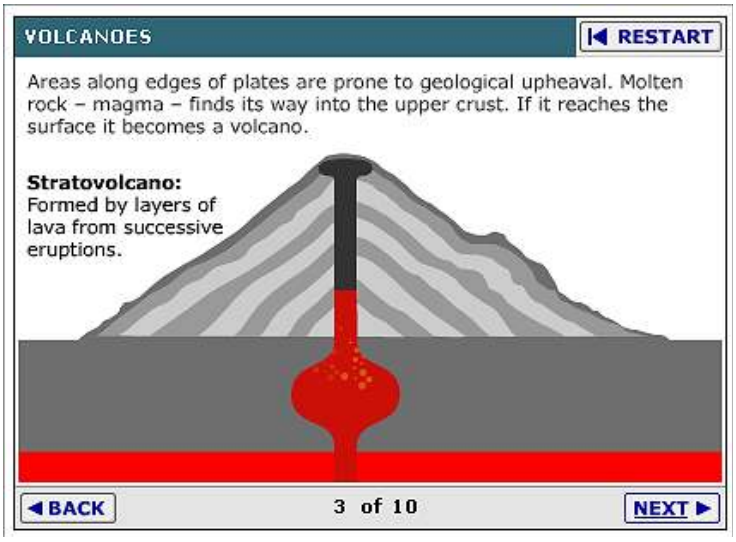
Observe how sediments are deposited
http://www.classzone.com/books/earth_science/terc/content/visualizations/es0604/es0



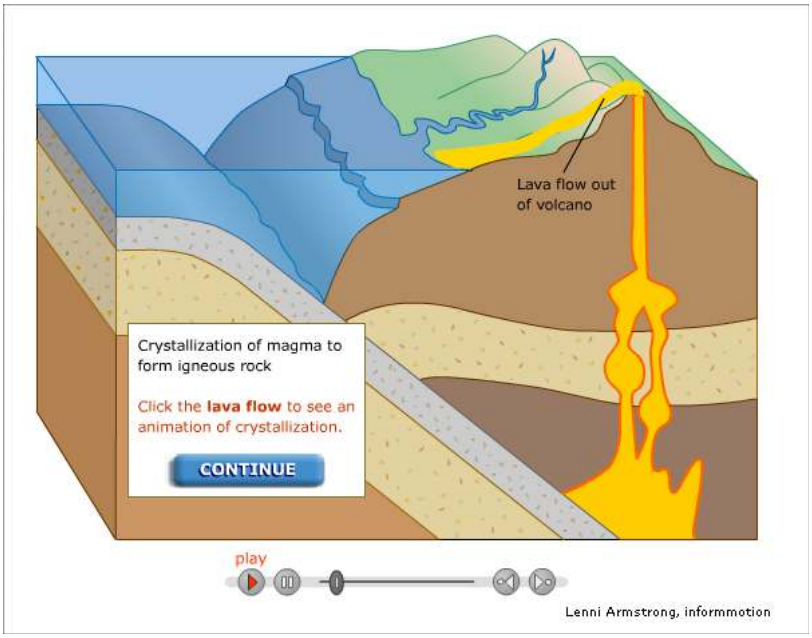
Observe an animation of sedimentary rocks forming
http://www.classzone.com/books/earth_science/terc/content/visualizations/es0605/es0



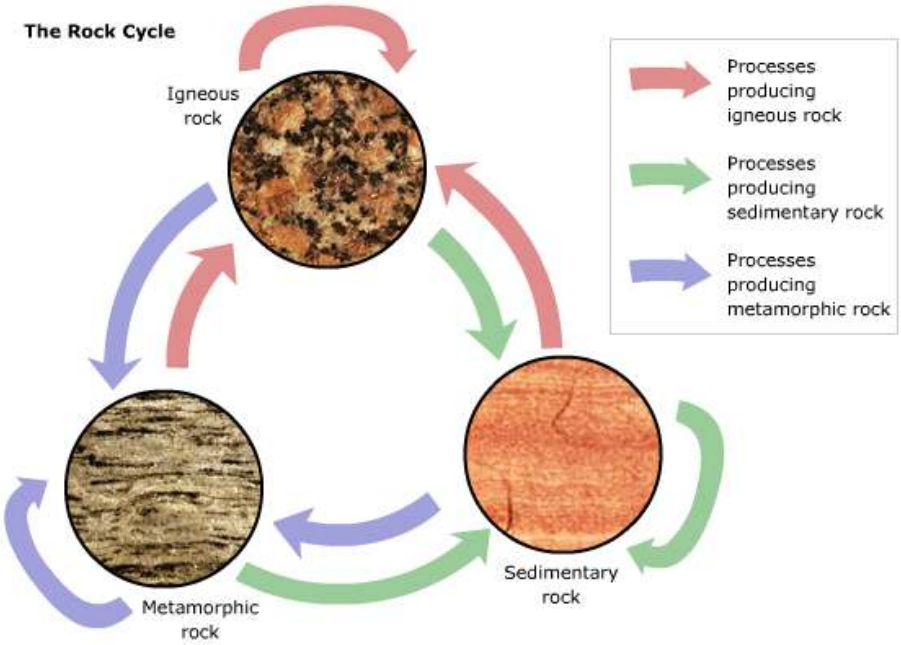
Animated guide: Volcanoes
http://news.bbc.co.uk/2/hi/science/nature/4972366.stm



Interactive Rock Cycle Animation
http://www.classzone.com/books/earth_science/terc/content/investigations/es0602/es0602page02.cfm



Rock Cycle Diagram
http://www.classzone.com/books/earth_science/terc/content/investigations/es0602/es0602page03.cfm



UNIT 8. THE LIVING BEINGS

1. CELL STRUCTURE

All living beings are made up of many cells. They are called multicellular organisms. The rhinoceros in picture1 is an example. But some living beings are made up of only one cell. They are called unicellular or single-cell organisms. The paramecium in picture 2 is an example.

Picture 1

Picture 2

We are made up of cells. Our body contains about one hundred billion (a million million) cells.

The cell is the basic structural and functional unit of life and performs the same functions as all living beings: nutrition, reproduction and interaction.

All cells have three main parts:

- Cellular membrane
- Cytoplasm
- Nucleus

1. **Cellular membrane**. It is a thin layer which separates the inside and the outside of the cell and covers the whole cell. It controls what passes in and out of the cell.

2. **Cytoplasm**. It is the jelly-like substance inside the cell. It contains various organelles and chemical compounds necessary for metabolic reactions.

3. **Nucleus**. It controls the cell. It controls the cell functions and cell division. It contains genetic material with hereditary information (DNA).

Inside the cell there are various structures or organelles that have different functions:

1. **Mitochondria**. Chemical reactions produce enormous amount of energy for the cell inside of the mitochondria.

2. **Ribosome**. Proteins are made inside of ribosomes.

3. **Vacuoles**. They are small sacs and contain food or water. They are the storage tank of the cell.

Plants and animals are also made up of cells. There are many types of cells. They have got different shapes and do different jobs.

ACTIVITIES

1. Match the parts of the cell with their main characteristics:

Answer

_____ 1. Nucleus	A. It is genetic material with hereditary information.
_____ 2. Cellular membrane	B. It is a jelly-like substance inside the cell.
_____ 3. Cytoplasm	C. It is a protective membrane surrounding the cell.
_____ 4. Organelles	D. It controls the cell functions and cell division.
_____ 5. DNA	E. They are structures inside the cell.

2. Fill the gaps with the following words from the list:

Hereditary, structural, protective, functions, cells, interaction, compounds, jelly-like, reproduce, reactions, genetic, cellular membrane

The cell is the basic _____ and functional unit of life and performs the same _____ as all living beings: nutrition, reproduction and _____ . All living beings are made of _____.

The basic elements in a cell's structure are:

- A _____ cell membrane surrounding it, called _____
- Cytoplasm, a _____ substance inside the cell. It contains chemical _____ necessary for metabolic _____ and various organelles.
- The nucleus controls the cell functions and cell division. It contains _____ material with _____ information (DNA). Without this, a cell cannot _____ and die.

3. Identify the parts of the cell and complete the table:

	It contains many different organic chemical compounds and organelles
	A piece of thin material similar to skin that covers and supports the cytoplasm content.
	A small body of dense material covered by a protective membrane . It controls all the activities of the cell. It contains genetic material (chromosomes)

4. Answer the following questions:

a) What processes do cells have in common with other living beings?

b) Name the principal parts of a cell

c) What is a living being called unicellular?

d) Give an example of single-celled organism

e) What is the name of the living beings that are made of many cells?

f) What is a Rhinoceros?

g) How many cells dos our body contain?

h) What is the name of the jelly-like substance inside the cell?

i) How is the layer which separates the inside and the outside of a cell?

_____

j) What does the cytoplasm contain?

_____

2. TYPES OF CELL

Cells can be classified into two types depending on whether or not they have a nucleus:

1. Prokaryotic cells are those which have not got a nucleus and do not contain separate cytoplasm organelles. DNA is found in the cytoplasm inside the cellular membrane. They are much simpler cells and form single-celled organisms. They are only found in bacteria and similar living beings as blue-green algae.

2. Eukaryotic cells are those which have got a nucleus in a protective membrane. This nucleus contains the chromosomes with the cell's genetic information. In the cytoplasm, there are individual structures called organelles. Eukaryotic cells are bigger and more complex than prokaryotic cells. They can form multicellular or single-celled organisms. Animal and plants have got eukaryotic cells.

ACTIVITIES

1. Complete this table:

	EUKATYOTIC CELLS	PROKARYOTIC CELLS
Nucleus		
Living beings		
Bacteria		
Organelles		
Chromosomes		
Animals		
Plants		

2. Fill the gaps with the following words from the list:

Nucleus, chromosomes, single-celled (x2), simplest, complex, multicellular, prokaryotic (x2), organelles, DNA, animals.

The prokaryotic cells are the _____ cells form _____ organisms.

The eukaryotic cells have got individual structures called _____.

The prokaryotic cells have not got a _____ but have got _____

The nucleus contains the _____ with the cell's _____ information.

Bacteria is a _____ organism with _____ cell.

Eukaryotic cell can form_____ or single-celled organisms such as _____ and plants.

Eukaryotic cells are bigger and more _____ than_____ cell.

3. Answer the following questions:

a) What is a prokaryotic cell?

_____

b) Where the DNA is in a prokaryotic cell?

_____

c) What kind of organism does prokaryotic cell form?

_____

d) Are the prokaryotic cells simpler or more complex than eukaryotic cells?

_____

e) Give an example of living being which has got prokaryotic cell

_____

f) What is a eukaryotic cell?

_____

g) What does the eukaryotic nucleus contain?

_____

h) What is a chromosome?

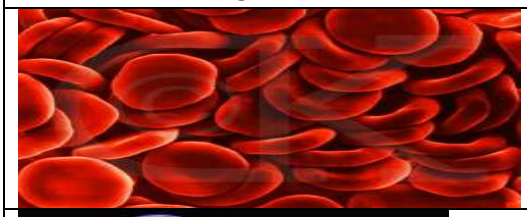
i) What has the eukaryotic cytoplasm got?

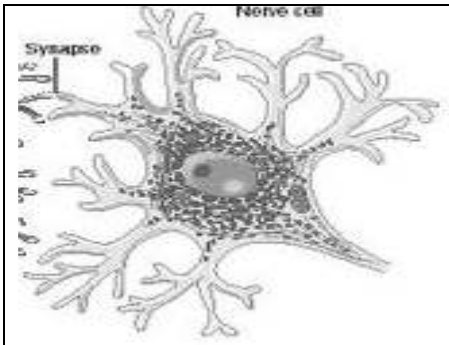
j) Are eukaryotic cells bigger or smaller than prokaryotic cells?

k) What type of organisms has eukaryotic cell got?

l) Give an example of living being which has got eukaryotic cell?

4. Read this table (it is not in the correct order):

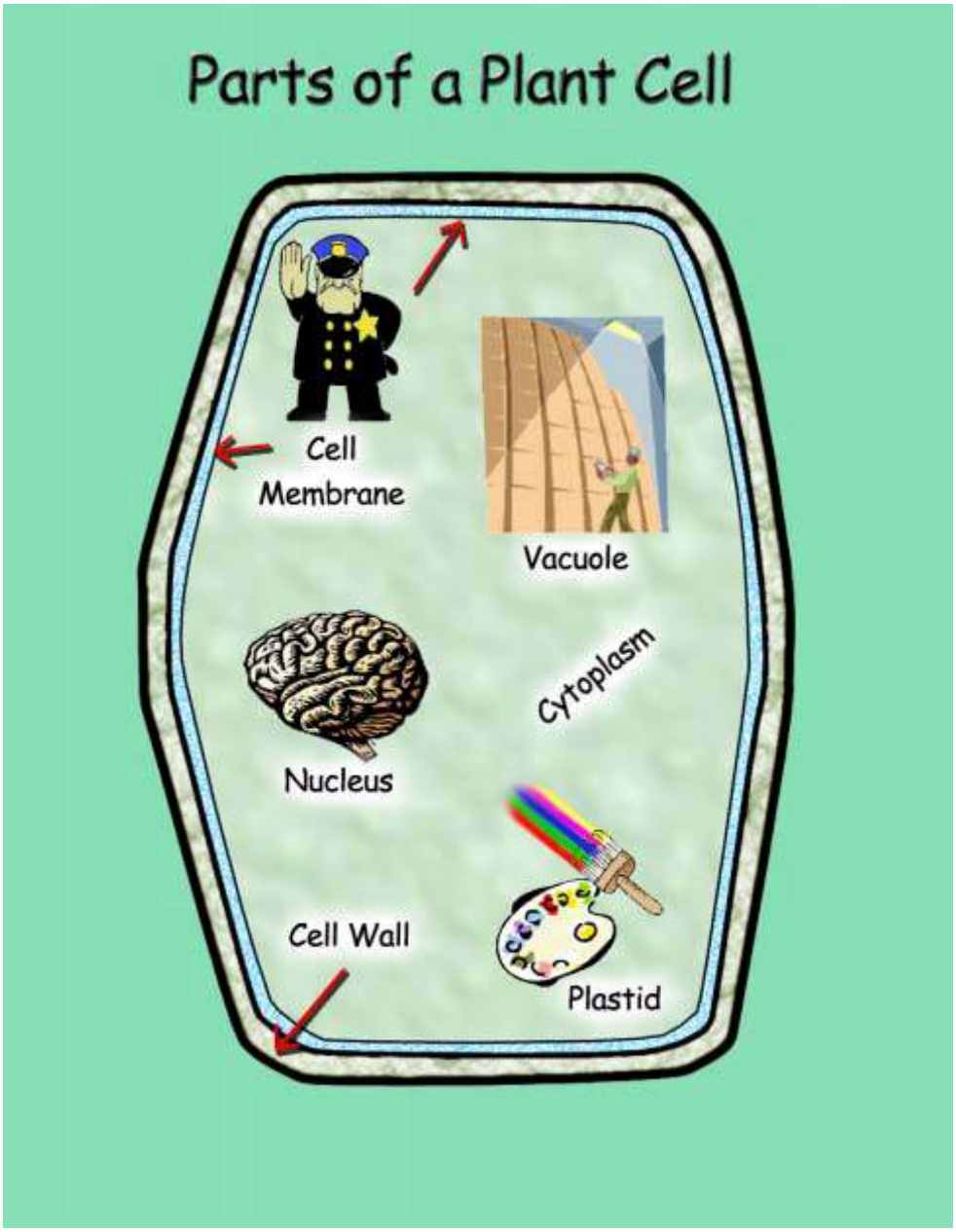
CELL	FUNCTION	TISSUE LOCATION
	A. It carries messages and information around the body.	I) Blood
	B. It carries oxygen to the other cells in the body.	II) Nerve tissue

	C. It stores food	III) Fat tissue.

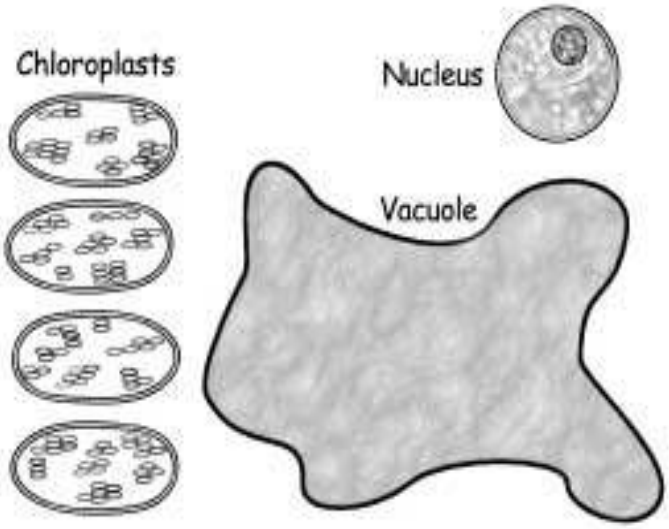
3. PARTS OF THE CELL

Cell Part	**Function**
Cell (plasma)	Membrane controls entry into and out of cell
Cell wall	Shapes and supports a plant cell
Chlorophyll	Traps light and is used to produce food for plants
Chloroplasts	Food for plant cells is made here
Chromosomes	Contains code which guides all cell activities
Cytoplasm	Substance within cell
Endoplasmic reticulum	Surface for chemical activity
Golgi bodies	Stores and releases chemicals
Lyosome	Digestion center
Microtubule	Hollow cylinder that supports and shapes cell
Mitochondria	"Powerhouse" of cell
Nuclear membrane	Holds nucleus together
Nucleolus	Spherical body within nucleus
Nucleus	Chromosomes are found here
Plastid	Stores food or contains pigment

Ribosomes	Where proteins are made
Vacuole	Contains water and dissolved minerals



Cell Part	Description	Function
Cell (plasma) membrane	Semi-permeable membrane surrounding cell	Selects what enters cell - traffic cop
Nucleus in center, bounded by membrane	Spherical, often to run cell - cell's brain or computer	Contains information
Cytoplasm between plasma and nuclear membranes	Semi-fluid medium within cell - contains organelles	Jellylike substance
Vacuole waste - cell's warehouse	Membrane-bound sac	Stores food and
Cell wall (plant cells only)	Fibers of cellulose	Shapes and supports a plant cell
Plastid	Contain pigments	Determines color



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Ribosomes	Where proteins are made
Vacuole	Contains water and dissolved minerals

ANEXOS