

UNIT 5. THE ATMOSPHERE

I. THE ATMOSPHERE

I.1. PARTS OF ATMOSPHERE

- The **atmosphere** is a layer of gas that surrounds the Earth. It has five layers: the troposphere, the stratosphere, the mesosphere, the thermosphere and the exosphere.
- The **troposphere** is the layer that extends from the surface to a height of about 15 km. This is where **weather phenomena** like wind, cloud formation, rain or storms take place.
- The layer above the troposphere is the **stratosphere**. It extends to 50 km and contains the **ozone layer**.
- The **mesosphere** extends to 80 km. At the top of the mesosphere, the temperature decreases to -100°C and the amount of air decreases with altitude.
- The **thermosphere** extends to an altitude of 500 km. Here, the temperature increases to 1500°C. The lower part of the thermosphere contains a sub-layer called the **ionosphere**.
- The **exosphere** extends to about 1000 km, where there is no longer any air and the temperature is stable.

troposphere	stratosphere	mesosphere
thermosphere	exosphere	ionosphere
ozone layer	aurora borealis	

I.2. THE COMPONENTS OF AIR

- Air is made up of a mixture of gases. The main gases are **nitrogen** (78%) and **oxygen** (21%). **Water vapour, carbon dioxide** and **ozone** are present in smaller quantities.
- Nitrogen is necessary for all living things to grow. Nitrogen returns to the atmosphere when organic matter decomposes.
- Oxygen (O₂) is used by living things in respiration. Plants return this oxygen back to the atmosphere through the process of **photosynthesis**.
- Water vapour enters the atmosphere through the evaporation of water from the oceans, seas, lakes and rivers, and through the process of **transpiration** by plants. Water returns to the Earth's surface as precipitation.
- During the day, carbon dioxide is taken in by plants through photosynthesis. When living things breathe, they return carbon dioxide to the atmosphere.
- Ozone (O₃) is found in a layer in the stratosphere. It protects living things from some forms of solar radiation.

nitrogen	oxygen	water vapour
carbon dioxide	greenhouse effect	photosynthesis
transpiration		

2. THE ATMOSPHERIC PRESSURE

- **ATMOSPHERIC PRESSURE** IS THE WEIGHT OR PRESSURE EXERTED BY A COLUMN OF AIR PER UNIT AREA ON THE EARTH'S SURFACE. THE ATMOSPHERE EXERTS A PRESSURE ON ALL OBJECTS AND LIVING THINGS. AT SEA LEVEL, ATMOSPHERIC PRESSURE HAS A VALUE OF 1.013 HECTOPASCALS (hPa) OR 1 ATMOSPHERE (atm)

3.-ATMOSPHERIC PHENOMENA

- Wind is the movement of air produced by the differences in air pressure between two different places. Winds have different names depending on their strength: **breeze, wind, storm** and **hurricane**.
- On a sunny day, air rises and creates a sea breeze that goes from sea to land. At night, the air over the sea rises and creates a land breeze that goes from land to sea.
- Storms are heavy precipitation, usually rainfall, accompanied by **thunder** and **lightning**. Lightning is an electrical discharge within a cloud, or between a cloud and the ground. Thunder is the sound produced by the lightning.
- Atmospheric water vapour condenses at the top of the troposphere. **Clouds** form when these water droplets and ice crystals come together. Clouds are classified into four basic types: **cirrus, cumulus, stratus** and **nimbus**.
- Water droplets and ice crystals in the clouds naturally join together. When they get heavy enough, they fall to Earth. Falling water droplets or ice crystals are called **precipitation**. Precipitation can take many forms: **rain, drizzle, hail, sleet** or **snow**.

wind	cloud	breeze
water droplet	storm	sleet
tornado	drizzle	lightning
hail	thunder	snow

METEOROLOGICAL INSTRUMENTS

Specialised instruments are used to record weather variables such as pressure, temperature, humidity, rainfall, wind strength and wind direction. These instruments are found in **weather stations**.

An outdoor **thermometer** marks the maximum and minimum temperatures of the day.

A **barometer** measures the atmospheric pressure.

A **wind sock** indicates the strength and direction of the wind. .

To measure the speed of wind, we use an **anemometer**.

Air humidity is measured with a **hygrometer**. When the hygrometer reaches 100%, the air is saturated. At this point, the air cannot hold any more water vapour.

4.-WEATHER AND CLIMATE

- **Weather** refers to the atmospheric conditions (temperature, humidity, atmospheric pressure, wind and cloud cover) in a particular place at a particular time. **Climate** refers to the weather in a particular place over a long period of time.
- **Atmospheric (air) pressure** is the weight or pressure exerted by a column of air per unit area on the Earth's surface. The atmosphere exerts a pressure on all objects and living things.
- The **atmospheric temperature** is a measure of temperature at different levels of the Earth's atmosphere due to factors such as solar radiation.
- **Humidity** is the amount of water vapour in the air.

weather	temperature	climate
rainfall	pressure	weather station
humidity	hectopascal	

5.- ATMOSPHERIC POLLUTION

- For life to exist, it is essential that the composition of air remains stable. When we **pollute the air**, we are changing its composition and can produce negative effects. The main sources of pollution are the engines of cars, lorries and planes, as well as industries and factories. There are two types of pollutants: primary and secondary:
 - **Primary pollutants** are produced by different sources, such as cars, lorries and planes. They release carbon and nitrogen oxides, hydrocarbons and toxic metal particles into our atmosphere.
 - **Secondary pollutants** are generated from the **interaction** of primary pollutants. Sulphur, carbon and nitrogen oxides released into the air by industrial processes combine with water vapour in the atmosphere to form sulphuric, carbonic and nitric acids.
- Some air pollutants cause a reduction in the thickness of the ozone layer. This has negative effects on living things because they are less protected from the Sun's harmful rays.
- Carbon dioxide is produced by the engines of cars, lorries or planes. This leads to an increase in the natural greenhouse effect which causes the temperature on Earth to increase. This is causing changes in the climate, called **climate change**.
- Secondary pollutants produce acid rain. Acid rain harms life on land and in lakes, rivers and seas.
- Air pollution is bad for the health of living things. The most common health disorders are respiratory problems, heart problems, itchy eyes, allergies and digestive problems. The thinning of the protective ozone layer causes sunburn and skin cancer.

acid rain	desertification	climate change
ice cap	respiratory problems	drought
hurricane		

ACTIVITIES

The atmosphere is a mixture of gases. Which gases are the most important?

Are the following sentences true or false?

1. Atmospheric phenomena take place in the stratosphere.

2. The temperature of the atmosphere decreases more or less constantly from the Earth's surface to the highest layer.

3. The exosphere is the outermost layer of the atmosphere.

4. The ionosphere reflects radio waves.

5. The ozone layer is located between the troposphere and the stratosphere.

6. The thickness of the atmosphere is variable.

What is the name of the atmospheric layer we live in? How far does it extend?

How do temperatures change in the troposphere? And the density of the air?

Name some of the main components of the atmosphere.

What is air?

Where does the name *greenhouse effect* come from?

What does the ozone layer do?

What is air pollution?

Are the following sentences true or false?

1. Weather maps show the state of the atmosphere in a particular area.

2. The numbers on isobars are expressed in percentages.

3. The areas of highest pressure are shown by the letter D.

4. The weather will be bad in areas where the pressure is lower than in the surrounding areas.

5. Atmospheric pressure is always the same in all areas of the Earth's surface.

6. Areas of high and low pressure produce wind.

7. Weather maps are made with information from weather stations and satellite photographs.

Complete the text with the missing words:

effects - concentration - essential - fundamental - health - polluted

For life to exist on Earth, it is that the composition of the air does not change, because each component has a role. When the atmosphere becomes with other gases or the of its natural components changes, negative for the of living beings can be produced.

What is the difference between *weather* and *climate*?

Match each meteorological instrument with the weather variable it records.

- wind direction

- air humidity

- atmospheric pressure

- amount of rainfall

- wind speed