

LESSON PLAN: AIR POLLUTION AND ITS CONSEQUENCES ON HUMAN HEALTH

Main Goal

To demonstrate the importance of air for human health by defining its characteristics and main dangerous pollutants.

Objective

Subsidiary Goals

- To define what air is and its characteristics.
- To d

- Topic Content Slides
- Activity Instructions
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(atmospheric pressure), and is sensitive to temperature (at higher temperatures, it expands and rises, and vice versa) (Equipo editorial Etecé, 2023). Its constitution varies according to the greater or lesser presence of contaminants. Approximately air has the following volumetric composition:

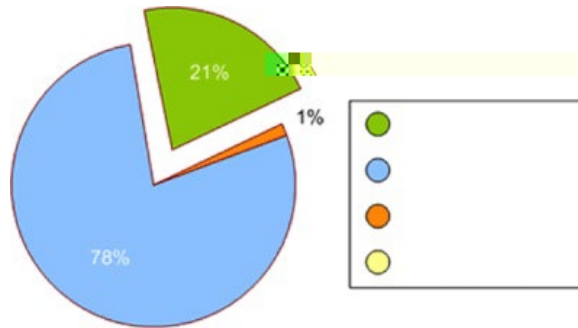


Figure 1. Volumetric composition of the air (Nuestraesfera.cl., 2014).

Among the noble gases present in the air are neon, krypton, xenon, or argon and may contain fewer toxic gases such as methane, carbon monoxide, and ammonia, which contaminate it as a result of anthropic activities (Equipo editorial Etecé. 2023). The following cyclical processes maintain the balance between these gases (Nuestraesfera.cl., 2014).

- Nitrogen (the main component of proteins present in all living beings) is regenerated through its incorporation into food chains and its subsequent return to the atmosphere (excrements).
- Oxygen (essential for the respiration of living beings) is recycled through photosynthesis in forests and marine phytoplankton.
- Carbon dioxide is regenerated from respiration, volcanism, or the combustion of materials such as wood.

Although these gases can be regenerated, the composition and quality of the air can be altered due to anthropic activities such as the indiscriminate felling of trees and the pollution of the seas, reducing the availability of atmospheric oxygen (Nuestraesfera.cl., 2014). Likewise, industrial activity increases carbon dioxide availability, altering the carbon–nitrogen cycle.

Among the functions of the air are to contain and transfer the gases necessary for plant respiration and photosynthesis and the water

- Particulate Matter (PM): Originated by industrial emissions, vehicles, cigarette smoke, and burning organic matter. PM comprises chemicals such as sulfates, nitrates, carbon, or mineral dust.
- Volatile Organic Compounds (VOCs): They are called volatile because they vaporize at room temperature and organic because they contain carbon. VOCs are released during gasoline and natural gas combustion and are emitted by paints, cleaning supplies, pesticides, and craft materials such as glue.
- Polycyclic aromatic hydrocarbons (PAHs): These organic compounds contain carbon and hydrogen. They are produced by combustion, industrial processes (such as manufacturing iron, steel, and rubber products), and power generation. PAHs are also found in particulate matter, and 15 of the 100 PAHs released in the environment are carcinogens.

- Pulmonary toxins (affect the lungs causing irritation and constriction of the airways, necrosis, edema, fibrosis, and cancer, such as asbestos, arsenic, and radiation).
- Reproductive dysfunction agents (decrease fertility and the chance that the embryo will survive or cause teratogenic effects. An example is radiation).
- Acutely toxic agents (cause an adverse effect after a single short-term exposure. Formaldehyde is an example and irritates the eyes, skin, and respiratory tract).
- Chronically toxic agents (require prolonged or repeated exposures to cause an adverse effect, such as asbestos).

Health Impacts due to Air Pollution

According to the National Institute of Environmental Health Sciences (2022), air pollution can affect human health by generating:

- Respiratory diseases
Emphysema, asthma, and chronic obstructive pulmonary disease (COPD) are respiratory diseases that can develop from air pollution, affecting lung development. Specifically, PM and nitrogen oxide are linked to chronic bronchitis.

