

Air and Water

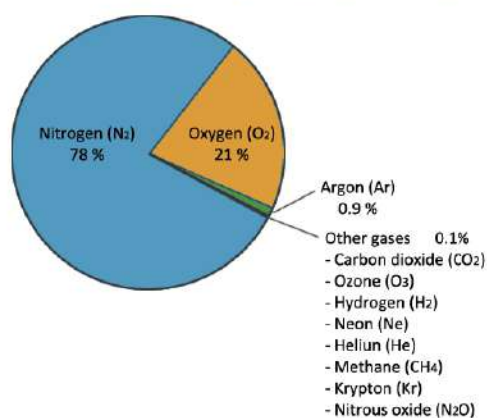


Air and water are essential for life on Earth. Understanding their composition, properties, and the effects of pollutants provides insight into environmental issues and ways to preserve these vital resources. Testing gases and purifying water are key skills in both chemistry and practical applications.

Composition of Air and Uses of Gases in Air

Air Composition:

Composition of Air



Air is a mixture of gases with the following approximate percentages:

78% Nitrogen (N₂): Inert, used in food packaging, fertilizers, and industrial processes like

ammonia production.

21% Oxygen (O_2): Vital for respiration, combustion, and medical applications.

0.93% Argon (Ar): Used in light bulbs and industrial applications.

0.04% Carbon Dioxide (CO_2): Used by plants in photosynthesis and in fire extinguishers.

Other Gases: Trace amounts of gases like neon, helium, and methane.

Air Pollutants:



Carbon Monoxide (CO): Produced by incomplete combustion, impairs oxygen transport in the blood.

Sulfur Dioxide (SO_2): From burning sulfur-containing fossil fuels, causes acid rain.

Nitrogen Oxides (NO and NO_2): From vehicle exhaust and industrial emissions, contribute to smog and acid rain.

Particulate Matter (PM): From dust, soot, and industrial emissions, causes respiratory problems.

Chlorofluorocarbons (CFCs): Depletes the ozone layer.

Control Measures:

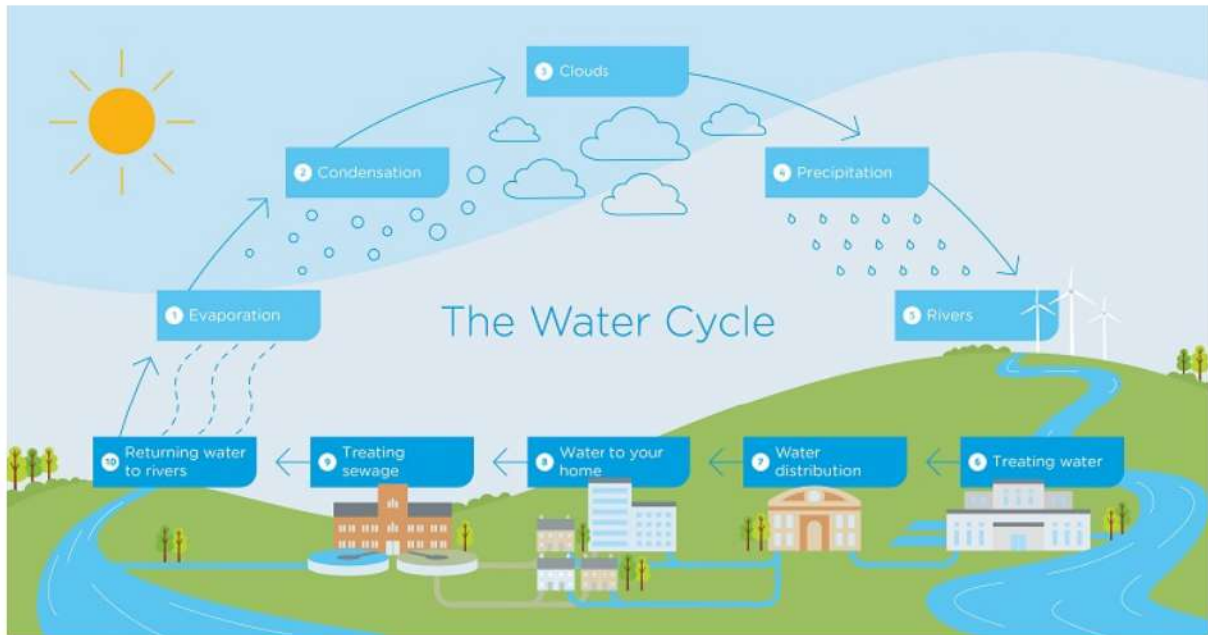
Shift to renewable energy sources.

Use catalytic converters in vehicles.

Regulate industrial emissions and promote green technologies.

Water Cycle and Treatment of Water for Drinking

Water Cycle:



Evaporation: Water vaporizes from bodies of water.

Condensation: Water vapor cools to form clouds.

Precipitation: Water falls as rain, snow, or hail.

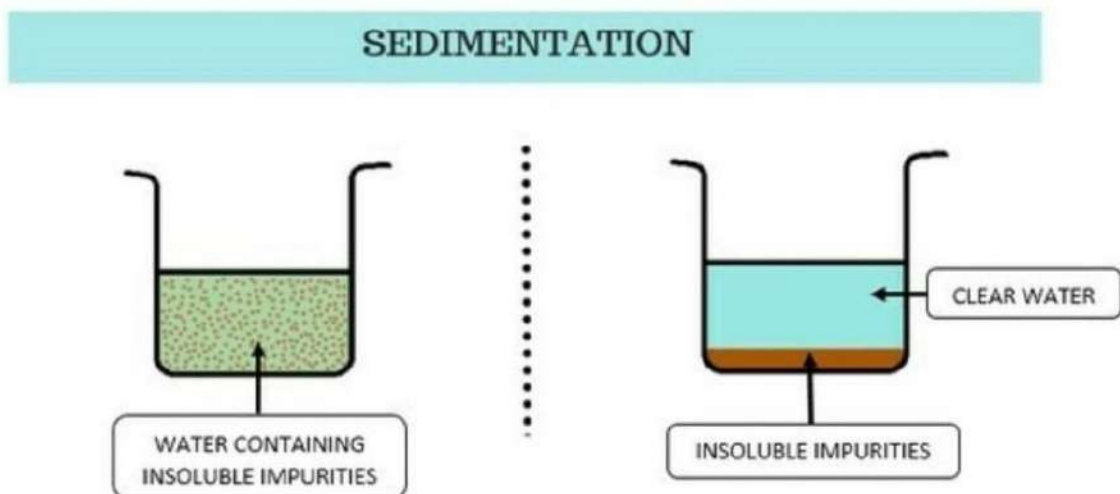
Collection: Water gathers in rivers, lakes, and underground reservoirs.

The cycle replenishes freshwater supplies and supports ecosystems.

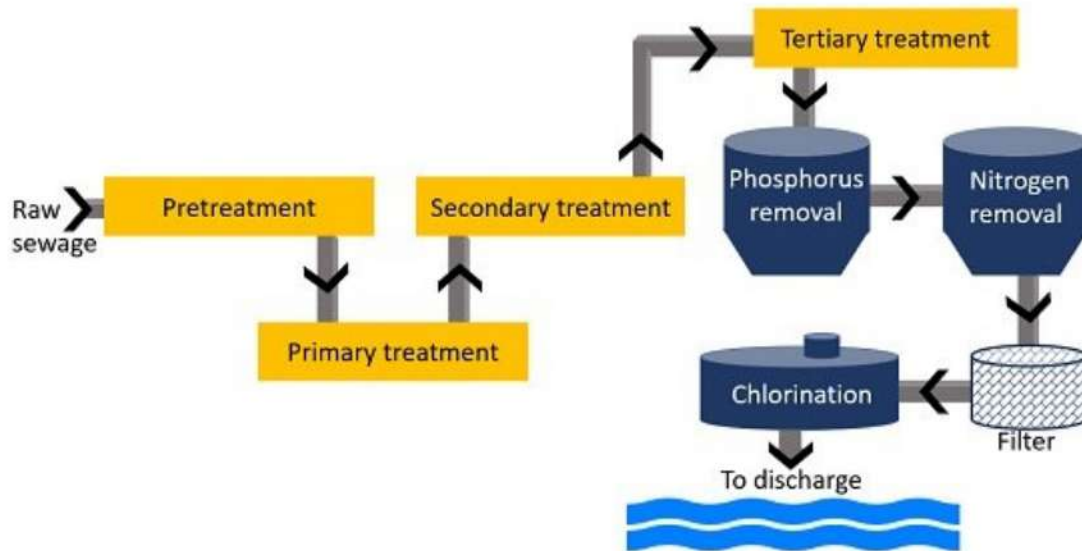
Water Treatment Process:

Screening: Removes large debris.

Sedimentation: Heavy particles settle.



Filtration: Removes smaller particles using sand and gravel.



Chlorination: Kills bacteria and pathogens.
pH Adjustment: Ensures safe drinking water.

Modern Methods:

Desalination: Converts seawater to freshwater.
UV and Ozone Treatment: Sterilizes water without chemicals.

Tests for Gases

<p><u>Test for Carbon dioxide</u> CO_2</p> <p>Carbon dioxide gas</p> <p>Limewater (clear/colourless)</p> <p>Limewater (cloudy/milky)</p>	<p><u>Test for Chlorine</u> Cl</p> <p>Chlorine bleaches damp blue litmus paper</p> <p>Blue</p> <p>Red</p> <p>White</p> <p>Chlorine gas</p>	<p><u>Test for Hydrogen</u> H_2</p> <p>Hydrogen makes a squeaky pop with a lighted splint</p> <p>POP!</p> <p>H_2 gas</p>
<p><u>Test for Water</u> H_2O</p> <p>Water turns cobalt chloride paper from blue to pink</p> <p>Cobalt chloride paper</p>	<p><u>Test for Oxygen</u> O_2</p> <p>Oxygen relights a glowing splint</p> <p>Glowing splint</p> <p>Oxygen</p>	<p><u>Cl Gas Tests</u></p> <p>Cl CO_2 O_2</p> <p>H_2 H_2O</p> <p>These gas tests appear regularly on the final exam. Try to learn them.</p>

Oxygen (O_2): Glowing splint relights in oxygen.
Hydrogen (H_2): Lit splint makes a 'pop' sound.
Carbon Dioxide (CO_2): Limewater turns milky.
Ammonia (NH_3): Damp red litmus paper turns blue.

Chlorine (Cl_2): Damp litmus paper turns red and then bleaches.

Nitrogen Dioxide (NO_2): Brown gas, turns damp litmus paper red.

Air and water are essential for life on Earth, supporting all living organisms and playing vital roles in regulating ecosystems and climate. Air provides oxygen for respiration and carbon dioxide for photosynthesis, while also helping to regulate temperature and protect life from harmful radiation. Water is crucial for hydration, nutrient transport, and temperature regulation, and it cycles through the environment to sustain both terrestrial and aquatic life. Testing gases in the air such as measuring oxygen, carbon dioxide, nitrogen, and pollutants like sulfur dioxide and nitrogen oxides is vital for understanding air quality and its impact on human health and the environment. These tests help monitor pollution levels, track climate change, and ensure that air remains breathable. Similarly, water testing is essential for detecting contaminants like heavy metals, pathogens, and chemical pollutants, ensuring that water remains safe for consumption and ecosystem health. However, both air and water are under threat from pollution, overuse, and climate change, making it imperative to protect these resources through responsible management and global cooperation. Ensuring clean air and water is essential for the health of the planet and the well-being of future generations.

Conclusion

The knowledge of air and water composition, pollutants, and treatment processes is crucial for environmental protection, public health, and sustainable development. Advances in water treatment, pollution control, and gas testing contribute to better resource management and healthier ecosystems. Air and water are essential for life on Earth, supporting all living organisms and playing vital roles in regulating ecosystems and climate. Air provides oxygen for respiration and carbon dioxide for photosynthesis, while also helping to regulate temperature and protect life from harmful radiation. Water is crucial for hydration, nutrient transport, and temperature regulation, and it cycles through the environment to sustain both terrestrial and aquatic life. However, both resources are under threat from pollution, overuse, and climate change, making it imperative to protect them through responsible management and global cooperation. Ensuring clean air and water is essential for the health of the planet and the well-being of future generations