ENGLISH MEDIUM

SCIENCE

GRADE 7

Atmosphere

UNIT 13

Kings Perera

B.Sc (UG) University of Colombo

GALLE | KANDY | COLOMBO | ONLINE

077 286 7229 / 071 063 9910

Atmosphere

- Thin layer of gases surrounding the Earth.
- Extends nearly **700 km** from Earth's surface.
- Cannot be seen directly, but objects like clouds, sky, stars, and planets are visible through it.

Atmospheric Pressure:

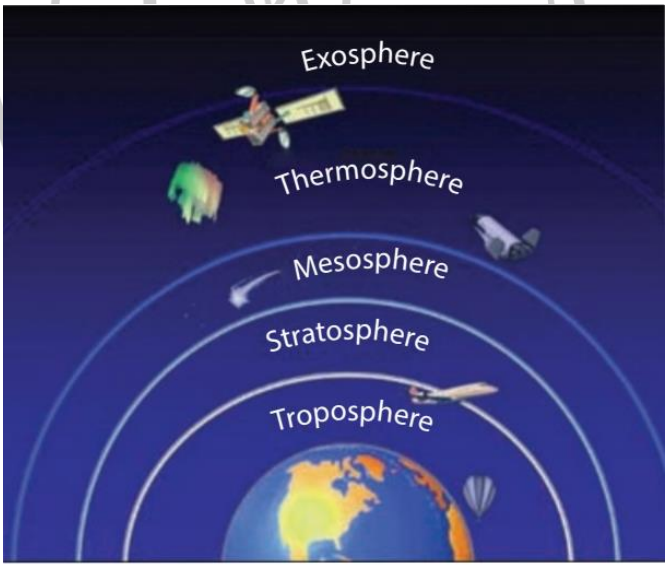
- Gases have mass, so the weight of gases above us exerts a **pressure**.
- This is called **atmospheric pressure**.
- Measured in **milli bars (mb)** to forecast weather.

Altitude:

- Height of a place from **sea level**.
- Pressure and temperature change with altitude.

Division of Atmosphere:

- Based on changes in pressure and temperature, the atmosphere is divided into **five layers**:
    1. **Troposphere**
    2. **Stratosphere**
    3. **Mesosphere**
    4. **Thermosphere**
    5. **Exosphere**



Troposphere

- Lowest layer of the atmosphere.
- Height:
    - **Near equator** → up to ~15 km.
    - **Near poles** → ~8 km.
- Contains nearly **75% of atmospheric air**.
- Most **water vapour and dust particles** are found here.
- **Weather changes** (rain, storms, etc.) occur in this layer.
- **Aircrafts** such as helicopters, parachutes, and aeroplanes travel through this layer.

Stratosphere

- Located **15 – 50 km** above sea level.
- Air is **dry** (very little water vapour).
- No storms or turbulence → suitable for **jets to fly**.
- Contains the **Ozone Layer**, which:

    - Absorbs harmful **UV rays** of the sun.
    - Protects life on Earth.
- **Cumulonimbus clouds** near the stratosphere:
    - Take the shape of an **anvil** due to one-directional winds.
    - Can cause **rain, thunder, and lightning**.

Mesosphere

- Extends from **50–80 km** above sea level.
- **Coldest layer** of the atmosphere.
- Water vapour freezes into **ice clouds**.
- At sunset, sun rays reflect on these ice clouds → visible as **night-time clouds**.

Thermosphere

- Extends from **80–120 km** above sea level.
- Air particles absorb the **sun's rays**, making this layer **very hot**.
- **International Space Station (ISS)** orbits in this layer.
- **Auroras** occur here:
    - **Aurora borealis** → near the northern pole.
    - **Aurora australis** → near the southern pole.

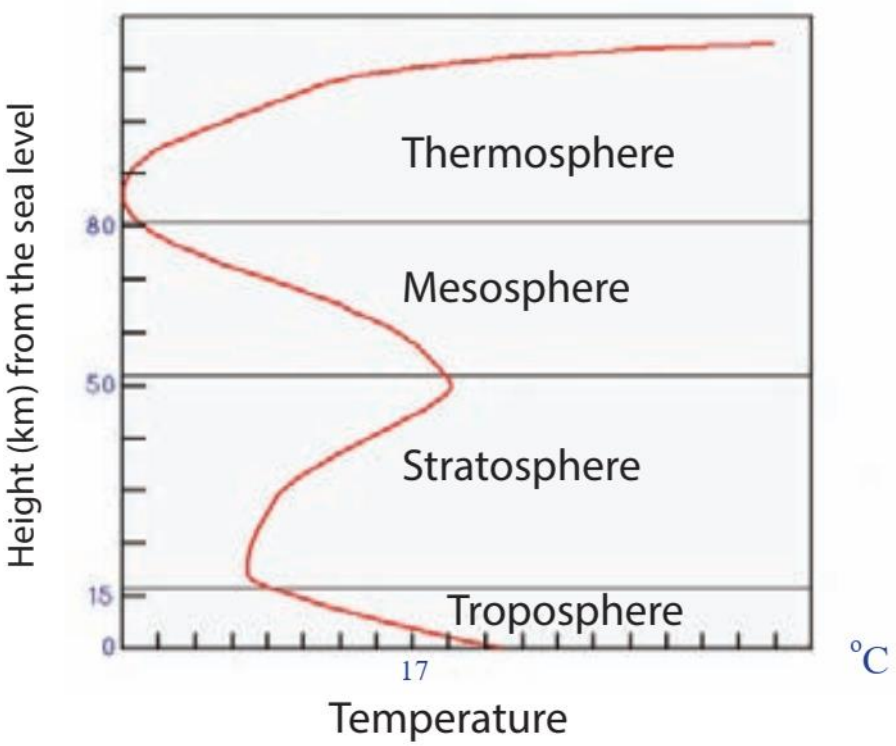
Exosphere

- **Outermost and thinnest** layer of the atmosphere.
- Extends beyond **120 km** from sea level.
- No definite boundary between the **exosphere** and **outer space**.

Differences of temperature and pressure in layers of the atmosphere

Pressure decrease from sea level to upwards through all the layers

The Figure shows the changes of temperature in different layers in the atmosphere.



Troposphere

- Temperature **decreases with height**.
- Reason: Land and sea absorb sun's heat → near the surface, temperature is higher.
- As altitude increases, temperature drops gradually.

Stratosphere

- Temperature **increases with height**.
- Reason: **Ozone layer** absorbs harmful UV rays of the sun.
- This absorbed energy warms the stratosphere.

Mesosphere

- Temperature **decreases with height**.
- Reason: Very little ozone present → less absorption of UV rays.
- **Coldest layer** of the atmosphere.
- Temperature at the top can be around **–90 °C** (colder than Antarctica).

Thermosphere

- Temperature **increases with height**.
- Reason: Air particles strongly absorb the sun's heat.
- Very high temperatures recorded here.

Exosphere

- Temperature continues to **increase more and more** closer to space.
- No clear boundary between exosphere and outer space.

Air and its components

Troposphere is the most important atmospheric layer for the living beings on the earth. The Table shows the component of the troposphere

Gas	Volume as percentage
Nitrogen (N_2)	78%
Oxygen (O_2)	21%
Argon (Ar)	1%
Carbon dioxide (CO_2)	
Water vapour	
Other gases	

Important Gases in the Atmosphere

1. Nitrogen (N_2)

- Most abundant gas in the air.
- Under atmospheric conditions, it has **low reactivity**.

2. Oxygen (O_2)

- Essential for **respiration** of organisms.
- Supports **combustion** (called a supporter of combustion).
- Can be separated from air.
- **Uses:**
  - Aid patients with respiratory difficulties.
  - Welding & cutting metals (oxy-acetylene flame).
  - Breathing support for divers & astronauts.

3. Argon (Ar)

- Third most common atmospheric gas.
- A **noble (inert) gas** → does not react with other elements.
- **Uses:**
  - To fill **filament bulbs**.
  - To produce **electric lamps** (orange colour light).

4. Carbon dioxide (CO_2)

- Essential for **photosynthesis** in green plants.
- Used in **fire extinguishers**.
- Helps maintain Earth's **temperature balance**.
- Found more in **exhaled air** than in inhaled air.

Functions of the Atmosphere

- Provides **oxygen** for respiration of animals and plants.
- Provides **carbon dioxide** for photosynthesis in plants.
- Supplies **nitrogen** to the soil → important for plant growth.
- **Ozone layer** protects Earth from harmful UV rays of the sun.
- Prevents Earth's heat from escaping into space → keeps Earth warm.
  - (Moon has no atmosphere → very hot in daytime, very cold at night).
- Maintains the **hydrological cycle** (water vapour in the air is essential).
- Helps **birds and insects** to fly.
- Supports **communication** (transmission of radio/TV waves etc.).
- Protects Earth from **meteors** (they burn up on entering atmosphere).

Air pollution

- Definition: Adding substances to the atmosphere that **change its composition** and cause **harmful effects** on organisms.

Types of Pollutants

1. **Gaseous pollutants**:
   - Carbon monoxide (CO)
   - Sulphur dioxide (SO_2)
   - Nitrogen dioxide (NO_2)
2. **Particulate pollutants**:
   - Carbon particles
   - Lead particles
   - Cement dust
   - Insecticide droplets
   - Unburnt fuel droplets
   - Asbestos particle

Causes of Air Pollution

- Combustion of fuel in vehicles.
- Combustion of fuel in factories.
- Exhaust from thermal power stations.
- Burning of waste materials.
- Volcanic eruptions.
- Deforestation (destroying forests).

Adverse Effects of Air Pollution

- Climatic changes on Earth.
- Respiratory health problems.
- Acid rain.
- Increase in atmospheric temperature (global warming).
- Reduction in clarity and transparency of air.

Precautions to Reduce Air Pollution

- Tune vehicle engines.
- Minimize combustion of fossil fuels.
- Use eco-friendly energy sources.
- Filter factory fumes before releasing.
- Recycle waste without burning.
- Protect forests.
- Encourage reforestation.