

# Notes for the Basics on the Atmosphere

- Energy from the Sun
  - Temperatures in the Sun are so hot that matter mostly exists as plasma, or charged particles, instead of atoms.
  - High temperatures in the Sun cause the charged particles to move at extremely fast speed, colliding into each other, and sticking together to form atoms, in a process called Nuclear Fusion.
  - Besides forming atoms, fusion reactions also release large amounts of energy. ( $E = mc^2$ )
  - The energy produced through nuclear fusion is called radiant energy and travels to Earth in the form of electromagnetic waves.

- **Electromagnetic Waves**

- **Electromagnetic waves are generated from vibrating electrical charges and consist of alternating electrical and magnetic fields.**
- **Electromagnetic waves all travel at the same speed of 186,000 miles/sec but vary according to wavelength and frequency.**
- **Radio Waves – Longest waves, lowest frequency.**
  - **Radios, TVs, Cell Phones, RADAR, and MRIs.**
- **Microwaves – Cause water molecules to vibrate and generate heat through friction.**
- **Infrared Waves – heat waves**
- **Light Waves – Only type of electromagnetic waves humans can see.**
  - **White light – all colors of light**
  - **ROYGBIV – colors of light in decreasing wavelength**
  - **We see the color reflected.**

- **Ultraviolet Waves – UVC, UVB, and UVA**
  - **100% UVC blocked by atmosphere, 95% of UVB blocked, and only 5% of UVA is blocked/**
  - **UVB – Sunburns**
  - **UVA – Wrinkles and skin cancer**
  - **Can be used to kill bacteria and viruses**
- **X Rays – Blocked by atmosphere**
  - **Able to penetrate soft tissue, used in medical field**
- **Gamma Rays – Shortest wavelength, highest frequency, most energy**
  - **Blocked by atmosphere**
  - **Able to penetrate cells and damage DNA**
  - **Released during nuclear fission reactions (breaking apart of large atoms)**

## Structure of the Atmosphere

- **Blanket of gases that surrounds Earth, held in place by Earth's gravity, and extends 800 miles into space.**

## Composition

- **78% Nitrogen gas (N<sub>2</sub>)**
- **21% Oxygen gas (O<sub>2</sub>)**
- **1% Other gases: carbon dioxide (CO<sub>2</sub>), ozone (O<sub>3</sub>), water vapor (H<sub>2</sub>O)**
- **Particulate solids: dust and salt (cloud formation)**

## Layers (Temperature and Composition)

- **Troposphere – lowest layer – water vapor – all storms**
- **Stratosphere – ozone layer – blocks UV radiation**
- **Mesosphere – Coldest – Meteors burn up here**
- **Thermosphere – Warmest – Auroras**
- **Exosphere – outer layer - satellites**