Introduction



The 8 Planets

- •Planets are characterized by composition, density, and distance from the sun.
- •The inner planets are smaller and rocky (example = Earth).
- •The outer planets are large and made of gases (example = Jupiter).



Planet Earth



• Environmental Science – is the study of the infinite number of interactions between humans and the world in which we live. This includes the living and non-living factors As Earth's human population continues to grow, as technology advances and human

needs and wants increase, our impacts on the world become more widespread and severe, despite improvement in some areas



What's so special about Earth?



- Earth supports life due to the presence of liquid water.
- Earth maintains a steady surface temperature due to the heat being absorbed in the summer and released in the winter through water.
- Many more unique qualities

Is the sun important?

•Supports life on Earth by transmitting energy to us in the form of light

•Light travels to Earth in the form of waves



Frequency (s⁻¹)

3	3 × 10 ¹⁰	3×10^{12} 3×10^{12}	1 ¹⁴ 3 × 10	5 ¹⁶	3 × 10 ¹⁸
Radio waves	Microwaves	Infrared	Ultraviolet	X-rays	Gamma rays
10 ⁻¹ Waveler	10 ⁻² 10 ⁻³	10-4 10-5 10-6	10-7 10-8	10 ⁻⁹	10-10 10-11

Why are plants green?



1.1 Planet of Life

• Living things are called *organisms*.

• Lithosphere – Layer of land that forms Earth's surface.



- **Hydrosphere** All the parts of Earth that are made up of water.
- Atmosphere Layer of air that surrounds Earth.
- **Biosphere** Anywhere on Earth where life exists

1.2 Earth's Land and Water

Lithosphere

- 3 Main rock types:
 - Sedimentary, Igneous, and Metamorphic
- Majority of rock is Igneous, however the rocks that we are in contact with are Sedimentary for the most part.
- Major Minerals Silicates

Examples of Igneous rocks that would form from lava include basalt, obsidian, scoria, and pumice.

Metamorphic Rock

Rock that is changed by heat and pressure

Sedimentary Rock

Rock that is formed from smaller particles that are squeezed together due to pressure.

Hydrosphere

- More than 70% of Earth is covered in water.
 - 97% of it is
 Salt water and
 3% Fresh
 water



• 2/3 or 66% of Freshwater is in our ice caps.



As our ice caps melt our freshwater decreases and our saltwater increases.

<u>Surface water</u> – ponds, lakes, and streams Groundwater aquifers

1.3 The Atmosphere

- 4 Atmospheric layers based on temperature change.
- Thermosphere (Highest)
- Mesosphere
- Stratosphere
- Troposphere (Lowest)

• The atmosphere becomes less dense the farther you travel from Earth.

The Air Pollution Problem

- Air is a mixture of gases.
 - Nitrogen 78% and Oxygen 21% followed by trace amounts of Argon, CO₂, and WV.



• Air pollution is the contamination of the atmosphere by wastes from sources such as industrial burning and automobile exhausts.



Primary and Secondary Pollutants



Primary Air Pollutants

Carbon Monoxide Carbon Dioxide Sulfur Dioxide Nitrogen Oxides most hydrocarbons most particulates • A primary pollutant is a pollutant that is put directly into the atmosphere by human or natural activity. An example would be soot from smoke.

- A secondary pollutant is a pollutant that forms in the atmosphere by chemical reactions with primary air pollutants, natural components in the air, or both. An example would be ground-level ozone.
- Ground level ozone forms when the emission from cars react with the UV rays of the sun and then mix with the oxygen in the atmosphere

- Acid precipitation is precipitation, such as rain, sleet, or snow, that contains a high concentration of acids, often because of the pollution of the atmosphere.
- When fossil fuels are burned, they release oxides of sulfur and nitrogen.
- When these oxides combine with water in the atmosphere they form sulfuric acid and nitric acid, which falls as acid precipitation.

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- This acidic water flows over and through the ground, and into lakes, rivers, and streams.
- Acid precipitation can kill living things, and can result in the decline or loss of some local animal and plant populations.

- A **pH** number is a value that is used to express the acidity or alkalinity (basicity) of a system.
- Each whole number on the scale indicates a tenfold change in acidity.
- A pH of 7 is neutral, a pH of less than 7 is acidic, and a pH of greater than 7 is basic.
- Pure water has a pH of 7.0, while normal precipitation has a pH of about 5.6.



- Normal precipitation is slightly acidic because atmospheric carbon dioxide dissolves into the precipitation and forms carbonic acid.
- Precipitation is considered acid precipitation if it has a pH of less than 5.0
- The pH of precipitation in the eastern U.S. and Canada ranges from 4.2 to 4.8, with the most acidic precipitation occurring around Lake Erie and Lake Ontario.

Global Warming

• Light energy enters the atmosphere and is absorbed at the surface. Light energy is changed to heat. Heat energy is radiated back to space in the form of infrared radiation.

The Greenhouse Effect

- CO₂ is the most significant greenhouse gas emitted in large quantities by humans.
- Greenhouse effect got its name because heat is trapped.
- Ice cores long cylinders of ice that are drilled and removed from deep within a sheet of polar ice.
- Ways to reduce Greenhouse Gases in the atmosphere:
 - Electric Cars
 - Solar Power
 - Increasing Fuel Efficiency Standards

Massachusetts

Connecticut Rhode Island

Service of

New Jersey

Maryland

strict of Columbia Delaware



Effects of Greenhouse Gas Pollution

- During the past 150 years, levels of atmospheric CO₂ has increased due to increased fossil fuel use.
- **Global Warming** an increase in Earth's average surface temperature caused by an increase in greenhouse gases.
- Some computer models project that Earth's temperatures will rise by 2 4 degrees C.
- Ice Caps will melt, coastal areas will flood, weather patterns will change, salt water will enter freshwater aquifers.

The Greenhouse Effect

Some energy is reflected back out to space Earth's surface is heated by the sun and radiates the heat back out towards space

Solar energy from the sun passes through the atmosphere Greenhouse gases in the atmosphere trap some of the heat 1.4 The Biosphere

• Anywhere that life can and is supported.

• It is 20 km thick

Spheres Interact

- Lithosphere interacts with the Hydrosphere when toxins from a factory run off into a water system and poison fish in a body of water
- Hydrosphere interacts with the Atmosphere when water evaporates and forms clouds
- Atmosphere interacts with the Lithosphere when acid rain falls and dissolves limestone

An **ecosystem service** is the role that ecosystems play in creating a healthful environment for humans.

- This grouped ecosystem services into four broad categories:
 - *Provisioning* such as the production of food and water
 - *Regulating* such as the control of climate and disease
 - Supporting such as nutrient cycles and crop pollination
 - *Cultural* such as spiritual and recreational benefits.