Earth Science 7 and 8: 12.1 Notes- The environment and pollution

"The earth is the Lord's and the fullness thereof; the world and they that dwell in it"- Psalm 24:1

- God created mechanisms in nature that replenish the earth and allow its inhabitants to function together
    - The study of these interactions is called **ENVIRONMENTAL SCIENCE**
    - Environmental science can be broken down into two categories
        - **BIOTIC**- living things
        - **ABIOTIC**- non-living things
            - Water, temperature, and oxygen are the most essential abiotic factors in our world

- 2 factors that affect humans life
    1. Amount of nutrients available
    2. Amount of energy available

- Nutrient cycles (biogeochemical cycles)- recycle minerals and other nutrients in the environment
- 3 types
    1. **HYDROLOGICAL**- the continuous recycling of water between the earth and the atmosphere
    2. **ATMOSPHERIC**- recycles nutrients found as gases in the atmosphere (example: nitrogen cycle)
    3. **SEDIMENTARY**- recycles nutrients found in soil and rocks (example: phosphorus cycle)

Views on Creation

1. Preservationists- believe humans are merely passing through the earth and have no claim to it. They want to preserve the resources and save them.
2. Conservationists -advocates for a wise use of natural resources. They encourage responsible use while maintaining land and its beauty

The most dangerous aspect of modern environmentalism is that it promotes a reverence (respect) that should be only used for God *

Pollution Basics'

-POLLUTION- any harmful substances released into the soil, water, or air. 3 categories of pollution- land, air, and water.

Land Pollution

- 85% of our energy comes from consumption of fossil fuels.
    - Fossil fuels are fumes that come from the burning of different natural elements
        - Example- the burning of coal can produce many pollutants

- **SOLID WASTE**- anything useless or unwanted or discarded (aka garbage)
    - To properly dispose of garbage it must be taken to a **LANDFILL**- land where garbage is collected, stored, and covered. This is the oldest disposal method
    - Waste to energy incinerators (WtE incinerators)- machines that use energy and electricity to incinerate or burn the waste into ashes.
    - EXAMPLE- plasma arc gasification- a gas will be heated by a powerful spark and is injected into a chamber containing waste. That waste is burned and broken down into a gas called **SYNGAS** (which means "gas for fuel")

Air Pollution

- Harmful chemicals released into the air. There are 2 main air pollutants

1. **PRIMARY POLLUTANTS**- come directly from the source, like a volcanic eruption
2. **SECONDARY POLLUTANTS**- come from when a primary pollutant reacts with chemicals in the atmosphere to produce another pollutant.
    a. Example→ nitrogen oxide reacts with oxygen in the air to create nitrogen dioxide which is the pollutant that gives the air a brownish appearance

- **SMOG**- most common example of air pollution. Originally known as fog mixed with smoke from factories.
    - **PHOTOCHEMICAL SMOG**- "modern smog" this comes from the chemicals released from car exhaust mixing with natural fog.

Water Pollution

- Water is considered polluted when it is not safe for human activities or capable of supporting life. (essentially you cant swim in it or drink it)
- Water pollution naturally occurs from algae blooms, volcanoes, and earthquakes.
- 2 types of water pollutants
    1. **POINT-SOURCE**- pollutants enters water from a specific place and is easy to identify and fix, like when a factory is placing chemicals in waters
    2. **NON-POINT SOURCE**- pollutants coming from multiple sources, like runoff coming from cities into the waters

- 3 most common kinds of pollutants
    1. **PATHOGENS**- to determine if pathogens are in water, scientists will measure the amount of **COLIFORM** bacteria in the water.
        a. Coliform bacteria is naturally form in the human stomach

        CHEMICALS- things useful to use on land that would be harmful to put into the water
. fertilizers

        MACROSCOPIC ITEMS- visible debris such as trash, shipwrecks, or plastic
        . Plastic composes 10% of beach litter.

ASSIGNMENT

1. **After reading through notes, answer the 12.1 section review questions. These are found in google classroom or use the textbook. Found on page 406 questions 1-7 but skip #6**

2. **After finishing questions please write a one paragraph answer to this question- Why is it part of our duty as a Christian to care for the environment? What are some ways we can do that? Do you feel like you have been someone who cares about the environment?**
3. **Do 12.1 Worksheet.**

12.2 Notes- Global Change

- God provided certain "checks and balances" in creation to prevent many global upsets that have been predicted by secular scientists.
    - Gen 8:22 reads " while the Earth remains, seedtime and harvest, and cold and heat, and summer and winter, and day and night shall not cease."

Acid Rain

- **ACID DEPOSITION**- is the falling of acidic precipitation onto the planet. There can be both wet or dry deposits. But the best known type of acid deposition is ACID RAIN.
    - **ACID RAIN** is defined as rain with a pH level of about 5.0 or less
    - Normal rain has a pH level of 5.6
    - pH is the scale that measures acidity in something.

- Acid deposition is primarily caused by the interactions between water and 2 compounds → sulfur dioxide and nitrogen oxides.
    - **SULFUR DIOXIDE** has the odor of a freshly struck match, colorless gas, released from volcanic eruptions, hot springs or burning coal
    - **NITROGEN OXIDE**- result from lightning flashes, bacterial activity or burning of fossil fuels.

- The National Research Council predicted that the number of acidic lakes would double by 1990. To prevent this from happening, industries stopped producing sulfur dioxides and nitrogen oxides.
    - They did this by burning less coal or using coal with less sulfur.
    - To purify lakes, **AGRICULTURAL LIME** was added to the water.
        - Agricultural lime is a purified form of limestone that was used to correct over acidic soil.

    - By 2002 sulfur dioxide production decreased by 30%

<u>Ozone Depletion</u>

- In 1985, 3 scientists claimed to have discovered a "hole" in the ozone layer over the South Pole.
- This was supposedly dangerous because it would increase the UV radiation exposure from the sun resulting in an increase of sun related illnesses.
- According to the Rowland-Molina hypothesis- the compound that caused ozone depletion (the hole in the ozone) was **CHLOROFLUOROCARBONS (CFCs)**
- In 1956 Dr. George Dobson discovered that the ozone was actually naturally thinner over the poles because of **POLAR VORTEXES.**
    - The "hole in the ozone" was not actually a hole; it was just an area with thinner ozone levels.
    - Some wonder if the thinner ozone is **ANTHROPOGENIC**- meaning was it caused by humans?
        - To prevent more thinning, President Ronald Reagan signed the **MONTREAL PROTOCOL**→ this called for a 50% reduction in CFCs (the thing that supposedly caused the "hole").
        - This protocol seemed to be based on faulty science and hasty conclusions because the "hole" does not exist.

<u>Global Warming</u>

- Another environmental issue is the idea that man is causing the earth's temperature to rise→ this is called the **ANTHROPOGENIC GLOBAL WARMING**
    - Some claim that this warming will have catastrophic effects on humans.

- Scientists could accurately measure temperature in the mid-1800s. From 1850-1940 temperatures slowly warmed then slightly dropped off until beginning to warm up again in 1980.
- Earth's natural temperature changes over time. It is cyclical. There will be a period of warm, then a period of cold.

    - For example, from 900-1100 there was a time where the global temperatures were warmer than what they are now. This was referred to as the **MEDIEVAL CLIMATE OPTIMUM**.
    - After this period, around 1300 the earth entered another 'mini Ice Age" where temperatures decreased.

- Scientists claim that the cause for this warming is because of the release of more **carbon dioxide**.
- This compound is supposedly what causes the greenhouse effect→ the process of trapping heat inside the atmosphere like a greenhouse.
- There is little proof that carbon dioxide causes warming. There is evidence though that there could be a warming because the sun can produce various amounts of light.

  *<u>*** the scientific evidence indicates that global warming is caused by natural processes, not by human activity***</u>*

<u>Assignment- Book questions 12.2 pg 414 #1-9. Found in google classroom or do on paper and turn in.</u>

- **<u>After fill out the 12.2 Worksheet.</u>**

12.3 Notes- Managing our Resources

- Because of the fall of man and sin, death has entered the world. Our earth does decay. We as humans cannot stop that process but it is our responsibility to care for and have dominion over God's creation as He called us.

Examining our resources

- **NATURAL RESOURCES**- are naturally occurring material that mankind can use.
    - Earth has 2 kinds of resources→ renewable and nonrenewable
        - **NONRENEWABLE**- we can't renew them, once we use it, it is gone → oil or coal
        - **RENEWABLE**- resources that regenerate quickly → water, wood, or soil.

- Because we are concerned about our resources, a new branch of environmental science has become popular. This branch is **ENVIRONMENTAL TECHNOLOGY**→ this develops new methods of conservation of resources through the application of environmental science.
    - This branch explores how we can manage the resources that are renewable. Like how can we naturally replenish these resources at a quicker pace.
    - Since there are a **FINITE** amount of nonrenewable resources, this branch helps us find new ways to extract these resources and use them efficiently.
        - An example of this is through **the recycling process**. Even though the resource that is being recycled is destroyed, it can be transformed into something else that is useful so it does not go to waste.
        - *** **THE LAW OF THE CONSERVATION OF MATTER**- matter cannot be created or destroyed, only changed or transformed****

Renewable Energy

- **LAW OF CONSERVATION OF ENERGY**- energy cannot be created or destroyed, only changed or transformed.
- **RENEWABLE ENERGY**- the process of using alternative methods of energy production that releases fewer pollutants. This can be generated by sunlight, wind or tides.
    - **SOLAR ENERGY**- energy that comes from harnessing the sun's radiation.
        - Creates zero pollution but the only drawback is that sunlight is not constant. Rain and cloudy weather regularly occurs depending on location.
        - 2 kind of solar energy
            - **PASSIVE SOLAR ENERGY**- uses solar energy that naturally falls on a building to heat that building directly.
            - **ACTIVE SOLAR ENERGY**- collects the energy emitted by the sun and then converts that into electrical energy.
            - EXAMPLE- **concentrating solar energy-** uses the sun's rays to heat a fluid that can be used to power different things.

    - **WIND POWER**- electrical power that comes from the wind. The device that is used to harness this is a **WIND TURBINE** (or aerogenerator).
        - Most common kind of turbine is a tall pole with 3 blades rotating on top.

    - **HYDROELECTRIC POWER**- water is used to generate electricity.
        - This is the most widely used form of renewable energy.

Nuclear Power

- **NUCLEAR POWER**- is electricity generated by reactions involving the nucleus. The **NUCLEUS** is the core/center of the atom.
- Nuclear power is generated through **NUCLEAR FISSION**→ the process in which an atom with two nucleus breaks into two atoms of elements with smaller nuclei.

    - When an atom is split, it releases neutrons which will hit other atoms causing those to split. This splitting process will repeat itself causing a **NUCLEAR CHAIN REACTION**.

- Even though nuclear power does release uranium (which is radioactive), nuclear power plants do not release radiation.
    - Nuclear power plants also will not blow up like a nuclear bomb.
    - The waste from nuclear power plants can be slightly radioactive. So to properly dispose of it, the waster must be buried and sit for years until substances have decayed.
        - If the waste has high levels of radiation it is stored in steel containers and then buried underground.

- A Nuclear power plant can produce 20-30 tons of fuel to use each year. The fuels created here are also recyclable.

Assignment: after reading through the notes, do 12.3 review questions located in google classroom or on pg. 423 #1-6.

- **After you do those use the notes/ book to complete the 12.3 worksheet.**

Name_____ Earth Science
12.1 Worksheet

1. What is environmental science? _____

_____

2. The two categories that environmental science can be broken down into are?

_____ _____

3. _____ are recycled minerals and other nutrients in the environment.

4-7. Answer to #3, has three types. List and describe 2 of them

- _____- _____

_____

- _____ - _____

_____

8. True or false: Preservationists are advocates for wise use of natural resources, they encourage responsible use while maintaining land and its beauty.

9. What are the 3 types of pollution we discuss in 12.1?

1. _____
2. _____
3. _____

10. What is waste that is burned and broken down into a gas, and means “gas for fuel”? _____

11. What is the difference between smog and photochemical smog? _____

_____

12. Nitrogen oxide mixing with oxygen to create nitrogen dioxide is an example of what kind of air pollutant?

_____

13. What is a landfill? _____

14-17. Name and describe the 2 kinds of water pollutants.

1. _____ - _____

_____

2. _____ - _____

_____

18. What percent of beach litter does plastic make up? _____.

19. True or false: coliform bacteria is naturally found in the human stomach.

20. What two things need to be true in order for water to be considered polluted? _____

_____

_____.

Name_____ Earth Science
12.2 Worksheet

1. Acid rain is defined as rain that has a pH level of _____, whereas normal rain has a pH level of _____.

2-5. Name and describe the 2 compounds are responsible for acid deposition

   1. _____ - _____
   2. _____ - _____

6. What was added to lakes to prevent them from becoming to acidic? _____
7. True or false: by 2002 sulfur dioxide production was decreased by 30%.
8. In 1985, scientists thought they had discovered a hole in the ozone layer, located where? _____
9. What is the Rowland-Molina hypothesis? _____

   _____

10. Who discovered that the ozone was just naturally thinner over the poles? _____
11. Is there actually a hole in the ozone? _____.
12. What does anthropogenic mean? _____
13. What is anthropogenic global warming? _____

    _____

14. Scientists claim that the release of _____ is the cause of the increase in global temperatures.

15-16. What happened regarding earth's temperature from 900-1100? And also in 1300? _____

   _____

   _____

17. True or false: scientific evidence actually indicates that global warming occurs naturally and the earth's temperature changes in cycles.

Name _____ Earth Science
12.3 Worksheet

1. What is a natural resource? _____

2-5. Name, Define and give an example of the 2 kinds of resources.

1. _____ - _____
2. _____ - _____

6. True or false: there is not a finite amount of nonrenewable resources.

7. What is the law of conservation of matter? _____

_____

8. What is the only drawback to using solar energy?_____

9. What are the two kinds of solar energy? _____

10. What kind of energy uses sunlight to heat a fluid? _____

11. What device is used to harness wind power? _____

12. Which kind of renewable energy source is the most widely used form? _____

13. The process in which an atom with two nucleus breaks into two atoms with smaller nuclei is called _____

_____.

14. True or false: nuclear power plants don't release harmful radiation and are safe to live near.

15. What happens to nuclear waste that has very low levels of radiation? _____

_____

16. A nuclear power plant can produce _____ of fuel each year.