***Chapter 2-Earth’s Systems and Water Resources***

***Lesson 2-Earth’s Major Systems***

***Slide 1-Narrative: Explain (1)***

1. Earth seems like a complicated place with many moving parts.
2. However, scientists describe Earth in terms of the interactions of four major systems:
3. The geosphere;
4. The hydrosphere;
5. The biosphere;
6. And the atmosphere.
7. These systems, also known as spheres, play a vital role in how Earth functions.
8. These systems make up all the land on Earth, water in oceans, rivers, and lakes, gases we breathe that surround Earth, and all living things from microscopic bacteria to the largest plants and animals.
9. Together, these four systems make up everything found on Earth.

***Video:***

1. Earth has different systems that interact with each other.
2. Four of these systems are the geosphere, atmosphere, hydrosphere, and biosphere.
3. The geosphere is made up of Earth’s layers.
4. The outer layer of solid rock is the crust, where life as we know it exists.
5. The hydrosphere is made up of all the water on Earth, including all oceans, lakes, and glaciers.
6. Clouds, which are made of water, are part of this system
7. The layer of gases above Earth’s surface is the atmosphere.
8. These gases allow living things to breathe.
9. The atmosphere also traps energy from the sun.
10. All living things on Earth make up the biosphere.
11. Life interacts with the planet through each of the other systems.
12. Each system interacts with the others in some way.
13. This helps balance the use of Earth’s resources.
14. Life on Earth as we know it depends on this balance.

***The Geosphere:***

1. The geosphere is all the solid land on the Earth’s surface and all the soft and molten rock beneath the surface.
2. Landmasses like the continents and islands, and features like mountains, volcanoes, and flat-plains are all part of the geosphere.
3. These features make up the outer layer of the Earth called the crust.
4. The parts of the geosphere below the surface are quite different.
5. The next layer down is the mantle.
6. It is the largest of Earth’s layers.
7. Like the crust, the mantle is made of rock.
8. However, the mantle is much hotter than the crust, so it is softer than the crust and can flow very slowly.
9. The next two layers are the outer core and the inner core.
10. The outer core is made of molten metals like iron and nickel.
11. Unlike the outer core, the inner core is solid because it is under a tremendous amount of pressure.

***The Hydrosphere:***

1. The hydrosphere is the collection of all the water found on Earth.
2. Water collects in vast quantities in the oceans, seas, lakes, and rivers.
3. These are all part of the hydrosphere.
4. Water found other places on Earth, such as groundwater, water frozen in glaciers and icebergs, and water vapor in the clouds are also part of the hydrosphere.
5. Water on Earth is either saltwater or freshwater.
6. Saltwater found in the ocean accounts for most of the water on Earth.
7. Most of the water on Earth is saltwater.
8. Freshwater found in lakes and rivers makes up a small fraction of Earth’s water, only 2.5%.
9. Glaciers and icebergs trap almost 70% of Earth’s freshwater.

***Slide 2-Narrative: Explain (2)***

***The Atmosphere:***

1. The atmosphere is the layer of gas that surrounds all the systems of the Earth.
2. This layer mostly contains gases like nitrogen and oxygen, as well as other gases like carbon dioxide.
3. The atmosphere helps to trap heat from the Sun, and it protects people from the Sun’s harmful radiation.
4. A number of fascinating things occur within the atmosphere.

***The Troposphere:***

1. Weather patterns we see on Earth occur in the troposphere, the lowest layer of the atmosphere.
2. It stretches from 0-10 kilometers from the ground.
3. Temperature gets colder as you go up through the troposphere.
4. The coldest temperature in the troposphere is about -60 degrees Celsius.
5. Items in the troposphere include clouds, Mt. Everest, and aircraft.

***The Stratosphere:***

1. The ozone layer within the stratosphere protects us from harmful ultraviolet radiation or UV radiation.
2. The stratosphere stretches from about 10 to 50 kilometers from the ground.
3. Temperature gets warmer as you go up through the stratosphere.
4. The coldest temperature is -60 degrees Celsius, while the warmest temperature is 0 degrees Celsius.
5. Radiosonde is found in the stratosphere.

***The Mesosphere:***

1. Meteors tend to burn up in a region of the upper atmosphere called the mesosphere.
2. The mesosphere stretches from 50 to 80 kilometers from the ground.
3. Temperature gets colder as you go up through the mesosphere.
4. The warmest temperature is 0 degrees Celsius, while the coldest temperature is -85 degrees Celsius.

***The Thermosphere:***

1. During an aurora, charged particles in the thermosphere collide with gas molecules, transferring energy and creating bright, colorful lights.
2. The thermosphere stretches from 80 to 700 kilometers above the ground.
3. Temperatures get warmer as you go up through the thermosphere.
4. The coldest temperature is -85 degrees Celsius, while the warmest temperature is 1500 degrees Celsius.
5. Spacecraft and the aurora borealis are found in the thermosphere.

***The Exosphere:***

1. The exosphere stretches from 700 kilometers to outer space.
2. Temperature gets warmer as you go up through the exosphere.
3. The coldest temperature is 1500 degrees Celsius, while the warmest temperature is 2000 degrees Celsius.
4. Satellites are found in the exosphere.

***The Biosphere:***

1. The biosphere is the collection of all living things and the ecosystems they live in.
2. The biosphere makes Earth unique because life has not been found anywhere else in the universe.
3. Living things interact with each other and with the Earth’s other systems in many complex and exciting ways.
4. For example, plants on land and plankton in the sea produce oxygen in the atmosphere.
5. Most organisms on Earth need oxygen to survive.
6. Without oxygen, complex life as we know it could not have formed.

***Slide 4-Narrative: Practice***

1. Which of Earth’s systems is responsible for wind?

The atmosphere. Wind is moving air, and air is part of the atmosphere.

1. What are some of the major sources of freshwater in Earth’s hydrosphere?

Lakes, ponds, rivers, glaciers, icebergs, underground wells.

1. What are some of the things that make up Earth’s biosphere?

All living things-plants and animals, fungi like mushrooms and yeast, bacteria and more- make up Earth’s biosphere.

***Slide 5-Peer Model: Explain***

1. Scientists learn more about other planets such as Mars by using rovers.
2. Scientists are very interested to see if there is water on other planets.
3. Earth is a unique planet in the solar system.
4. People are still learning more about other planets.
5. But as far as anyone knows, only Earth has water, air, and biodiversity.
6. Liquid water is part of the hydrosphere.
7. The hydrosphere makes up oceans, lakes, glaciers, and rivers and supports life on Earth.

***Video:***

1. The Earth is made of rock, soil, water, and air.
2. The Earth is made up of four different systems.
3. The atmosphere is a collection of gases that make up the air.
4. It is made up of many different layers.
5. The geosphere is made up of rock, soil, and sediment.
6. These form the Earth’s core, mantle, and crust.
7. The prefix geo- means rocks.
8. The hydrosphere is the water and ice found on the Earth.
9. It includes the oceans, lakes, ponds, and seas, as well as water vapor and clouds in the air.
10. The prefix hydro- means water.
11. The biosphere is made up of all the living things on Earth, including animals, plants, fungi, and even bacteria.

***Key Words:***

1. Atmosphere: The layer of gas that surrounds all the systems of Earth.
2. Geosphere: All the solid land on Earth’s surface and all the soft and molten rock beneath the surface that includes the landmasses.
3. Hydrosphere: The collection of all the water found on Earth that includes oceans, seas, lakes, and rivers.
4. Biosphere: The collection of all living things and the ecosystems they live in.
5. Core: The inner layer of Earth.
6. Inner core: The inner layer of Earths core, made of solid iron and nickel.
7. Outer core: The outer layer of Earth’s core, made of molten iron and nickel.
8. Mantle: The largest of Earth’s layers found below the surface.
9. Crust: The outer surface of Earth that includes landmasses.
10. Troposphere: The lowest level of the atmosphere, where clouds form and where weather occurs.
11. Ozone layer: A layer of gas in the stratosphere that protects life by absorbing harmful ultraviolet rays.
12. Stratosphere: The second layer of the atmosphere, which contains the ozone layer that protects Earth from the sun’s rays.
13. Ultraviolet (UV) radiation: A form of electromagnetic radiation emitted by the sun.
14. Mesosphere: The third layer of the atmosphere.
15. Thermosphere: The fourth layer of the atmosphere.

***Slide 7-Peer Model: Practice***

1. How many major systems does Earth have?

There are four. They are the geosphere, hydrosphere, biosphere, and atmosphere.

1. True or False. Water vapor and glaciers are not part of the hydrosphere.

False.

1. Is the ozone layer a part of the geosphere? Name some parts of the geosphere.

The ozone layer is a protective layer in the atmosphere. The crust, mantle, and the outer core are parts of the geosphere.

***Slide 8-21st Century-Explain***

***Define and Identify the parts of Earth’s Major Systems:***

1. The four sphere on Earth are the geosphere, the hydrosphere, the atmosphere, and the biosphere.
2. The top level of the geosphere is called the lithosphere.
3. The geosphere is all the solid land on Earth’s surface and all the types of rock beneath the surface.
4. Landmasses such as continents and islands are part of the geosphere, as are features such as mountains, volcanoes, and plains.
5. The hydrosphere is the collection of all the water found on Earth.
6. Water is found in the oceans, seas, lakes, and rivers.
7. These are all part of the hydrosphere.
8. Water is found in other places on Earth: groundwater, water frozen in glaciers and icebergs, and water vapor in the clouds are also part of the hydrosphere.
9. The atmosphere is the layer of gas that surrounds all the systems of Earth.
10. This layer mostly contains gases such as nitrogen and oxygen, as well as other gases such as carbon dioxide.
11. The atmosphere traps heat from the sun, and it protects us from the sun’s harmful radiation.
12. The biosphere is the collection of all living things and the ecosystems in which they live.

***Slide 8-21st Century-Practice***

1. The biosphere includes all living things on Earth.
2. It includes people, animals, and insects.
3. It also includes plants.