**Welcome to Geology! It’s gonna be a “ROCKY” ride…..**

*Earth is a complex, dynamic planet that has continuously changed since its origin 4.6 billion years ago.*

1. These changes and the present day features we observe result from the interactions of the earth’s and systems
2. By viewing the earth as a we can see all of the components that are interconnected.
   1. System:

(Ex. A car)

***Earth’s Principal Subsystems:***

1. Atmosphere ( )
2. Biosphere ( )
3. Hydrosphere ( )
4. Lithosphere ( )
5. Mantle ( )
6. Core ( )
7. The between these subsystems result in our dynamically changing planet where and are continuously recycled in different forms.
8. are a part of this system and our activities can produce changes with potentially wide-ranging consequences.
   1. when issues such as and are debated it’s important to remember they aren’t isolated…

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* 1. goes through longer cycles than humans
  2. Although there may be disastrous short-term results for humans… are part of a longer cycle that has caused many glacial advances and retreats over the past 2.6 million year.

***What is Geology?***

1. Geology…
   1. 1. Now must also include the study of the planets and moons in our solar system.

Generally divided into to areas:



1. **Physical Geology** is the
2. **Historical Geology** examines the
3. Although Geology is very broad, nearly every aspect has some or relevance.
   1. Exploration of and resources
   2. Determining the location of
   3. Solving
   4. Finding resources
   5. Monitoring and and its cleanup
   6. Finding safe locations for dams, waste disposal sites and power plants

***Geology and the Formulation of Theories***

1. can have many different meanings
2. Scientifically a theory is a
3. Theories are formulated through the

***How does Geology Relate to the Human Experience?***

1. Geology influences our every day lives
2. References can be seen in , , , etc
3. Empires throughout history have risen and fallen on the and of natural resources.
4. Wars have been fought to secure

***How does Geology affect every day life?***

1. The most obvious connection can be seen during natural disasters like , , , , or
2. Less apparent, but equally important connections can be drawn between geology and , , and issues.
3. Consider how dependent we are on geology in our daily routines
   1. Most of our comes from burning coal, natural gas, or uranium consumed in nuclear-generating plants.
   2. Geologist locate , (oil/natural gas), and
   3. Copper and other metal wires are made from materials found through
   4. Concrete, windows, and drywall are all derived from
   5. is mainly based on some type of petroleum by-product and build from metal alloys

**ALL OF THESE ARE A RESULT OF PROCESSING GEOLOGIC RESOURCES!**

1. As a society our standards of living is obviously dependent on the consumption of .
2. We therefore need to be aware of how our use and misuse of geologic resources may affect the .
   1. We must .
   2. Allow for globally

***Global Geologic and Environmental Issues facing Humankind***

1. Most scientists would argue that is the greatest environmental problem
   1. The world’s population reached in 2011
   2. Projections indicate that it will be by 2045
   3. It may not seem like a geologic problem….
2. Most of this population growth will be in areas already at risk from
   1. , , , etc
3. Adequate must be found and protected
4. Additional must be found
5. An environmental imbalance is being created by a .
6. Other global environmental issues include:


   3. 1. These are all similar situations that deal with due to increased atmospheric caused most likely by

***How it all began…Origin of the Universe, Solar System, and our place in it***

*How did the universe begin? What’s its history? How will it end?* These are just a few basic questions we’ve always asked.

***Origin of the Universe***

1. Most scientist think the universe began about years ago with the Big Bang
   1. is a model for the evolution of the universe with all matter at a dense, hot center followed by an explosion resulting in an expansion and cooling
2. How do we know the Big Bang happened?
   1. 2 fundamental facts indicate it occurred:

      2. It is permeated by

***Our Solar System: its origin and evolution***

1. Our solar system is part of the
2. It consists of , , , 101 known moons, asteroids, comets, meteorites, and interplanetary dust and gas
3. The formation of our solar system is explained by the .
   1. It states the solar system formed from a
   2. of the material went into the formation of the sun
   3. The rest became everything else
4. and history of the planets are a consequence of their distance from the sun
5. Terrestrial planets -
   1. Composed of and elements
6. Jovian planets -
   1. Composed mainly of , , , and

***Earth’s Place in our Solar System***

1. The planets in our solar system formed years ago
2. Early earth was probably , uniform , and density, and composed of mostly , , and
3. Collisions with meteorites, gravitational compression, and heat from radioactive decay increased the temperature enough to melt iron and nickel and formed the layers of the earth
4. The differentiation into a is probably the most significant event in earth’s history
   1. Lead to the formation of the and
   2. Probably responsible for the origin of and

***Why is Earth a Dynamic and Evolving Planet?***

1. Earth has changed continuously during its history
2. Earth consists of 3 physical layers:


   3. 1. Differences in layers is due to caused by differences between , and

**CORE**

1. Density
2. Occupies % of earth’s total volume
3. Seismic data shows there is a , inner portion surrounded by a outer region
4. Both are made of and

**MANTLE**

2. Makes up % of earth’s volume
3. Less dense ( )
4. Composed mostly of and
5. Divided into 3 zones:
   1. Lower mantle:
   2. Asthenosphere:
      1. Same composition as lower mantle
      2. (due to partial melting and generation of magma)
      3. .
   3. Upper Mantle:

      2. is broken into pieces called that “float” over the asthenosphere ( )
      3. Interactions of plates cause , , and

**CRUST**

2. 2 types:
   1. 1. (20-90km)
      2. Average density
      3. and rich
   2. 1. (5-10km)
      2. Denser ( )
      3. Composed of dark igneous rocks (Gabbro and basalt)

***Theory of Plate Tectonics***

1. The Theory of Plate Tectonics is the unifying theory of geology
3. Accounts for:


   3. Plate boundaries:
4. Plate tectonics provides the framework for interpreting the , , and of earth on a global scale

***Rock Cycle***

1. A rock is an
2. 1. More than minerals have been identified
   2. Of those about make up the bulk of the earth’s crust
3. Geologists recognize 3 types of rocks


   3. 1. Each are characterized by their
4. The rock cycle illustrates
   1. Basically a
5. How are Plate Tectonics and the Rock Cycle Related?

***Uniformitarianism***

1. One of the fundamental ideas of geology is the principle of
2. Principle of Uniformitarianism:
   1. Assumes present day processes have occurred
   2. Powerful idea that allows us to use present day processes as a basis to interpret the past and predict the future
3. Does not exclude
   1. (Floods, earthquakes, tsunamis, landslide, etc)
   2. Although the and at which processes have occurred has changed over time –

EX. …but erosion is always occurring in the basic way it is right now.

***So how does studying Geology help us today?***

1. Earth is an extremely planet in which interactions are taking place between the various subsystems and have been for the past 4.6 billion year.
2. To ensure the survival of our species…
3. More importantly we need to understand how our actions affect the delicate balance between systems.
4. We don’t just study geology ….. !
5. is a part of our everyday lives (even if we don’t always realize it!)
6. Our depends on our consumption of natural resources that formed millions of years ago
7. How we and those resources will determine the standard of living we can pass on to the next generation