Unit 4: Earth Systems and Resources

Name:

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| ***Topics:*** | |
| 1. Plate Tectonics | VI. Watersheds |
| 1. Soil Formation and Erosion | VII. Solar Radiation and Earth’s Seasons |
| III. Soil Composition and Properties | VIII. Earth’s Geography and Climate |
| IV. Earth’s Atmosphere  V. Global Wind Patterns | IX. El Niño and La Niña |

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| ***Vocabulary***   * Climate * Weather * Troposphere * Stratosphere * Mesosphere * Thermosphere * Exosphere * Albedo * Tilt * Saturation point * Adiabatic heating/ cooling * Latent heat release * Atmospheric convection current * Insolation | * Convection cells:   Hadley, Polar, Ferrell   * Coriolis effect * Rain shadow * Gyre * Upwelling * Thermohaline circulation * ENSO   (El Niño/ Southern Oscillation, La Niña)   * Core/Mantle/Crust * Asthenosphere * Lithosphere * Magma * Hot spot * Plate tectonics | * Subduction * Plate boundaries * Seafloor spreading * Divergent/convergent * Transform fault * Seismic activity * Earthquake * Epicenter * Richter scale * Rock cycle * Igneous/Sedimentary/ Metamorphic * Physical/Chemical weathering * Acid precipitation * Rainshadow effect | * Erosion * Parent material * Soil degradation * Horizons: O/A/E/B/C * Water holding capacity/retention * Porosity * Permeability * CEC (Cation exchange capacity) * Soil texture triangle * Saltwater intrusion * Floodplain * Watershed * Watershed divide * Intertropical convergence zone |

1. **Geology & Plate Tectonics**

*Objective:*

* Describe the geological changes and events that occur at convergent, divergent, and transform plate boundaries.

Computer Interactive and Videos

🡪 **Computer Activity:** [*http://www.learner.org/interactives/dynamicearth/index.html*](http://www.learner.org/interactives/dynamicearth/index.html)

**A. Earth’s Structure**

|  |  |
| --- | --- |
| **Layer of the Earth** | **Composition/Other notes** |
| 1. (Innermost) |  |
| 2. |  |
| 3. |  |
| 4. |  |

**B. Plate Tectonics**

Alfred Wegener suggested that the plates of the Earth today have not always been in the same place. The **plate tectonics theory** suggests that these plates have moved over time in relation to one another resulting in different interactions between landmasses.

The last supercontinent \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ began to break up \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

|  |
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| The modern theory of plate tectonics provides us with a framework for understanding what? |

***Complete game: “Continents Over Time”***

**C. Plates & Boundaries**

How many tectonic plates make up the earth’s surface? \_\_\_\_\_\_\_

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| What are the 2 types of crust and how are they different?  1.  2. |

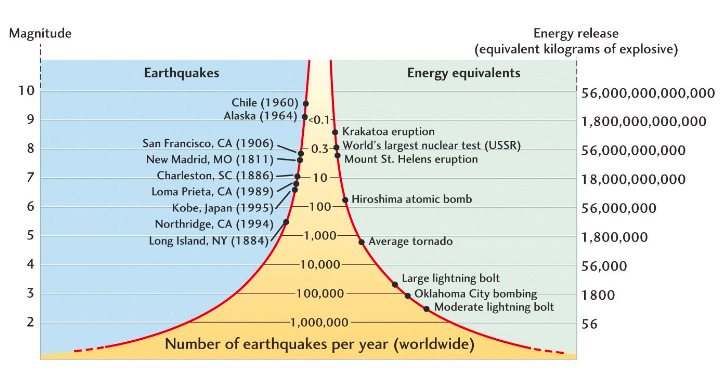
|  |  |  |
| --- | --- | --- |
| **Type of Boundary** | **Describe and give 1 real-life example** | **Draw a picture** |
| 1. |  |  |
| 2. |  |  |
| 3. |  |  |

|  |  |  |
| --- | --- | --- |
| * Earthquakes (usually) * Himalayas * Island arcs * Mid-Atlantic Ridge * Mid-ocean ridge | * Mountain ranges * Rift * San Andreas Fault * Seafloor spreading * Subduction zone | * Slip-strike * Tsunamis * Volcanoes (usually) |

**D. Slip, Slide, & Collide**

Write the following terms under the type of plate boundary it relates to. You will need to click through and read both screens.

|  |  |  |
| --- | --- | --- |
| Convergent | Divergent | Transform |
|  |  |  |
| Why do many volcanoes and earthquakes tend to be found on plate boundaries? | | |



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| How many times greater in magnitude is an earthquake that measures 7.0 on the Richter scale as opposed to one that measures 3.0? |

|  |  |
| --- | --- |
| **Focus:** | **Draw picture** |
| **Epicenter:** |

Earthquake Science! <https://www.youtube.com/watch?v=Nt0m5JWa62w>

**🡪 Video:** *What is a Volcano? (3:13)* <https://www.youtube.com/watch?v=WgktM2luLok>

|  |
| --- |
| Describe in your own words how volcanoes form and erupt. |
| What are two ways volcanoes have been necessary to form our current environment?   1. 2. |

**🡪 Video:** *Mt. St. Helens Eruption (6:27)* <https://www.youtube.com/watch?v=-H_HZVY1tT4&t=1s>

|  |  |
| --- | --- |
| How can eruptions affect the **environment** and **natural ecosystems?** | How can eruptions affect **humans?** |

Types of Rocks

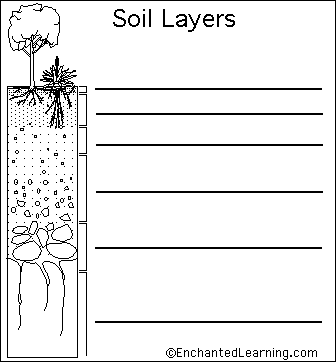
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Igneous** | **Sedimentary** | **Metamorphic** | |
| **Formation** |  |  |  | |
| **Types** |  |  |  | |
| **Unique characteristics** |  |  | |  |

1. **Soil Formation and Erosion**

*Objectives:*

* Describe the characteristics and formation of soil.
* Identify and describe the soil horizons based on their composition and organic material.
* Describe soil erosion, desertification and the ecosystem services provided by soil.

Topic notes:



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| **Important biome differences:**   * ***Forests 🡪*** * ***Grassland 🡪*** * ***Rainforest 🡪*** * ***Desert 🡪*** |

Reading🡪*World on the Edge: Chapter 3—Eroding Soils and Expanding Deserts* <http://www.earth-policy.org/images/uploads/book_files/wotebook.pdf>

|  |
| --- |
| Why does Lester Brown call topsoil the “foundation of civilization”? |
| Why is soil erosion the “silent global crisis”? |
| Briefly explain how desertification occurs and dust bowls are formed (see p. 37). |
| List three regions or countries affected by soil degradation and desertification and give 2 pieces of data that support the claim.  1.  2.  3. |

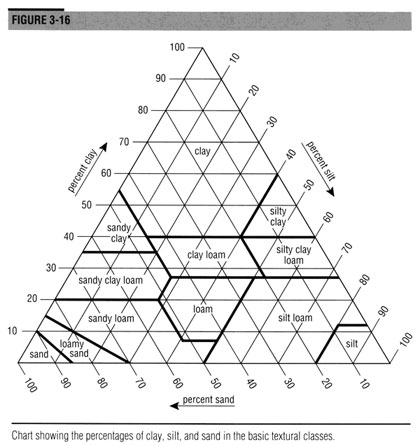
1. **Soil Composition and Properties**

Topic notes:

*Objectives:*

* Describe similarities and differences among properties of different soil types.
* Describe the formation of soil and causes of soil degradation.

Using your soil texture chart, determine the following soil textures using the percentages given.



|  |  |  |  |
| --- | --- | --- | --- |
| **Soil Textural Triangle Practice Exercises** | | | |
| **% Sand** | **% Silt** | **% Clay** | **Texture Name** |
| **75** | **10** | **15** | Sandy loam |
| **10** | **83** | **7** |  |
| **20** | **20** | **70** |  |
| **42** |  | **37** |  |
|  | **52** | **21** |  |
|  | **35** | **50** |  |
| **64** | **30** |  |  |
| **50** |  | **40** |  |
| **36** |  |  | Clay loam |
|  |  |  | Silty clay |
|  |  |  | Loamy sand |
|  |  |  | Silt loam |

1. **Earth’s Atmosphere**

* Describe the four systems that provide the life support for our planet.
* Describe the structure and composition of the Earth’s atmosphere.

Topic notes:

**V. Global Wind Patterns *(Module 10)***

* Explain how environmental factors can result in atmospheric circulation.
* Explain the Coriolis effect and its cause.

Topic notes:

🡪 *Video: “Global Atmospheric Circulation” (2:24)* [*https://www.youtube.com/watch?v=Ye45DGkqUkE*](https://www.youtube.com/watch?v=Ye45DGkqUkE)

*🡪 Video: “Coriolis Effect” (2:55)*<http://video.pbs.org/video/2365036901/>

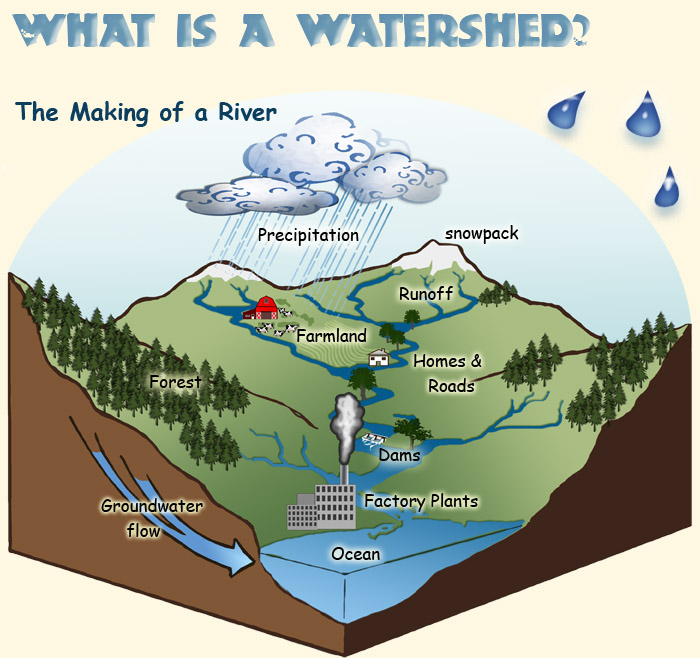
|  |  |
| --- | --- |
| What is the Coriolis Effect? | Draw it! |

1. **Watersheds**

* Describe the characteristics of a watershed, including area, length, slope, soil, vegetation types, and boundaries with adjoining watersheds.
* Explain the importance of protecting watersheds at their source and solutions to downstream issues.

What is a watershed? Video🡪

[*https://youtu.be/QOrVotzBNto*](https://youtu.be/QOrVotzBNto) *(1:17)*



<http://www.discoverwater.org/explore-watersheds/>

|  |
| --- |
| What effects can dams have on watersheds? |
| What makes floodplains popular areas for human settlement? |
| What factors need to be considered when building housing on a waterway? |

*🡪* Video: **Water: The Source of Life *(8:42)*** [*https://ed.ted.com/featured/FJ4ywGH8#watch*](https://ed.ted.com/featured/FJ4ywGH8#watch)

|  |  |
| --- | --- |
| Track the water from the source to the sink. | |
| *Location 1*  Source: | The frejelón plant is an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ species, found nowhere else on earth. *(look up this ecological term—not in video)* |
| What service does the frejelón provide in the Andes? |
| What service does the moss provide? |
| *Location 2*  Midway along the journey: | What is added to the water as it runs through agricultural areas? |
| *Location 3*  Final destination: | Who relies on clean water in a city? |
| What is a water fund, and which nonprofit is working on it in Bogotá? | |
| Why should the city of Bogotá pay for conservation efforts in the Páramos? | |
| What has the Avellanada family agreed to do, and why? | |
| What do you think about “water funds”? Would they work in the US? Why or why not? | |

1. **Solar Radiation and Earth’s Seasons**

* Describe Earth’s movements including rotation, revolution & axial tilt.
* Explain the differential heating between equatorial & polar areas as a function of sunlight intensity and surface area covered.
* Explain Earth’s seasons in terms of its movements.

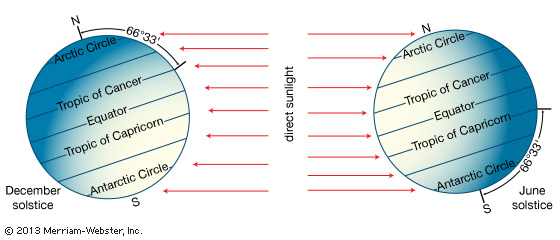
Topic notes:

Factors that affect the amount of solar energy at the surface of the earth (directly correlated with plant productivity)

What causes **seasons?**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (period of greatest solar radiation) occurs in the Northern Hemisphere when it is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Sun rises \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and stays above the horizon \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, rays strike ground \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (less of an angle) –the opposite of this is when \_\_\_\_\_\_\_\_\_\_\_\_\_\_ occurs
* Earth is actually closest to sun in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Jan. perihelion) not summer (July aphelion)

🡪 **Seasons are NOT caused by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ !**



*🡪 Video: Bill Nye Explains Seasons* [*https://www.youtube.com/watch?v=KUU7IyfR34o*](https://www.youtube.com/watch?v=KUU7IyfR34o)

1. Seasons are caused by 🡪
2. Temperatures being colder at the poles, warmer at the equator caused by 🡪
3. **Earth’s Geography and Climate *(Module 10)***

* Explain how weather and climate are also affected by geologic and geographic factors, such as mountains and ocean temperature.
* Describe a rain shadow and how it forms.

Climate patterns determined by:

1.

2.

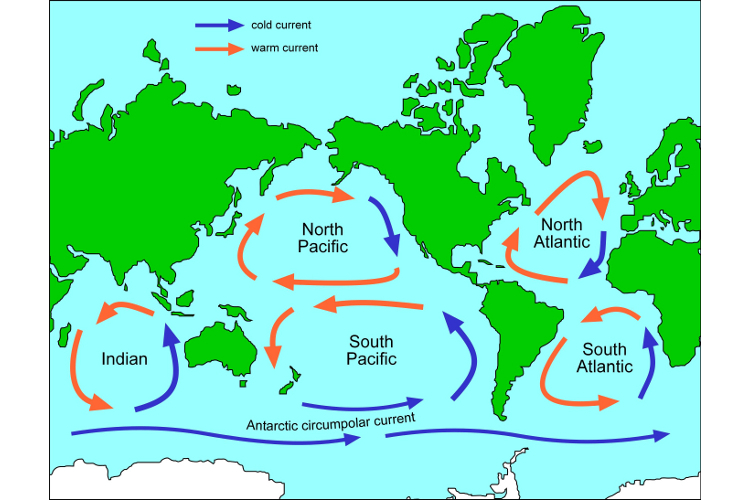
3.

|  |
| --- |
| Draw and label a rain shadow effect. |

1. **El Niño and La Niña *(Module 11)***

* Describe the formation, effects and environmental changes that result from El Niño and La Niñaevents (El Niño-Southern Oscillation, or ENSO).

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ : Large-scale water circulation that moves clockwise in the Northern Hemisphere and counter-clockwise in the Southern.



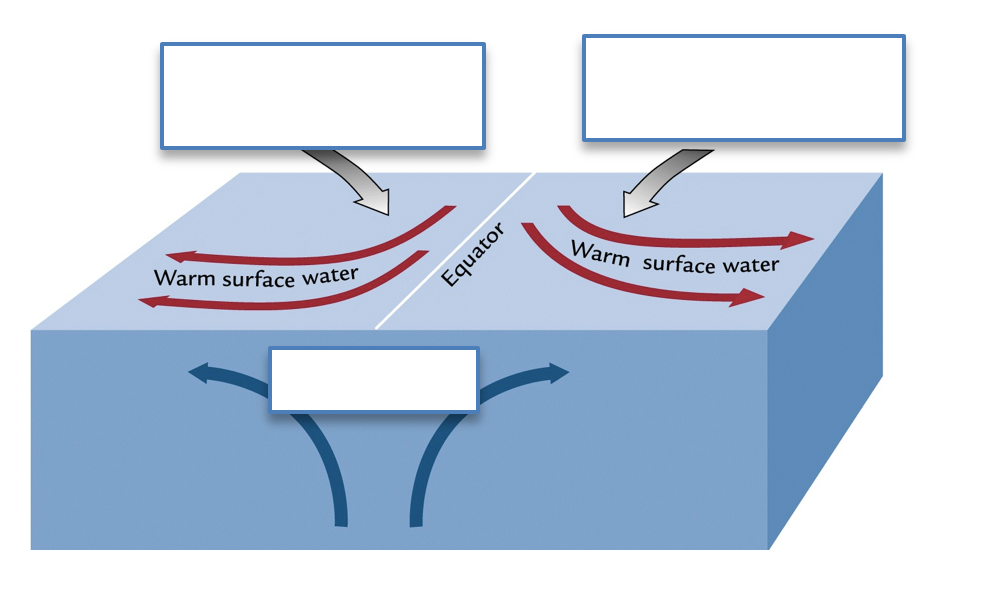
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: upward movement of ocean water causes mixing, bringing cool and nutrient-rich water from the bottom of the ocean to the surface

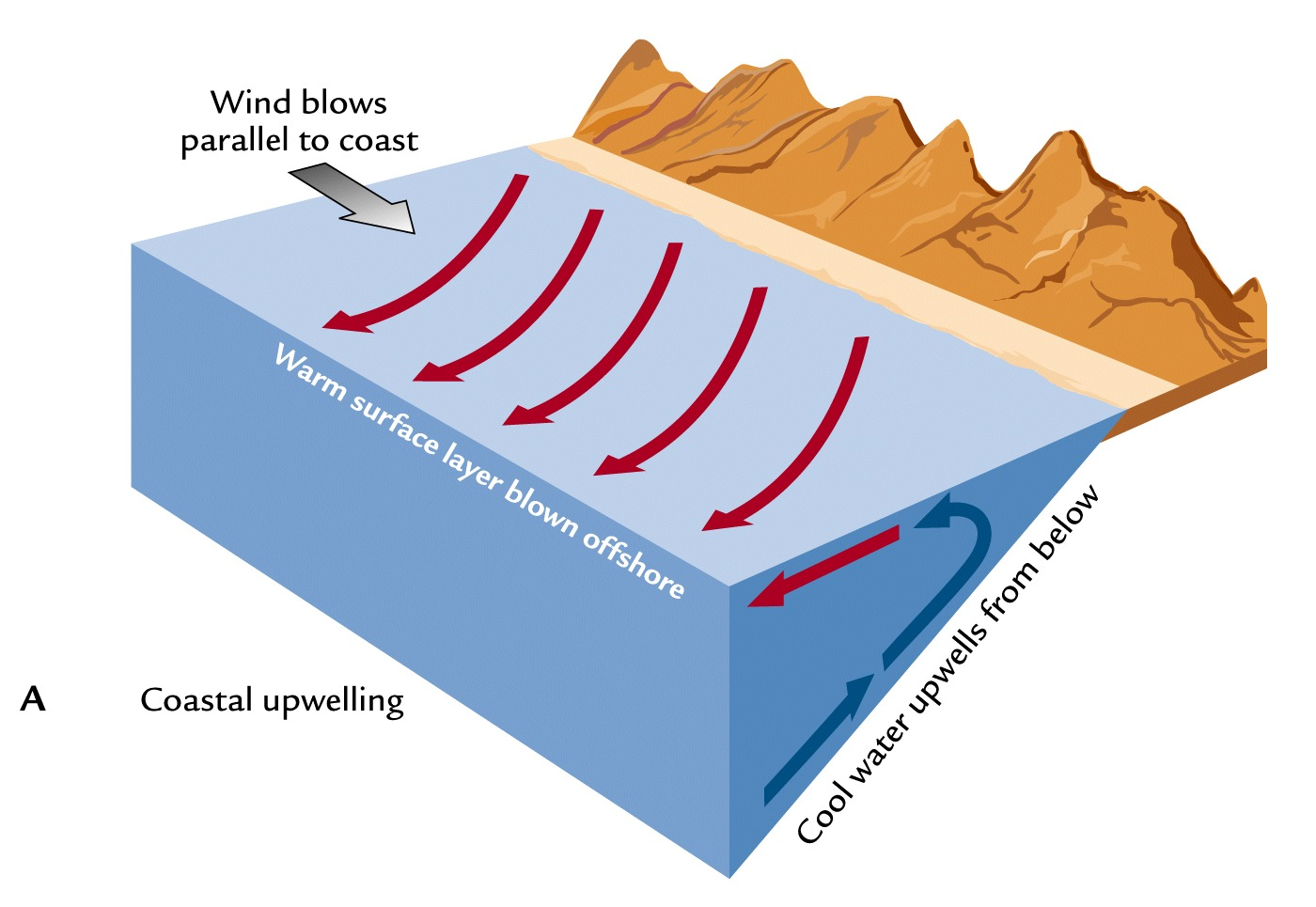
The warm water supports large populations of phytoplankton, zooplankton, fish, fish-eating seabirds

Upwellings occur when:

1. Far from shore:

2. Along steep western coasts of continents:

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What happens in an El Niño?

Possible Effects of El Niño:

La Niña:

