

## **Study Questions—Week 4    Soils & Geology**

### **Forests Through Time and Space**

1. Explain the geological processes that are behind the current Mt. St. Helens eruption.
2.
  - a. What is cation exchange capacity?
  - b. Briefly explain where it is found in soils and why it's important.
  - c. Outline how CEC can buffer changes in soil pH.
3. Generally, we think of deserts as sandy areas with limited rainfall. Soil formation depends, in part, on rainfall. However, irrigation of many desert soils can often result in fertile agricultural systems. How is this possible? Support your answer.
4. Compare the current soil development factors and soil profile characters at the Hoh rainforest (river trail) with the Mt. Elinor area. Use relative terms to describe the characteristics.
5. The rate of chemical weathering on parent material is proportional to the surface area. Calculate the increase in surface area that would take place if the outer 2 mm of a boulder (30 cm diameter) were physically weathered into sand-sized particles (diameter 1.3 mm). Assume that the boulder is spherical. Volume of a sphere =  $\frac{4}{3} \pi r^3$  Surface area of a sphere =  $4\pi r^2$ .

*Problem solving strategy: Be sure to convert all measurements to the same units*

- a. Calculate the volume and surface area of the boulder before weathering.
  - b. Calculate the volume and surface area of the boulder after the outer 2 mm was weathered.
  - c. Calculate the volume of the material contained in the outer 2 mm of the boulder
  - d. Calculate the volume of one sand particle, then use this to determine how many sand particles would be formed from the outer 2 mm of the boulder.
  - e. Calculate the surface area of one sand particle and then the surface area of all the sand particles formed from the outer part of the boulder.
  - f. Add the surface area of the sand particles to the surface area of the boulder after weathering. Compare this with the original surface area. How many times bigger is it?
  - g. Now to continue the mental challenge (pain?)... Calculate how many clay particles (diameter of 0.001 mm) could be created from one grain of sand through chemical weathering and what the combined surface area of those particles would be. Assume that there would be no loss of volume.
  - h. How many grains of sand would have to be converted to clay to equal the surface area of the original boulder?
6. Refer to Table 3.4 on p 65 that lists the amount of energy available with various electron acceptors available in soils. Why would organisms using sulfate ( $\text{SO}_4^{2-}$ ) as an electron acceptor not be found in a soil layer with a redox potential of 800 mV?
  7. What is a terrane and how have they affected the terrain we know as the PNW?

**Quiz Questions—Week 4**  
**Forests Through Time and Space**

1. “Create your own reality” was a common phrase during the 70’s and 80’s. After reviewing soil-forming processes, it is evident that plants were hip to this scene a long time ago and are continually creating better conditions for themselves. Explain how they do this, be sure to cover processes that capture or retain nutrients as well as those that release, increase availability of and/or form nutrients.
2. Tropical rainforests contain significantly more biomass than temperate forests. When temperate forests are cleared and converted to agricultural uses, it usually results in productive farms with fertile soils. However, when tropical forests are cleared and converted to agricultural uses, the soils are not very productive. Explain.