**ES473 Environmental Geology Textbook Review Questions**

Keller Textbook Chapter 10 Water Resources Reading Review Questions

Instructions: visit the ES473 class web site and download a digital MS word document version of the text review questions. Review and read the relevant textbook chapter posted on the ES473 moodle site (moodle.wou.edu) and answer the following questions. Answers should be word-processed with MS Word using figures and pasted images from the text book or favorite internet resources. The MS Word version of these review questions are available on the ES473 main class web site at: <https://people.wou.edu/~taylors/g473/Chapter10_Water_Resources.docx>

Use the MS word document to provide your answers. Your work should look complete and professional.

1. Of the Fresh Water on planet Earth, what percentages are derived from the following uses:

Agriculture \_\_\_\_\_\_\_\_\_ Industry \_\_\_\_\_\_\_\_\_\_ Residential \_\_\_\_\_\_\_\_\_\_\_

1. Based on the global water budget, identify the total volumes in cubic kilometers, transferred by the following processes:

Ocean Evaporation \_\_\_\_\_\_\_\_\_ Precipitation on Ocean \_\_\_\_\_\_\_\_\_\_\_\_\_

Precipitation on Land \_\_\_\_\_\_\_\_ Evaporation from Land \_\_\_\_\_\_\_\_\_\_\_

1. Based on the World’s Water Supply, list the following percentages of total water:

Oceans \_\_\_\_\_ Atmosphere \_\_\_\_\_\_ Rivers and Streams \_\_\_\_\_\_\_\_ Groundwater \_\_\_\_\_

Lakes \_\_\_\_\_\_\_ Ice Caps an Glaciers \_\_\_\_\_\_\_

1. List and discuss the four primary factors that affect surface water runoff.
2. Answer the following True or False Questions
   1. Permeable gravel and sandy soils have relatively high runoff rates \_\_\_\_\_\_\_\_\_
   2. Impermeable clay and shale substrates have relatively low runoff rates \_\_\_\_\_\_\_\_\_\_
   3. Fractured bedrock has relatively low runoff rates \_\_\_\_\_\_\_\_\_\_
   4. Thick vegetation modulates and decreases runoff \_\_\_\_\_\_\_\_\_\_\_\_
3. Examine Table 10.3, list the three river basins in the U.S. that have the highest average sediment yield per year, via stream erosion. List each river basin with the average yield numeric value.
   1. \_\_\_\_\_\_\_\_\_\_\_ b.\_\_\_\_\_\_\_\_\_\_ c. \_\_\_\_\_\_\_\_\_\_\_\_\_
4. Define and distinguish the following key terms related to groundwater, provide sketches or images where required:
   1. Vadose zone vs. phreatic zone
   2. Water Table (draw a sketch and define)
   3. Aquifer vs. aquitard
   4. Unconfined vs. Confined Aquifer
   5. Cone of depression (provide sketch)
   6. Hydraulic gradient (provide sketch)
   7. Porosity vs. permeability
   8. Hydraulic Conductivity
   9. Darcy’s Law vs. Darcy’s Flux
   10. Hydraulic Head (provide sketch)
5. Examine Table 10.6, answer the following true or false questions.
   1. Uncompacted clay has relatively high porosity and low hydraulic conductivity \_\_\_\_\_\_\_.
   2. Well sorted gravel is associated with the highest hydraulic conductivity of sediment \_\_\_\_\_\_\_.
   3. Shale has low hydraulic conductivity \_\_\_\_\_\_\_\_\_\_\_\_.
6. Describe the difference between influent streams and effluent streams, draw a cross sectional sketch illustrating each type.
7. Write the equation for Darcy’s Law, list and define all of the variables in the equations, draw a sketch.
8. What is “base flow” and why is it an important concept to understand?
9. Examine Figure 10.13, list the three states / geographic regions that have the highest rates of over-pumping of groundwater.
10. List and describe the two main trends of water use in the U.S. from the time period of 1950 to 1995.
11. True or False: water resources continue to expand in highly sustainable ways, compared to human population growth over historic times.