

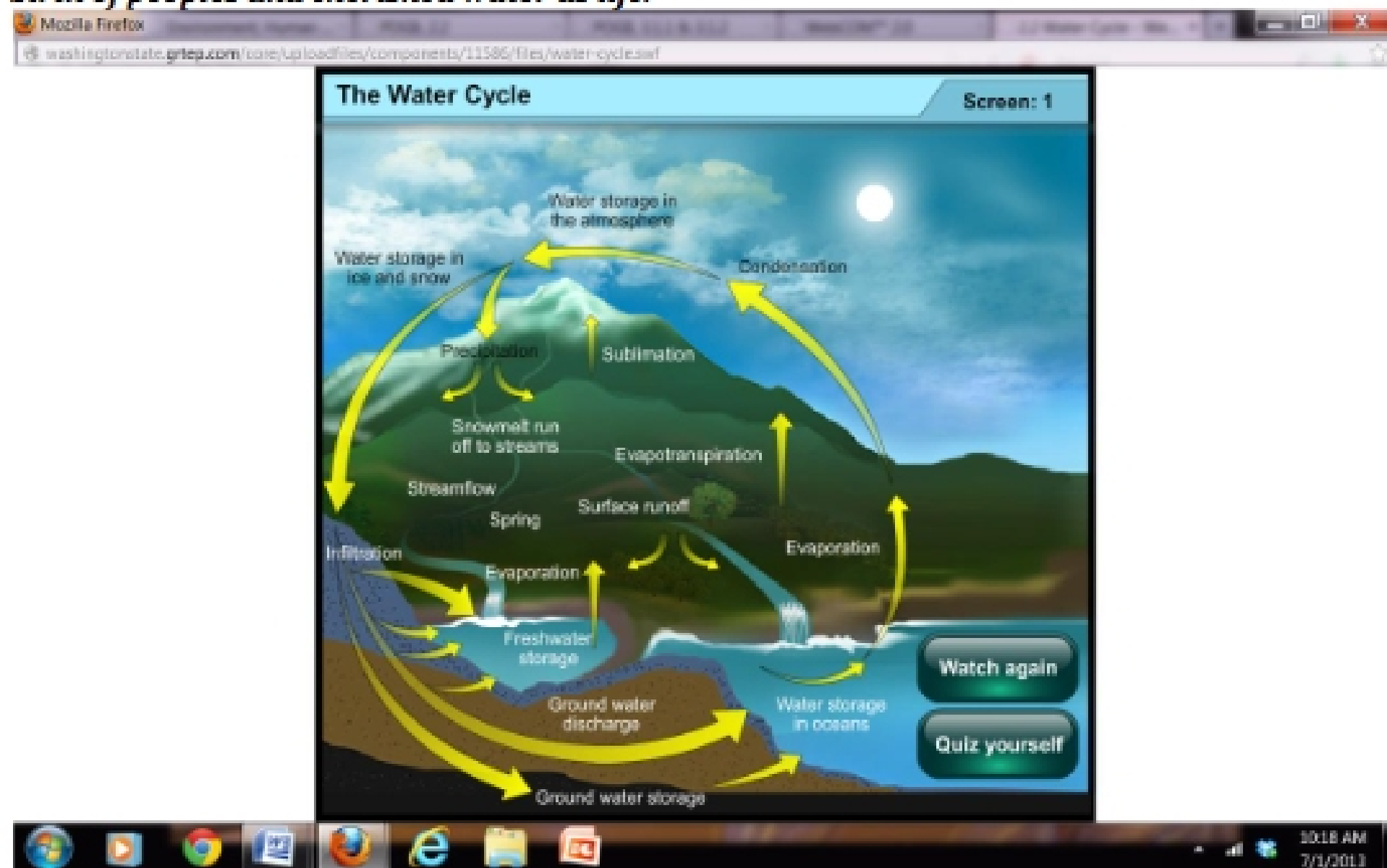
## POGIL 2.2: The Water Cycle (1)

### Review

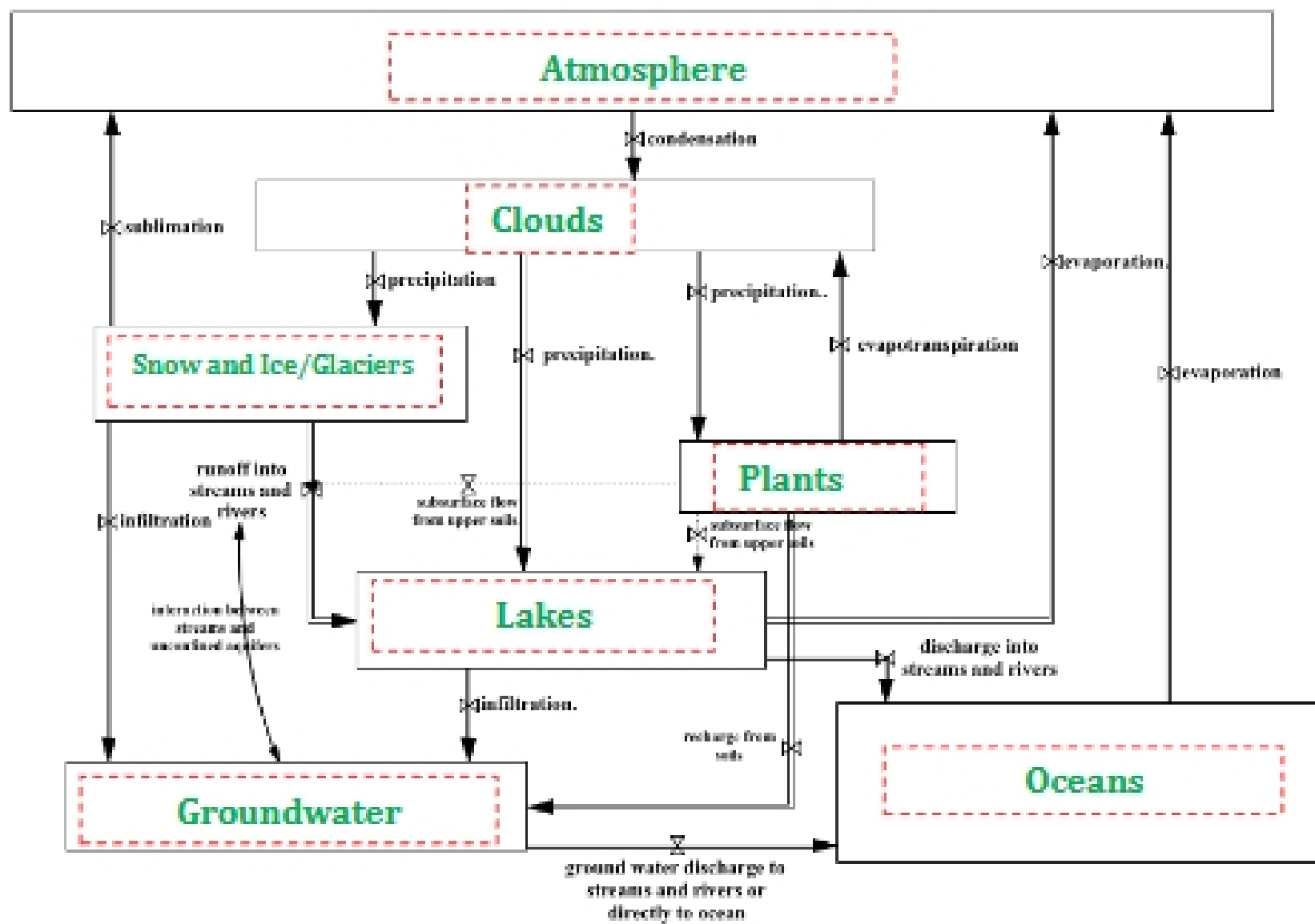
**\*\*Read Chapter 2.2 of the E-text and then complete this part of the POGIL worksheet.**

**\*\*Please fill out worksheet in a different font or text color (green or blue) so it is easy to distinguish your answer from the questions.**

**READ THIS:** *The planet is a closed ecosystem; the only additive component is energy from the sun. The oxygen and hydrogen atoms that make up the molecule  $H_2O$  have been on the planet since it formed billions of years ago. The water cycle moves molecules of  $H_2O$  around the planet as liquid water, frozen water and water vapor. Water is both a solvent and a transporter. The services of water support all life, primary productivity, nutrient cycling, and the dispersal of seeds and pollutants. The flow of water shapes the landscape through erosion and in doing so supports the formation of soils. The services of water help to regulate climate. Water provides humans with cultural services such as beautiful views, a sense of place, or a religious foundation. Indeed, long before humans understood that carbon was the “duck tape of life” they understood that water was essential to all life. Cultures since the beginning of human society have often venerated water, described water deities, associated water with the birth of peoples and cherished water as life.*

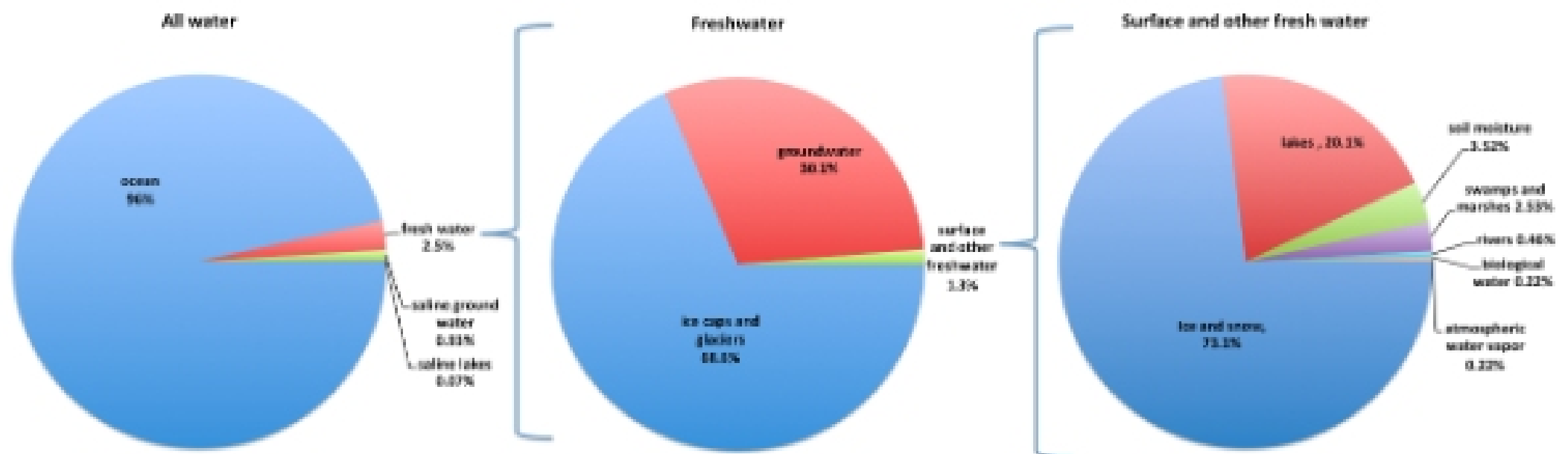


EQ1. Using the water cycle model (Figure 2.2.4 in the e-text), fill in the names of the stocks in the model below. (Hint: Transpiration is the flow of water vapor from plants to the atmosphere. Evaporation from soils and transpiration are typically measured as a combined rate called *evapotranspiration* (ET)). (use text boxes to fill out)



### Stocks or accumulations of water

**READ THIS:** *The model above illustrates where water accumulates in stocks and how it flows between those stocks. We will now get more specific and explore the distribution of water in more detail. Scientists estimate that the total volume of water on earth distributed throughout ocean, atmosphere and terrestrial stocks is 1.4 billion cubic kilometers. The figure below illustrates the current estimated global distribution of water.*



EQ2. What percentage of the water on the planet is fresh (not salty)? 2.5 %

EQ3. There are three stocks of fresh water on the planet. What are they and what percentages of global freshwater do each of these stocks contain? Ice caps and Glaciers (68.6%); Groundwater (30.1%); and Surface and other freshwater (1.3%)

EQ4. A small percentage of global freshwater is found in the category "surface and other." How is water distributed in this stock?

Ice and snow (73.1%); Lakes (20.1%); Soil Moisture (3.52%); Swamps and Marshes (2.53%); Rivers (.46%); Biological water (.22%); atmospheric water vapor (.22%)

EQ5. Based on the information above, in what form is most of the freshwater found? Or in other words, is it vapor, liquid or solid?

Solid, stored in ice caps and glaciers!

EQ6. Why does the chart distinguish between "ice caps and glaciers" and "ice and snow"? (Hint: think about how long a water molecule would stay in each of these stocks.)

Ice caps and glaciers are very long term storages; while ice and snow are a much shorter storage of water (they melt and then come back again the next year)

### Flows of water

Look at your model on page 1 to answer the following questions.

EQ7. When the sun heats the surface of a body of water, such as the ocean, its energy "breaks" bonds between water molecules, allowing some water to escape in the form of water vapor. This process is called Evaporation

EQ8. When the sun heats a glacier, ice field, or snow, water can move from a solid form in the snow or ice directly into the atmosphere as a vapor. This process is called Sublimation

EQ9. The sun also drives the movement of water from plants and soils in a process that is called Evapotranspiration

EQ10 As the (warm) water vapor rises in the atmosphere, it cools and forms clouds. This process is called Condensation

EQ11. Depending on atmospheric conditions, the condensed water molecules in the clouds will collide and cling to one another. This process is called Condensation