SCIENTIFIC

Name____

AP Physics 2 Review Questions

Integrating Content, Inquiry, and Reasoning

1. Consider the same experimental setup as in the *Guided-Inquiry Activity*.

   a. Using Bernoulli's equation, derive a mathematical relationship between fluid height in the container and the speed with which the water exits the container.

   b. With the relationship derived in Question 1a, do you expect the experimental values to be higher than or lower than the theoretical values? Calculate what the theoretical values of fluid speed should be for each point of fluid depth measured.

   c. Give an explanation for any difference in value between the theoretical and experimental fluid speeds.

   d. How does the flow rate of water dropping in height throughout the bottle compare to the flow rate of water exiting the hole?

2. In your own words, explain how the systems analyzed in the *Introductory Activity* and the *Guided-Inquiry Activity* follow known conservation laws.

3. A volume of 2 m^3 of water is flowing in a level, horizontal pipe with a flow rate of 1 m^3/s. The water flows from a pipe section with a cross sectional area of 0.2 m^2 to a pipe section with a 0.1 m^2 cross sectional area. Before entering the constricted segment of pipe, the water is at a pressure 20 kPa above atmospheric pressure. What is the average acceleration that the volume of water undergoes when flowing from the unconstricted pipe segment to the constricted pipe segment? See Figure 2.

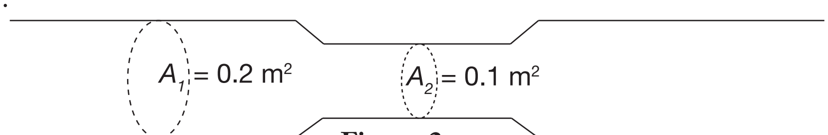

Figure 2.

4. Far into the future, Mars has been successfully colonized. A farmer on Mars has a personal water tower for which the water level is always kept constant. This water tower is used to feed the farmer's irrigation system. Water from the water tower flows down through a single tube and is held under pressure behind an irrigation system valve (the water is no longer moving at this point). In order to irrigate the field, the water is held at 100 kPa when the valve is closed.

   a. How tall must the water tower be in order to irrigate the field? The water pressure in the tower is 1 kPa and the acceleration due to gravity on Mars is 3.8 m/s^2.

   b. Once the valve is opened, how fast does the water flow? The atmospheric pressure on the Martian surface is about 600 pascals.