

Names: _____ Lab Instructor: _____

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Mechanical Engineering
2.001 Mechanics and Materials I
Spring 2003

Lab 1: Wine Bottle Experiment

Objective:

To review free body diagrams, isolate subcomponents, identify reaction forces and moments

Apparatus:

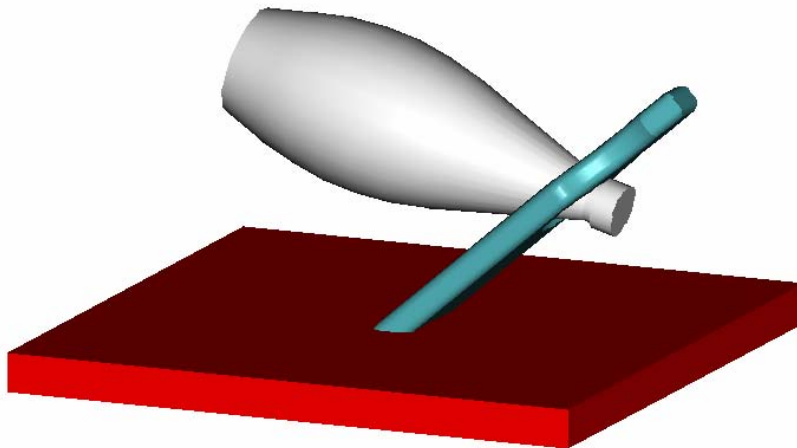
1- 750mL bottle of Perrier
Bottle Stand

Procedure:

Insert neck of bottle into hole. Place assembly onto the desk with the flat side of the bottle stand contacting the table.

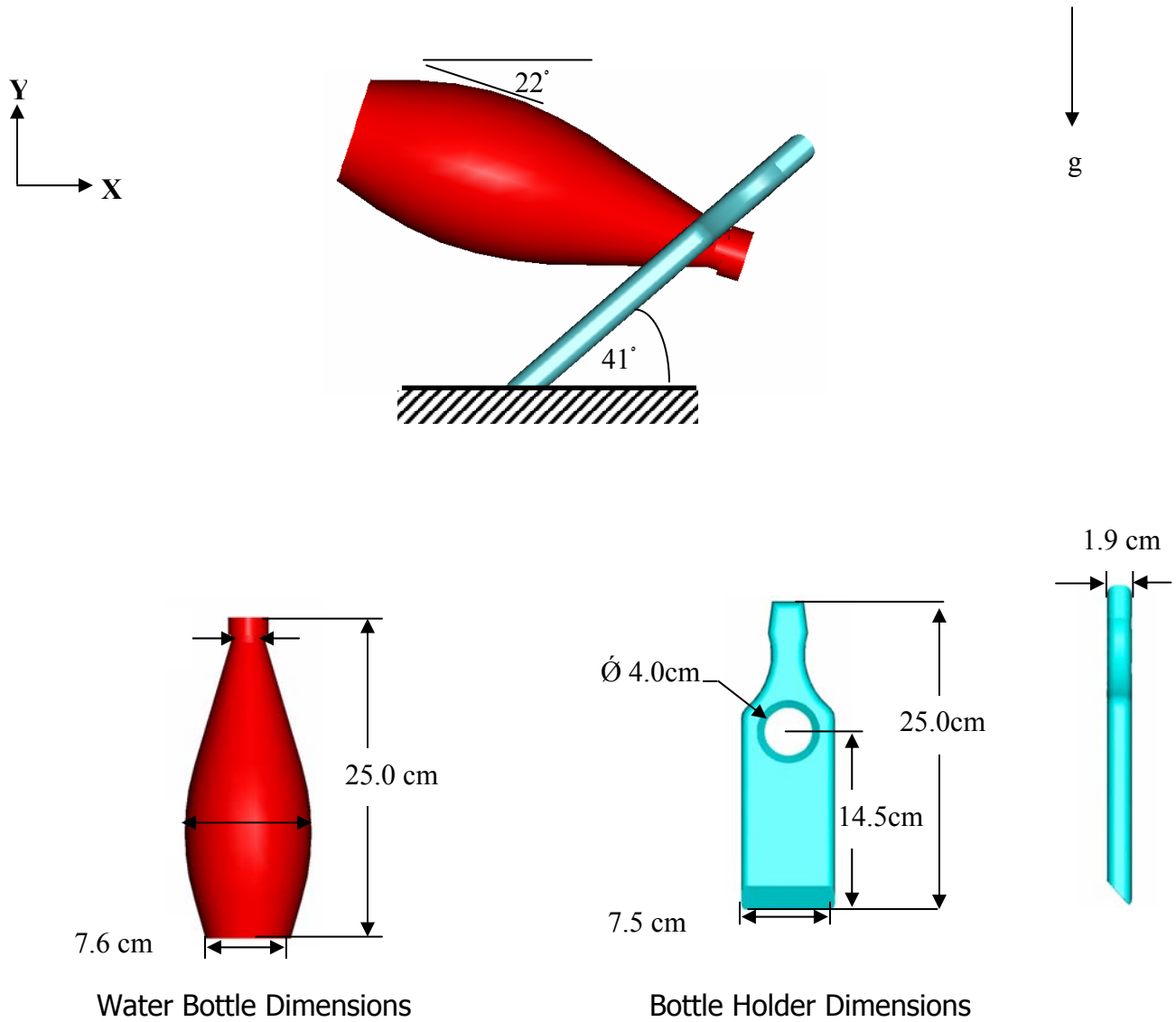
For this exercise, you will work with one or two partners. Write your answers and show your work on this handout.

You may hand in one set of responses for your 2/3-person team. Turn this handout in at the end of lab

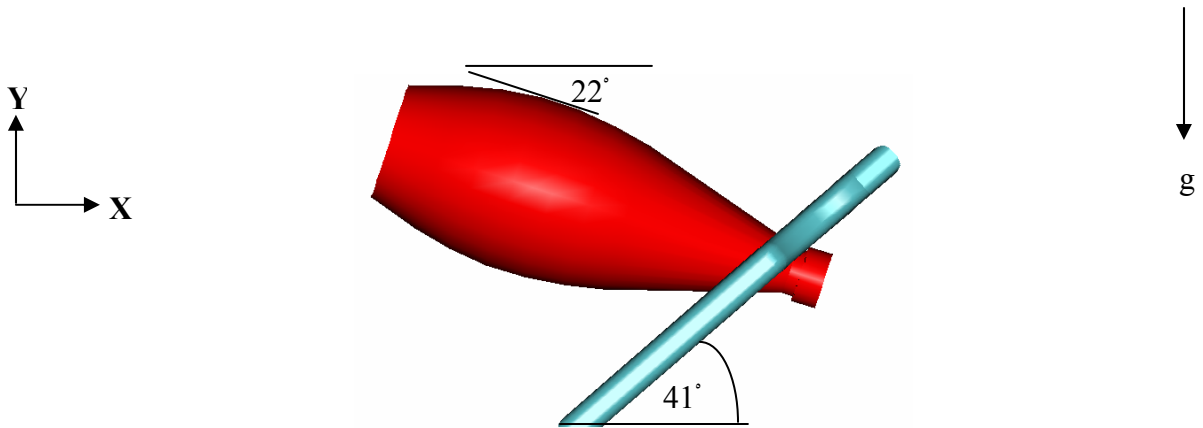


Questions:

1. Consider the following diagram of the bottle holder assembly. The weight of the bottle is 11N, and the weight of the board is negligible.



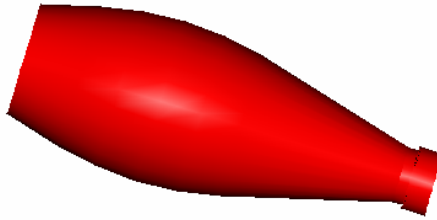
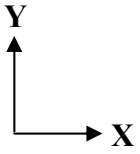
a. Draw a free body diagram of the **system**. Show all forces and where they act. List all assumptions that are made.



b. Solve for the reaction forces and/or moments (forces and/moments that the ground applies to the board). Solve for any other unknowns based on your FBD (solve symbolically)

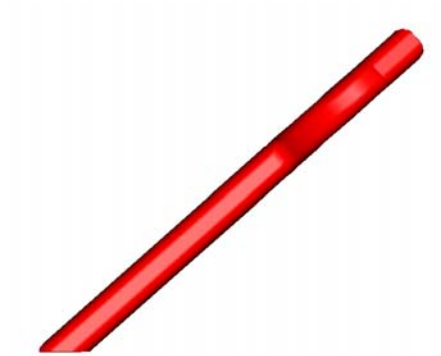
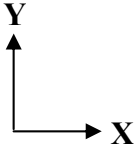
2. Take each individual piece: the bottle, and its holder, and draw a free body diagram for each piece.

a. Draw a FBD of the bottle. Referring to the above dimensions of the bottle and the experiment, approximate the location of the forces acting on the bottle from the board.



b. Using equilibrium (recall that force and moment equilibrium must be satisfied for each component), determine the internal forces and/or moments. (Forces and/or moments transmitted between the bottle and its holder).

c. Draw a FBD of the bottle holder



d. Using equilibrium (recall that force and moment equilibrium must be satisfied for each component), determine the internal forces and/or moments. (Forces and/or moments transmitted between the bottle and its holder)

3. Additional Experiments

a. Conduct the experiment using an empty Perrier bottle. State your observations, and provide an explanation based on the physics of the system.

b. Conduct thought experiments with other bottles: Consider inserting a different bottle. Does the paddle hold this Bottle? What happens and explain why?

