Physics 201B

Take home lab

BALLOONS AND BOTTLES

In this lab you will examine the motion of liquid in a bottle and predict and examine the motion of a helium-filled balloon during the acceleration of a carload of physics students out for a drive. You will need 3 to 4 people, notebook and pencil, one 2 liter soda bottle half full of liquid with cap securely in place, and one helium-filled balloon tied to a string. Helium balloons can be obtained from many restaurants and paper stores. The lab should be conducted in an empty or nearly empty parking lot. Be sure you have ample space, follow safe driving practices, and wear your seat belt. Obey the graduated licensing law.

Lab procedure: There will be 4 parts to the experiment, to be done in the following order:

Part 1. Hold the half-full bottle flat on its side with the cap end of the bottle facing the front of the car. While making several slow and moderate starts, stops and turns (not sudden), observe and record the behavior of the liquid in the bottle. A single turn in either direction is acceptable.

Part 2. Turn bottle 90° so that it points toward either side of the car (still flat). Repeat the experiment of part 1 above.

Part 3. Based on what you have observed in parts 1 and 2 above, record your group's predictions about how the helium-filled balloon will behave when following the part 1 experiment. Imagine the balloon string attached to a fixed object inside the car in such a way that the balloon is free to move in all directions inside the car as the car accelerates and turns (windows closed and ventilation turned off).

Part 4. Now carry out the experiment of part 1 above using the helium balloon set up as described in part 3 above. Be sure to keep windows closed and ventilation off. Do not let balloon touch the car ceiling or be otherwise impeded. Record your observations.

Lab report requirements:

1. One report per group. Cover sheet must include name, teacher, and class hour of all group members. Identify any non-physics students.
2. Observations must be organized in a neat data table on unlined paper showing, as a minimum, the results of slow and moderate turns (right or left), slow and moderate starts, slow and moderate stops, and predictions. Use drawings and brief descriptions to illustrate what happened in each case. Make all observations/predictions relative to the car's forward motion.
3. Answer the following questions in complete sentences:
    - How does the motion of the liquid and balloon show the amount and direction of acceleration?
    - Are the actions of the balloon and liquid similar or dissimilar? Explain why this is so, including what physical principle is involved.
    - Imagine you are on a jet plane. Describe the motion of the liquid and balloon during take off and landing and compare to what you found during this lab.
4. Conclusion: discuss results and applicable physical principles as to why liquid in bottle and the balloon behave the way they do. Were the results you obtained what your group expected?

Submit full lab report in the following order (total 40 points):

_____	Cover page/names/hours	4 pts
_____	Purpose (typed)	2 pts
_____	Procedure (typed or this handout)	2 pts
_____	Data table (neatly done)	15 pts
_____	Prediction	3 pts
_____	Questions (typed)	6 pts
_____	Group conclusion and summary (typed)	4 pts
_____	Neatness, accuracy, completeness	4 pts

Optional: Turn in your lab report wrapped around empty, clean 2 liter bottle with cap and receive 3 extra points.

Due: ~~Wednesday~~ October 18. May be turned into any physics teacher during any hour.
Friday, Oct. 18