

Making the Turn Lab

Teacher's Guide

Topic:

Circular Motion and Satellite Motion

The following information is provided to the student:

Question:

What is the direction of the velocity of and the net force upon a passenger in a car which is making a left hand turn?

Purpose:

To describe the direction of the **velocity** of and the **net force** on a passenger in a car which is making a left hand turn - with and without a car door.

A complete lab write-up includes a Title, Purpose, Data section, and a Conclusion/Discussion of Results. The Data section should include an organized and informative record of your observations of the motion of the ball relative to the board using both words and a diagram. The Conclusion/Discussion should answer the question posed in the Purpose and cite the evidence (observations) which support such a conclusion.

Materials Required:

Wood board; tennis ball; wood block; masking tape; space to walk.

Description of Procedure:

A tennis ball is balanced upon a wood board as it is held in a horizontal plane by two opposite ends. Students walk forward at a constant speed with the ball balanced as motionless upon the board. The board represents a car and the tennis ball represents the passenger. The student makes a sharp left hand turn while holding the board level. The path of the ball relative to the path of the board is observed. A wood block is now taped to the right side of the board. It represents the passenger side door. The tennis ball is placed upon the wood board next to the wood block. As before, the student walks forward at constant speed and then makes the same left hand turn. The path of the board and the ball are observed. All observations are recorded and used as supporting evidence for the conclusion.

Alternative Materials and Procedure:

A similar activity which targets the same concept involves the use of aluminum pie plates and a marble. A portion of the pie plate wall is removed. The marble is placed inside the pie plate and rolled along the inside wall. The path of the marble upon leaving the pie plate is observed. The direction of force upon the marble by the pie plate during the circular path is contemplated. Observations and reasoning is used to make a similar conclusion.

Safety Concern:

There is always a higher than usual level of risk associated with working in a science lab. Teachers should be aware of this and take the necessary precautions to insure that the working environment is as safe as possible. Student *horseplay* and off-task behaviors should not be tolerated.

The Laboratory

Suggestions, Precautions, Notes:

1. The wood boards used in this lab are 2-foot by 2-foot boards cut from a 4'x8' panel of shower tile purchased at a home store. The boards are used as mini-whiteboards for students to present solutions to problems. They are used here in this lab as car chassis.
2. Both this activity and the activity described in the Alternative Materials and Procedure section are worth doing. One can be done as a student activity and the other can be demonstrated.

Auxiliary Materials:

None

Scoring Rubric:

CG1. Making the Turn Lab	Score
— Included, labeled and organized all parts of the lab report.	
— Data section includes an organized record of the relevant observations using both words and a diagram.	
— Conclusion/Discussion answers the <i>question</i> posed in the Purpose; evidence which supports such a conclusion is cited and discussed.	—/—

Connections to The Physics Classroom Tutorial:

The following reading is a suitable accompaniment to this lab:

<http://www.physicsclassroom.com/Class/circles/u6l1a.cfm>

<http://www.physicsclassroom.com/Class/circles/u6l1c.cfm>

Connections to Minds on Physics Internet Modules:

Sublevels 1 and 3 of the Circular and Satellite Motion module are suitable accompaniments to this lab:

<http://www.physicsclassroom.com/mop/module.cfm>