Main Topic	Forces
Subtopic	Acceleration, Newton's Laws
Learning Level	High
Technology Level	Mid
Activity Type	Student

Description: Basic air track lab using photogates to observe acceleration on an inclined air track and draw conclusions about net force.

Required Equipment	Air track, 1 glider, 2 photogates, ruler or meterstick, Balance
Optional Equipment	

Educational Objectives

- Describe the motion of a glider on an inclined air track, and relate the motion to Newton's Laws.

Concept Overview

In this simple lab using an air track and two photogates, students will calculate the acceleration of a glider sliding on an incline, and calculate the force that caused the acceleration.

Lab Tips

Simple connected photogates are needed for this lab. They need to display the time they are blocked, and the time between. Note that "time between" is from the beginning of one gate to the beginning of the other.

"Motion on a Level Air Track," in which students observe a glider on a level track and conclude that there is no net force, should be completed prior to this lab.

The Inclined Air Track

Name: _____

Class: _____

Goal:

Observe and describe the motion of a glider on an inclined air track.

Materials:

Air track, 1 glider, 2 photogates, ruler or meterstick, balance

Procedure:

1. Turn on the air blower. Place a glider at one end of the track. Adjust the track's feet until the glider begins sliding on its own and reaches the other end of the track within 5 seconds.
2. Arrange two photogates at least half the track length apart, so that the glider flag triggers the gates when it passes through.
3. Measure and record the length of the part of the glider that passes through the photogate, in cm _____ and in m _____
4. Place the glider at one end of the track and release it (without pushing) so that it passes through both photogates. (Catch it before it can bounce back through.) Record the times reported by the gates:
   a. Gate 1: _____
   b. Gate 2: _____
5. Record the time elapsed between the glider beginning to pass through Gate 1 and reaching Gate 2. (It will probably be longer than 1 second.) _____
6. Calculate the speed (in m/s) of the glider as it passed through each gate by dividing the length in #3 by the times in #4.
   a. Gate 1: _____
   b. Gate 2: _____
7. Calculate the glider's acceleration as it passed from Gate 1 to Gate 2.

8. How did the glider's speed change as it traveled on the track?

   _____

9. What do you know about the net force on the glider?

   _____

10. List forces that act on the glider <u>after it is released</u>. Describe any details you know about how these forces relate to one another. (Are any equal?)

    _____

    _____

11. Which force is minimized by using the air track in this experiment?

    _____

12. Measure and record the mass of the glider in g _____ and in kg _____.
13. Use Newton's Second Law to calculate the net force on the glider.

14. Which of the forces you listed in #10 provides the net force you found in #13?