Detecting Acceleration

Objective: To learn what acceleration is and how to detect acceleration using a simple device.

Research:

- Speed: equals distance divided by time.
  - *EX- 10 kilometers per hour (10kmph). 6 miles per hour (6mph).*
- Velocity: speed in a particular direction.
  - *Ex-10 kilometers per hour north (10kmph N). 6 miles per hour south (6mph S).*

Research:

- Acceleration: the rate at which speed or velocity changes.
- Positive acceleration: velocity increases.
- Negative acceleration: velocity decreases (deceleration).

Research:

- Acceleration
- $\frac{\text{final velocity} - \text{starting velocity}}{\text{time it takes to change velocity}}$

or

$$\frac{\text{change in velocity}}{\text{time}}$$

Example

- Suppose you get on your bicycle and accelerate southward at a rate of 1m/s/s.
- This means that every second your velocity increases at a rate of _____.
- 1m/s.
- If your final velocity after 5 seconds is 5m/s, your acceleration can be calculated:
- $$\frac{5\text{m/s} - 0\text{m/s}}{5\text{s}} = 1\text{m/s/s}$$

Research

- Accelerometer: device which is very sensitive. It shows acceleration only briefly.

Problems & Analysis

- A plane passes over Point A with a velocity of 8,000 m/s North. Forty seconds later it passes over Point B with a velocity of 10,000 m/s North. What is the plane's acceleration from A to B?
- A coconut falls from the top of a tree and reaches a velocity of 19.6 m/s Down when it hits the ground. It takes two seconds to reach the ground. What is the coconuts acceleration?

Problems & Analysis

- When you push the accelerometer at constant speed, why does the cork quickly swing back after it shows you the direction of acceleration?
- You are watching a car that is waiting at a stoplight. A passenger in the car is holding helium balloons. What do you think will happen to the balloons when the car accelerates?

Procedure I

1. Turn the bottle upside down and place the cap on the table top. Notice that the cork floats straight up in the water.
2. Gently start pushing the accelerometer across the table at a constant speed. Notice that the cork quickly moves in the direction you are pushing, then swings backward. If you did not see this happen, try again until you see the first movement of the cork.

Procedure II

3. Once you are familiar with how to use the accelerometer, try the following changes in motion and record your observations of the cork's first motion.

   A) While moving the accelerometer across the table, push a little faster.

   B) While moving the accelerometer across the table, slow down.

   C) While moving the accelerometer across the table, change the direction that you are pushing. Try both left and right.

Procedure III

3. D) make any other changes in motion you can think of. You should only change one part of the motion at a time.