

PHYSICS

LAB – Centripetal Acceleration (CBL)

Purpose:

To observe the centripetal acceleration of an object in uniform circular motion. Relate the changes in velocity and radius to the centripetal acceleration.

Materials:

TI-83

Metronome

CBL

Triple beam balance

25g accelerometer

Masking tape

Stopwatch

Procedure:

1. Connect the 25g accelerometer to the CBL and TI-83.
2. Access the PHYSICS program in the TI-83 and set-up to monitor the input of the accelerometer.
3. Determine your starting radius for the first trial and mark it off on the accelerometer wire (measure from the center of the accelerometer).
4. Establish a reasonable period of revolution with the metronome.
5. Swing the accelerometer overhead at the established radius and period. When the readout on the CBL is stable record the centripetal acceleration.
6. Using the same radius and period, use the stopwatch to time how long it takes for 10 revolutions. Calculate the time for 1 revolution.
7. Using the radius, calculate the circumference of the circular path (see Ref. Table).
8. Calculate the velocity of the accelerometer.
9. Calculate the centripetal acceleration of the accelerometer using the radius and the velocity you just calculated.
10. Calculate the percent deviation between the value you recorded and the value taken from the CBL.
11. Repeat steps 3 – 10 using a different radius.
12. Repeat steps 3 – 10 using the initial radius and a different velocity (period).
13. Find the mass of the accelerometer and calculate the centripetal force for each trial.

Discussion Questions:

1. How did your calculated values of centripetal acceleration compare to those recorded from the CBL?
2. What is the relationship between radius and centripetal acceleration?
3. What is the relationship between velocity and centripetal acceleration?