

## EXPERIMENT #5 - PHYSICS 30

### Centripetal Force

OBJECT: To study uniform circular motion and centripetal force.

EQUIPMENT: PSSC centripetal force kit  
Cenco centripetal force apparatus  
Timing device

THEORY: Refer to Chapters 4 and 6 of Resnick and Halliday

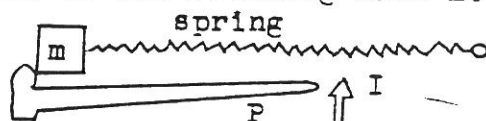
#### GENERAL DIRECTIONS:

##### A. PSSC apparatus:

1. Examine the contents of the PSSC centripetal force kit and determine its principle of operation.
2. By using this equipment and a clock roughly measure the angular speed, radius, and mass and calculate the centripetal force. Compare this value to the vertically suspended weight. Explain why this simple device may not give very accurate results.

##### B. Cenco apparatus:

1. Examine the Cenco centripetal force apparatus and determine its principle of operation.
2. By means of the threaded collar, adjust the spring to nearly minimum tension. Be sure that the set screw which secures the apparatus to the rotating spindle is tight and that the rotating spindle is vertical and its set screw holding it in this position is tight. Set the friction wheel near the center of the driving disk and release the driving disk so that it presses against the friction wheel. (note: Some of the motors do not have a friction wheel and the motor speed is controlled by a knob at one end of the motor.)
3. Start the motor. With the eyes on a level with the index I (see diagram below) adjust the speed control until the pointer P is just opposite the index. When the pointer is oscillating with a small motion with the index as its mean position, then the centripetal force is approximately equal to the spring force at a defined radial position of the rotating mass m.



4. Using a clock or watch, the revolution counter, and the procedure just outlined determine the angular speed of the rotating apparatus when the centripetal force acting on the mass m is equal to the force due to the spring.
5. When the apparatus is not rotating, measure the radial distance to the position of the center of mass m when the pointer P was oscillating about the index I.

6. The force due to the tension in the spring may be found by removing the rotating apparatus, suspending it properly, and attaching known weights to the system until the spring stretches an appropriate distance.
7. From the experimental data determine the value of the centripetal force by considering the tension of the spring. Compare this value to the value obtained by using the theoretical equation for centripetal force and the experimental values of radius, mass, and angular speed.
8. Repeat this experiment for two other values of spring tension.
9. Explain why there may be any experimental error.