Circular Motion

Book Chapter: 7, 8
Book Pages: 185-212, 221-222, 236-238
Practice Problems: pp214-216: 4, 6, 16, 30; pp244-250: 2, 46
Terms/ Ideas:
Centripetal Acceleration
Frequency
Hertz
Angular velocity
Centripetal force
Angular acceleration
Torque
Angular momentum
Period
Harmonic Motion
Centripetal Force
Centrifugal Force

Equations:

$$T = \frac{2\pi r}{v}$$

$$a = \frac{v^2}{r}$$

$$a = \frac{4\pi^2 r}{T2}$$

$$T = 2\pi\sqrt{\frac{l}{g}}$$

$$f_c = ma = \frac{mv^2}{r}$$

$$f = \frac{1}{t}(\,frequency)$$

$$\omega = \frac{v}{r} = 2\pi f$$

$$a = \alpha r$$

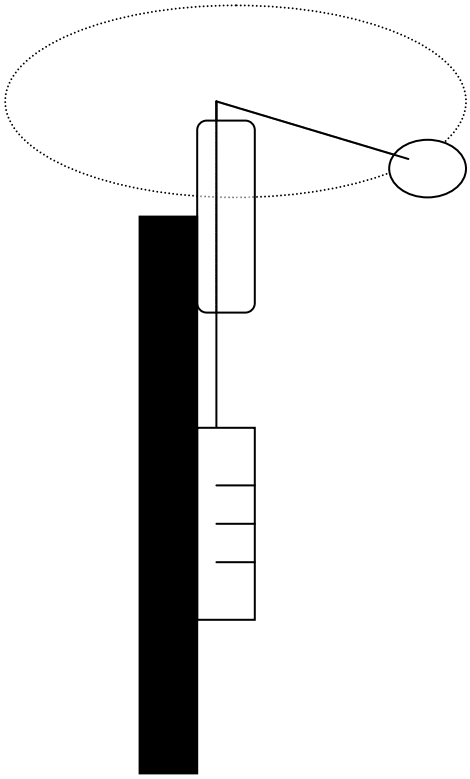
$$\tau = I\alpha$$

$$KE = \frac{1}{2}I\omega^2$$

$$F = -kx(Hooke'sLaw)$$

Free Response Question:

To study circular motion, two students use the below apparatus, which consists of a spring scale attached to a solid rod. A polished glass tube attached to the top serves as a guide for a light cord attached to the spring scale.



A ball of mass .200 Kg is attached to the cord. One student swings the ball around at constant speed in a horizontal circle with radius .500 m. Assume friction is negligible.

1) Explain how the students, by using a timer and the above information, can determine the speed of the revolving ball.

2) How much work is done by the cord in one revolution?

3) The speed of the ball is found to be 3.7 m/s. Assuming that the cord is perfectly horizontal while it swings, calculate the expected tension in the cord.

4) The actual tension in the cord is found to be 5.8 N as measured by the scale. What is the percentage difference between the measured and calculated values?