Physics 3204
Core Lab #2: Centripetal Force and Centripetal Acceleration

Pre- Lab Questions:

1   Define uniform circular motion.

2   A boy ties a rock to a 2.0 m string and holding it at the very end whirls it around himself horizontally. The rock completes 10 revolutions in 30.0 s. What is the speed of the rock?

3   Define centripetal acceleration.

4   Define centripetal force.

5   What is the direction of the centripetal force that acts on the rock that is moving in a horizontal circle when attached to the string?

6   Determine the acceleration of a car that travels around a curved road which has a radius of 225m. The speed of the car is a constant 26.0 m/s.

7   An object completes 10 cycles in 20 s. What is its period?

8   An object completes 10 cycles in 20 s. What is its frequency?

9   Calculate the gravitational force for a 50 g mass.

Purpose: To determine the relationship between centripetal force(centripetal acceleration) and radius, period and frequency.

Materials: Rubber lab stopper   standard mass set
                 1.5 metres of fishing line or thread   metre stick
                 stopwatch   safety goggles
                 graph paper   markers(assorted colours)
                 glass tube(wrapped with masking tape to prevent damage),

Procedure: See text book, Physics Concepts and Connections, page 228-229, for parts A and B.

Data:

Table 1: Centripetal Force and Period (with changing mass, constant radius)

Mass(g)	Gravitational Force(N)	Centripetal Force(N)	No. of Rotations	Time(s)	Period(s)	Frequency (Hz)
50			10			
100			10			
150			10			
200			10			
250			10			
300			10			

Table 2: Centripetal Force and Radius: (with constant mass, changing radius)

Mass(g)	Fg(N)	Fc(N)	Radius(m)	No. of rotations	Time(s)	Frequency (Hz)	Frequency^2 (Hz)^2
200				10			
200				10			
200				10			
200				10			

Analysis:

1. Plot a graph of centripetal force versus period.

2. What does the graph indicate about the relationship between period and centripetal force?

3. Plot a graph of centripetal force versus frequency.

4. What does the graph indicate about the relationship between centripetal force and frequency?

5. Plot a graph of centripetal force vs. frequency squared. Use table #2. See instructions #1,#2 and #3 on pages 229 and 230 for detailed instructions for drawing and using the graph. Read carefully.

6.   Use the graph of centripetal force versus frequency squared to determine the values of centripetal force at different radii. Record the values in the chart below.

Radius (m)	Centripetal Force (N)

7.   Plot a graph of centripetal force versus radius for a constant f^2 with centripetal force as the dependent variable.

8.   What is the relationship between centripetal force and radius?

9.   Write a proportionality statement and the equation describing the relationship between centripetal force and the variables of frequency, period and radius.

Variable	Proportionality Statement	Equation
Frequency		
Period		
Radius		