Ver. 2.1

☐ **PHYS1050/** ☐ **PHYS1250**
Ref. (Staff Use)_____

Laboratory Worksheet
Experiment NE01- Centripetal Force
Department of Physics
The University of Hong Kong

Name**:** _____ Student ID**:** _____ Date: _____

Experiment 1: Centripetal force and linear velocity

Table 1.1 Data of apparatus

Position of free mass holder, r (mm)	
Position of fixed mass holder, r (mm)	

Table 1.2 Fitting parameter

For "Force vs Linear Velocity" curves:

	Masses of free mass holder and fixed mass holder			
	15g	20g	25g	30g
Fitting parameter $f(x) = Ax^2 + Bx + C$	Values	Values	Values	Values
A				
B				
C				
Mean Squared Error				
Root MSE				

Experiment 2: Centripetal force and angular velocity

Table 2.1 Data of apparatus

Mass of free mass holder, M (g)	
Mass of fixed mass holder, M (g)	

Table 2.2 Fitting parameter
For "Force vs Angular Velocity" curves:

	Positions of free mass holder and fixed mass holder		
	80m	**90mm**	**100mm**
Fitting parameter $f(x) = Ax^2 + Bx + C$	**Values**	**Values**	**Values**
A			
B			
C			
Mean Squared Error			
Root MSE			

Experiment 3: Centripetal force and mass

Table 3.1 Data of apparatus

Position of free mass holder, r (mm)	
Position of fixed mass holder, r (mm)	

Table 3.2 Mass vs. mean value of force

Mass (g)	Mass (kg)	Mean value of force (N)
5		
10		
15		
20		
25		
30		
35		

Table 3.3 Fitting parameter
For "Force vs. mass" curves:

Selected curve fitting is :	Values
Parameter value:	
Parameter value:	
Parameter value:	
Mean Squared Error	
Root MSE	

Discussion Questions:

Experiment 1: Centripetal force and linear velocity

1. According to theory, what is the relation between centripetal force and linear velocity, linear or quadratic? Using the rotation speed and radius you used in Experiment 1, derive theoretically the mathematical expression with the proportionality constants calculated explicitly. (Hint: It is okay to just use one set of mass and rotation speed to find the relation between centripetal force and linear speed.)

2. What are the major causes of errors making the discrepancies between the actual fitting and your expected fitting in Question 1?

Experiment 2: Centripetal force and angular velocity

3. According to theory, what is the relation between centripetal force and angular velocity, linear or quadratic? Using the rotation speed and radius you used in Experiment 2, derive theoretically the mathematical expression with the proportionality constants calculated explicitly. (Hint: It is okay to just use one set of mass and rotation speed to find the relation between centripetal force and linear speed.)

Experiment 3: Centripetal force and mass

4. In Experiment III, did the velocity stay constant? Why?

    _____

    _____

    _____

5. The maximum possible radius of the rotating arm is 110 mm, would it be better to use this value in the experiment? Why?

    _____

    _____

<u>References:</u>

PASCO scientific. (n.d.). 012-08478B *Centripetal Force Manual*. Roseville, CA, USA: PASCO scienfitic.