Date of Lab_____ Date of Submission_____

Laboratory Report

Title Moment of Inertia and Rotational Motion

Homeroom	Section	Name	
120			Nagisa Shionoya

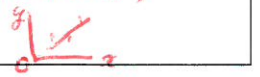
Lab Partners _____ _____

Summary
To understand the moment of inertia and rotational motion, we measured the acceleration of a weight which is ~~dropped from second floor~~ falling and ~~connected to the~~ string ~~which is~~ connected with a disk by a string. We changed the radius of the disk and the mass of weight, and see how they affect on the acceleration ~~change~~. As a result, the acceleration increases as these factors increase, and this is consistent with theoretically. Therefore, our lab was successful, and this makes my understanding about moment of Inertia & Rotational motion much deeper.

· Meet a deadline · Write logically · Write clearly · Write with your own words

Teacher's Comments

when you want to show that two variables are "proportional", your graph must include an origin.



1	2	3	4	5	6	7	8	9
Due	Summary	Intro.	Method.	Results	Table/Fig.	Discussion	Clearness	General
+					+++		+	++

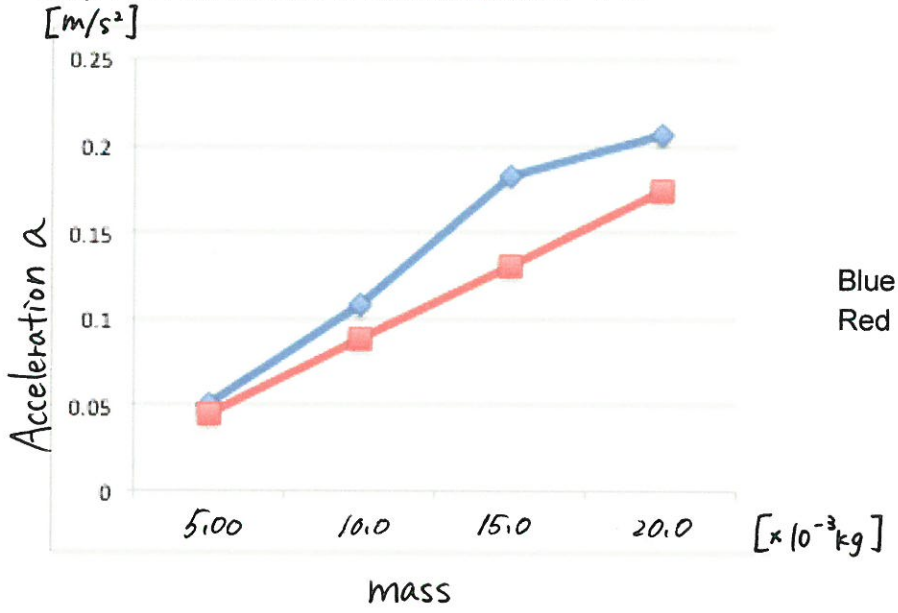
* Use this form as a cover sheet.
* Submit your reports by the seventh day after your lab.

Results

Table 1 : General Experiment Data

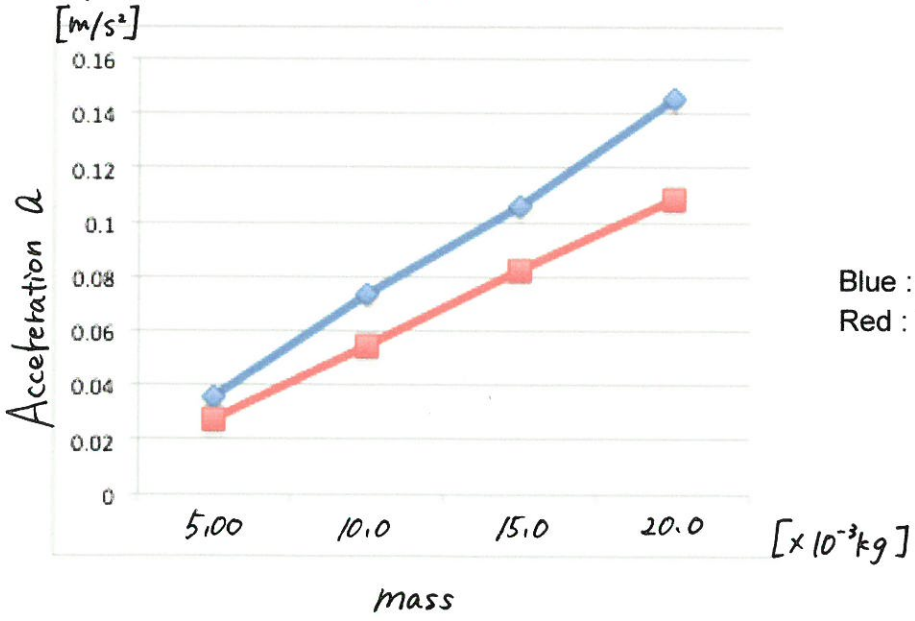
Experiment #		1	2	3	4	5	6	7	8	9	10	11	12
Radius of Hub	[x10^-2 m]	2.58	2.58	2.58	2.58	2.04	2.04	2.04	2.04	1.51	1.51	1.51	1.51
Distance	[m]	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17
Weight	[x10^-3 kg]	5.00	10.0	15.0	20.0	5.00	10.0	15.0	20.0	5.00	10.0	15.0	20.0
Observed Time	[s]	12.8	8.78	6.75	6.37	15.2	10.6	8.88	7.57	19.2	13.5	11.9	9.59
Observed Acceleration	[m/s^2]	0.0505	0.108	0.183	0.206	0.0359	0.0738	0.106	0.146	0.0226	0.0460	0.0589	0.0907
Theoretical Acceleration	[m/s^2]	0.044	0.0877	0.131	0.174	0.0276	0.0550	0.0823	0.109	0.0151	0.0302	0.0452	0.0602

Graph 1 : ~~Acceleration of~~ Radius 2.58x10^-2 m



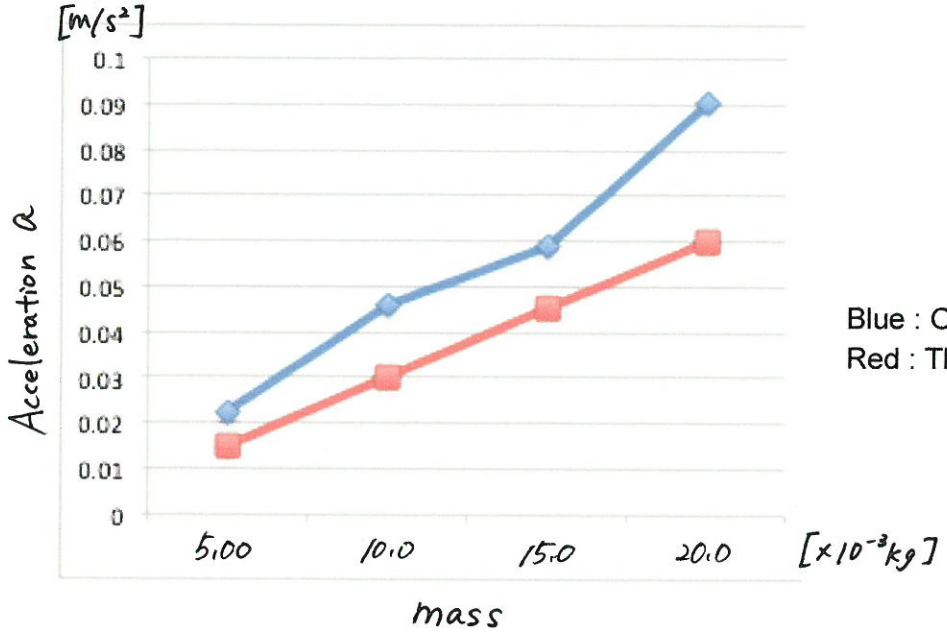
Blue : Observed Acceleration
Red : Theoretical Acceleration

Graph 2 : Acceleration of Radius 2.04x10^-2 m



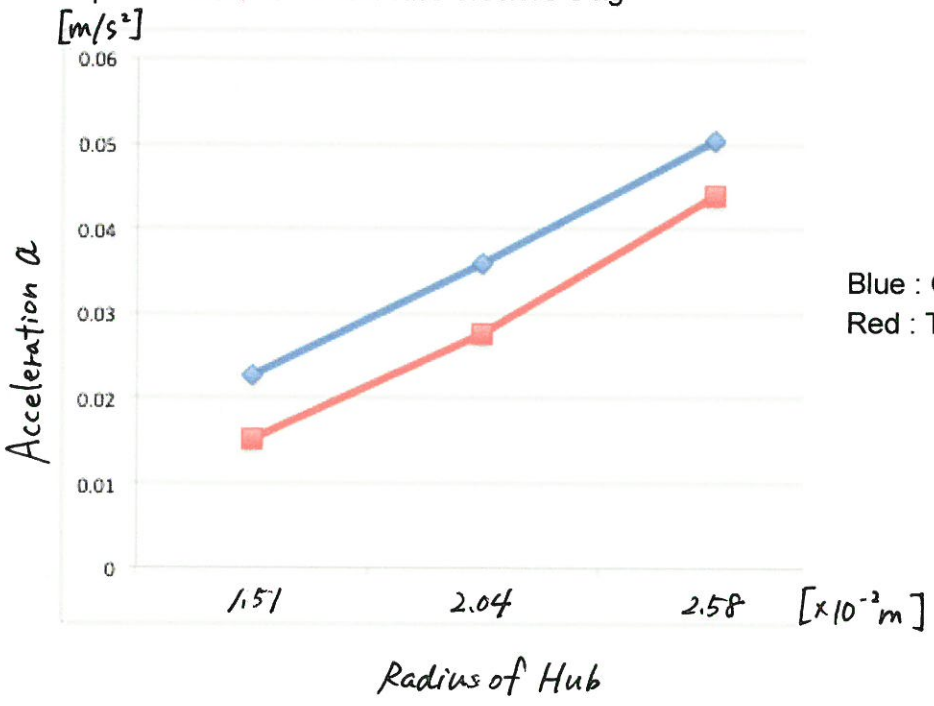
Blue : Observed Acceleration
Red : Theoretical Acceleration

Graph 3 : Acceleration of Radius 1.51x10^-2 m



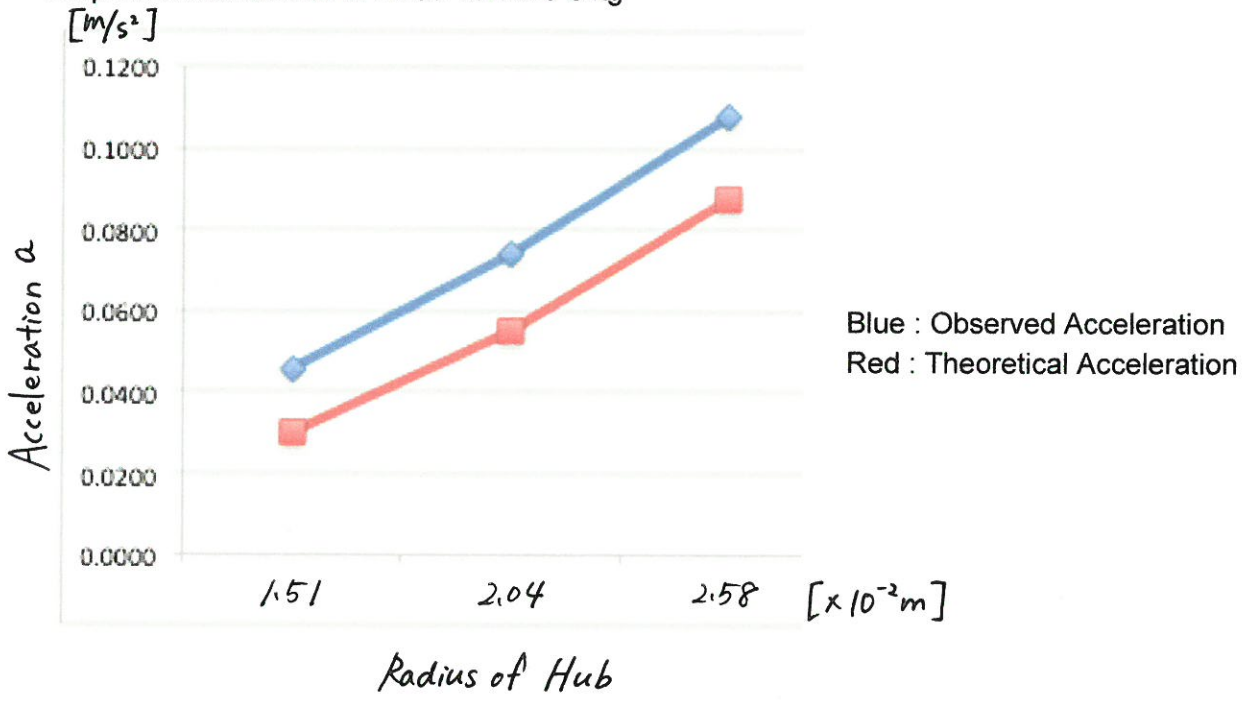
Blue : Observed Acceleration
Red : Theoretical Acceleration

Graph 4 : Acceleration of Mass 5.00x10-3 kg



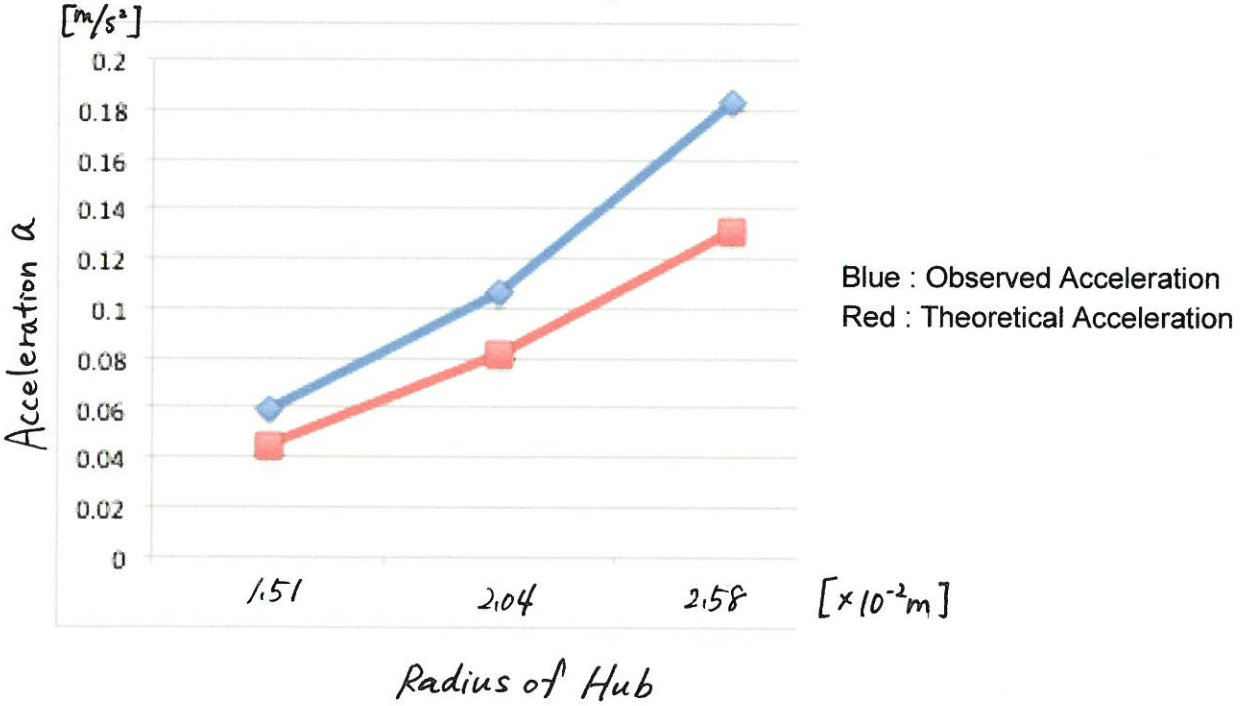
Blue : Observed Acceleration
Red : Theoretical Acceleration

Graph 5 : Acceleration of Mass 10.0x10-3 kg



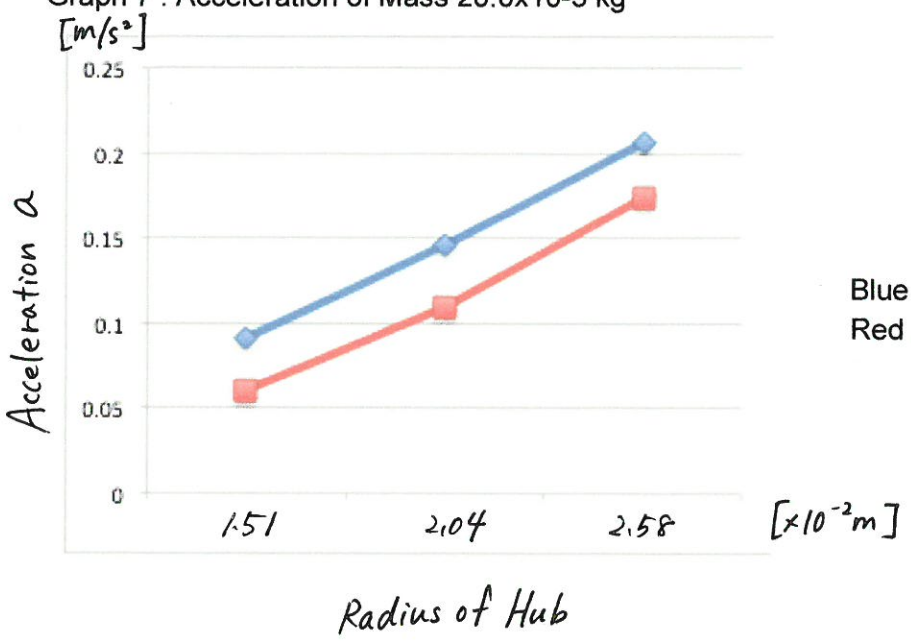
Blue : Observed Acceleration
Red : Theoretical Acceleration

Graph 6 : Acceleration of Mass 15.0x10-3 kg



Blue : Observed Acceleration
Red : Theoretical Acceleration

Graph 7 : Acceleration of Mass 20.0x10-3 kg

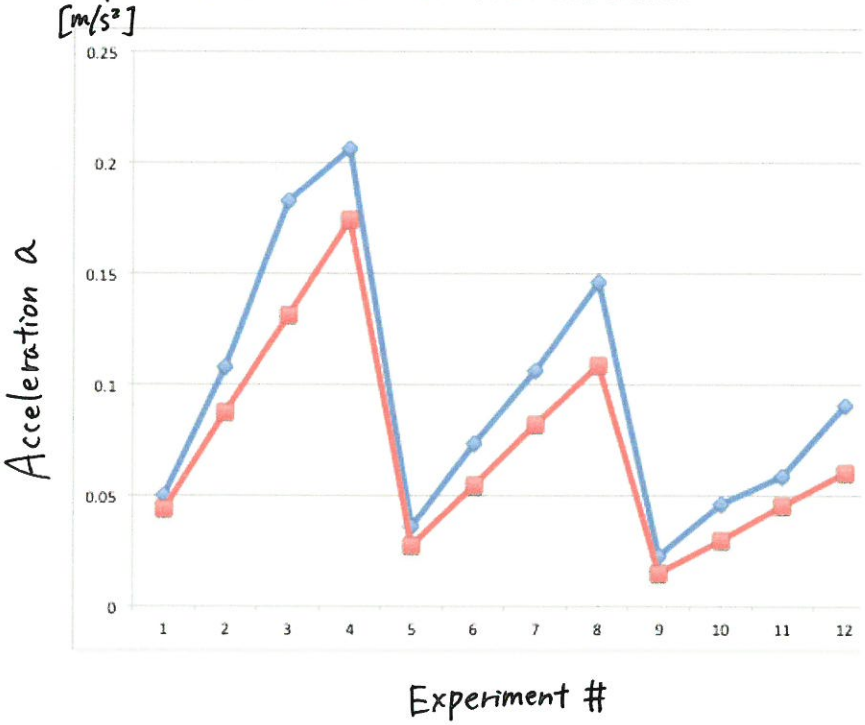


Blue : Observed Acceleration
Red : Theoretical Acceleration

Table 2 : Percentage Error of Acceleration

Observed Acceleration	[m/s^2]	0.0505	0.108	0.163	0.206	0.0359	0.0738	0.106	0.146	0.0226	0.0460	0.0589	0.0907
Theoretical Acceleration	[m/s^2]	0.044	0.0677	0.131	0.174	0.0276	0.0550	0.0823	0.109	0.0151	0.0302	0.0452	0.0602
Persentage Error	(%)	14.8	23.1	39.7	18.4	30.1	34.2	28.8	33.9	49.7	52.3	30.3	50.7

Graph 8 : Observed and Theoretical Acceleration



Blue :
Observed Acceleration

Red :
Theoretical Acceleration

Discussion

As you can see from Graph 1-3, acceleration increases as mass increases. This is because

$\tau = I\alpha$

$I = \frac{1}{2} MR^2$

$T = m(a+g)$

$\alpha = a/r$

$\tau = -Tr$

$a = -g / (1 + (I/mr^2))$

From this formula, $a = -g / (1 + (I/mr^2))$, if "m" increases, "a" increases naturally. Also, you can know that acceleration and radius are almost proportional to each other from graph 4-7. These graphs shows that acceleration increasing with radius of hub increasing. This can also prove theoretically. From same equation, $a = -g / (1 + (I/mr^2))$, when radius, r, increases, acceleration, a, must increases. Therefore, acceleration increases by increase of mass and increase of radius of hub.

In addition, from Table 2 and Graph 8, you can see that a lot of error is produced. I think this is because radius of hub is changed by thickness of string; there are a few errors in measuring time due to the sound of velocity; and air resistance might cause the difference between observed and theoretical value. They cause such a huge error in experimental values.