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Date	25.09.2024.
Lab session (Day & time)	26.09.2024, 09:00 - 10:50
Lab partner	ZHU, Mingyuan

M3 Centripetal Force Lab Report

A. Answer the following questions BEFORE the lab session (6 pts each)

1. Using words and a mathematical expression to describe the relationship between the centripetal force and angular velocity in uniform circular motion.

The centripetal force is proportional to the square of angular velocity: $F = m \cdot R \cdot \omega^2 \sim \omega^2$

(m: mass of body; R: radius of circle)

2. In Part I of the experiment, you are asked to plot the logarithm of the measured centripetal force as a function of the logarithm of the angular velocity in linear scales. What should the curve look like? If a linear function is used to fit the data, what is the meaning of the fitted slope?

$F = A \cdot \omega^2 \Rightarrow \ln F = \ln A + 2 \ln \omega$ — linear in $\ln \omega$.

The curve should be a straight line, the slope represents the exponent of ω in the proportion $F \sim \omega^{\alpha}$, and normally α should be 2.

3. Using words and a mathematical expression to describe the relationship between the centripetal force and radius in uniform circular motion.

$F = mR\omega^2 \sim R$ — centripetal force is proportional to radius, provided that angular velocity is constant.

4. In Part II of the experiment, you are asked to plot the measured centripetal force as a function of radius in linear scales. What should the curve look like? If a linear function is used to fit the data, what are the expected values of the intercept and slope?

The curve should be a straight line.

$F = m \cdot \omega^2 \cdot R$ — the intercept should be 0, and

slope $= m\omega^2$