# Simple Pendulum

Name_____ ID_____ TA_____

Partners_____

Date_____ Section_____

**Please exercise caution so that the swinging weight does not hit people and the photo gate.**

**1. Amplitude dependence of the period**
[Fixed mass = 0.05 kg (50 g)] [The length $\ell$ must be at least 1.0 m to have enough amplitude.]

| # | Amplitude (°) | Period (s) |
|---|---|---|
| 1 | 2° | |
| 2 | 4° | |
| 3 | 6° | |
| 4 | 8° | |
| 5 | 10° | |

**Question 1:** Does the period, $T$, of a simple pendulum depend on its amplitude of motion?

**2. Mass dependence of the period** [Fixed amplitude = 5°] [Fixed length (*See the note.*)]
*Please be prepared to catch the hanging weight especially when you use a large mass.*

| # | Mass (kg) | Period (s) |
|---|---|---|
| 1 | 0.02 kg | |
| 2 | 0.05 kg | |
| 3 | 0.10 kg | |
| 4 | 0.20 kg | |
| 5 | 0.50 kg | |
| 6 | 1.00 kg | |

**Question 2:** Does the period of a simple pendulum depend upon the mass, $M$ ?

**3. Length dependence of the period** [Fixed mass = 0.10 kg, Fixed amplitude = 10°]

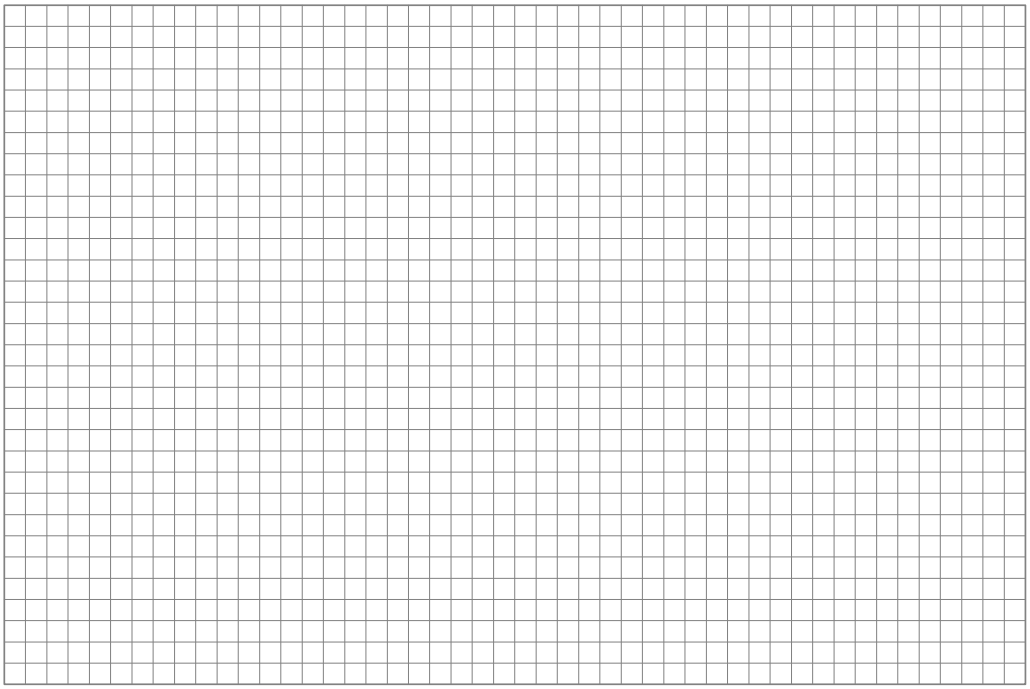
| # | Length $\ell$ (m) The increment or decrement must be at least 0.1 m. | Period $T$ (s) | $\frac{\lvert T-2\pi\sqrt{\ell/g}\rvert}{T}\times 100$ fractional % error | | $\frac{T}{\sqrt{\ell/g}}$ |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |

**Question 3:** Does the period of a simple pendulum depend upon its length?

**Question 4:** Deduce whether accuracy is improved by choosing longer or shorter value of $\ell$?

**Question 5:** What is the last column in the above table? [Hint: 2 × a famous constant]

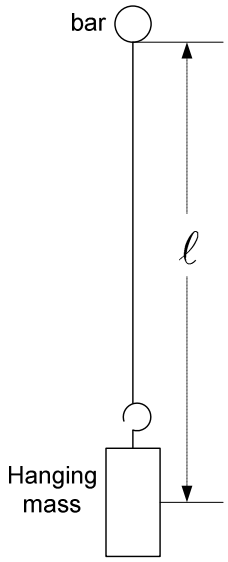
**4. Plotting data [T** (y-axis) **vs.** $\ell$ (x-axis)**]**



**Question 6:** Do you obtain a proper plotting for T vs. $\ell$? How does T depend upon $\ell$?

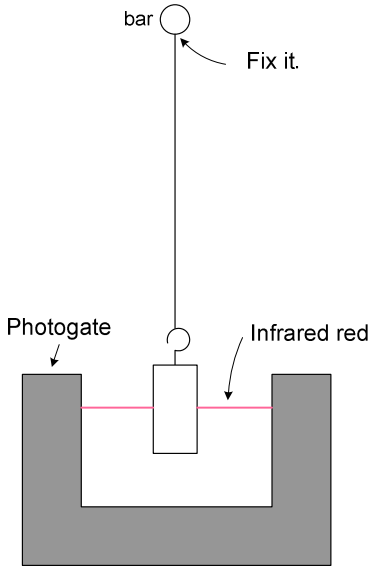
# Notes for Simple Pendulum

## 1. Through this experiment




⇐ The length, $\ell$, should be taken from the end of the bar to middle of the hanging mass.

Before swinging, make sure that the infrared red is placed middle of the hanging mass. (You cannot see the light, but you can see where it comes from.) ⇒




For the second part, you have to keep the same length even though you changed hanging masses as shown. ⇒