3. Practice

3.1 Study of distance variations as a function of time

Set up the experimental setup for Figure 2:

- m1: trolley with overload.
- m2: weights.
- B.O.1: Optical barrier.
- B.O.2: Optical barrier.
- Weigh the mass of trolley m1 and then add a 100g mass.
- Place a 55g mass on the mass port such that m2 = 60g.
- Place the small rod on the trolley and measure its width.
- Initially position the optical barrier at a specific location.
- Start the air blower.
- Set the stopwatch to zero and release the motion.
- Take two measurements.
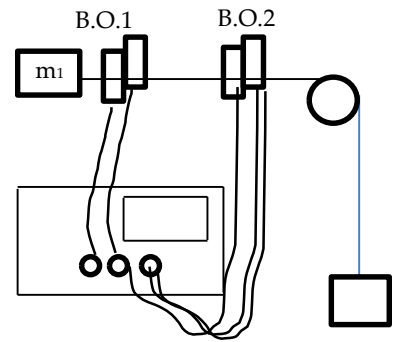- Choose a new step distance of 10 cm and repeat the previous steps.

Table 1

$S = S_f - S_0 (cm)$	30	40	50	60	70
t_1					
t_2					
t_{moy}					
t^2_{moy}					
γ					
g					
Δg					

Questions

1. Fill in Table 1.
2. Plot the curve $S = f(t^2)$ (figure below). Then deduce the value of g_{exp}

   ………
   ……

3. Deduce from the table the value of g for the city of M'sila and express it as $g_{exp} = \bar{g} \pm \Delta g$

   ………
   ……

4. What short or long distances do you use to obtain the best value of g_{exp}

   ?………
   ………………………………………………………………..

3.2 Relationship between acceleration and force

We study the relationship between the acceleration of the system and the accelerating force (F), while keeping the total mass m1 + m2 of the system constant. We take the acceleration due to gravity g_{exp} from the first part.

- To vary F, we remove mass from one side and add it to the other.
- Fix the optical barriers at long distances.
- Record in Table 2 the respective values of the passage times« δ_t » for the rod of width $\delta x = 5mm$ .Repeat the operation a second time.
- Return the trolley to the initial position and set the stopwatch so that it indicates the time t it takes to pass through each optical barrier. Repeat the operation a second time.

Questions

1. Fill in Table 2.
2. What do you observe about the ratio F/γ ?

……………………………………………………………………………………………………
……………………………………………………………………………………………………

3. Plot the variation of « F » with « γ » (figure below).
4. What does the slope represent? Compare it to the ratio« F/γ »?

……………………………………………………………………………………………………
……………………………………………………………………………………………………

Table 2

m$_2$(g)	5	10	20	30	40
m$_1$					
[m$_1$+m$_2$](g)	305	305	305	305	305
$F = m_2\bar{g}(N)$					
$t_1(s)$					
$t_2(s)$					
$\delta t_1(s)$					
$\delta t_2(s)$					
$v_1 = \delta x/\delta t_1\ (m/s)$					
$v_1 = \delta x/\delta t_2\ (m/s)$					
$\gamma = v_2-v_1/t_2-t_1$					
F/γ					

Conclusion

……
……
……
……
……
……
……
……………………………………………………………………………………………