

General Physics Laboratory I

Week 02: Report Guideline

Experiment 1. Projectile Motion

2. Newton's 2nd Law

TA: Danho Ahn (danho.ahn@kaist.ac.kr)

General Report Guideline

1. You can use either Korean or English.
2. I suggest you to write a report with a language with which you can write rigorously. (There is no need to be shy about writing in Korean)
3. However, do not mix two languages. (ex: newton's law는 다음과 같이... → X)
4. No more than 5 pages. The font size must be greater than 9 pts.
5. Only *.doc, *.docx, *.hwp extensions are allowed.
6. Do not make a cover page.
7. Do not repeat the details in the manual.
8. Make the report simple but it should contain rigorous answers.
9. If you suggest the origin of the error, please show your quantitative justification. (No quantitative explanation → No points)
10. You have to cite every source of theory and information beyond the manual.
11. Clarify a theme and a purpose of each part.

1. Projectile Motion

1. Abstract (5pts, < 300 words)
2. Introduction (10pts): Show your conceptual understanding about the subject.
3. Theoretical Background (10pts)
 - ✓ (5pts) Explain **constant velocity** and **constant acceleration** motions. Give the **general equation of the x-t graph** in 1D.
 - ✓ (5pts) Explain the **2D projectile motion**. Give the **general equation of the y-x graph** in 2D and the **horizontal distance R**.
4. Methods (5pts)
5. Results (20pts)
 - ✓ (5pts) **Plot x-t, y-t graphs** for each trial(30, 45, 60 degrees).
 - ✓ (5pts) **Plot $v_x(t)$, $v_y(t)$, $a_y(t)$** for each trial(30, 45, 60 degrees).
 - ✓ (5pts) **Plot y-x graphs** for each trial(30, 45, 60 degrees).
 - ✓ (5pts) **Find horizontal distance R(x-distance until the projectile returns to its initial height)** for each trials(30, 45, 60 degrees).
 - ✓ Each graph should include **the axis labels** and **the trend-line(with R-square value)**.
6. Discussion (30pts)
 - ✓ (5pts) Is the magnitude of initial velocity $|v|$ is same for every trial? (5pts) How much is the error? Where does the errors come from?
 - ✓ (5pts) What is the expected launch angle θ for the maximum horizontal reach? (5pts) Are the results consistent with your expectation?
 - ✓ (5pts) Calculate $U = mgh$, $K = mv^2/2$, $E = U + K$ for each trials. (5pts) Plot energy(E , U , K) vs time graph and discuss about the energy conservation.
 - ✓ (Additional) Discuss about your own question and analysis.
7. Conclusion (10pts): Summarize the report effectively.
8. References (10pts)

2. Newton's 2nd Law

1. Abstract (5pts, < 300 words)
2. Introduction (10pts): Show your conceptual understanding about the subject.
3. Theoretical Background (10pts)
 - ✓ (5pts) **Explain a gravitational force** on a surface of the earth and **justify it using 'projectile motion' data and Newton's 2nd law.**
 - ✓ (5pts) **Describe the experimental situation** using Newton's 2nd law and various forces.
4. Methods (5pts)
5. Results (20pts)
 - ✓ (5pts) **Plot x-t graphs** for each measurement.
 - ✓ (5pts) **Find acceleration** for each measurement.
 - ✓ (5pts) **Calculate the force using Newton's 2nd law ($F_N = Ma$) and gravitational force formula ($F_g = mg$).**
 - ✓ (5pts) **Plot measured force F_m vs calculated forces (F_N, F_g) graph.**
 - ✓ Each graph should include **the axis labels** and **the trend-line (with R-square value)**.
6. Discussion (30pts)
 - ✓ (5pts) What is a meaning of the slopes of the F_N - F_m and F_g - F_m graphs. (5pts) Do the results support Newton's 2nd law?
 - ✓ (5pts) What is a meaning of the vertical intercept of the F_N - F_m and F_g - F_m graphs. (5pts) Do the results support Newton's 2nd law?
 - ✓ (5pts) Can friction explain the the F_N - F_m and F_g - F_m graphs? (5pts) Discuss about a static friction and a kinetic friction using data.
 - ✓ (Additional) Discuss about your own question and analysis.
7. Conclusion (10pts): Summarize the report effectively.
8. References (10pts)