大學普通物理實驗課程報告撰寫應注意事項

提供學生撰寫實驗報告時參考

一、基本格式與結構

1. **封面：含**
   (1) 實驗名稱
   (2) 課程名稱與代號
   (3) 學生姓名、學號與組別
   (4) 指導教師姓名
   (5) 實驗日期與繳交日期
2. **內容架構**
   (1) **摘要 (Abstract)**：簡述實驗目的、方法、主要結果與結論（150–200 字為宜）。
   (2) **實驗目的 (Purpose)**：清楚闡明欲驗證或探討的物理原理。
   (3) **實驗原理 (Theory/Background)**：以文字與必要公式說明相關物理定律或模型，並點出與本實驗的關聯。
   (4) **實驗方法與步驟 (Method/Procedure)**：敘述實驗裝置、器材與步驟，可配合示意圖，但避免逐字照抄講義。
   (5) **實驗結果 (Results)**：
      (a) 數據表格（需含單位與標題）
      (b) 圖表（曲線圖、直方圖等，需有標題、座標軸名稱及單位）
      (c) 計算過程（含誤差分析）
   (6) **討論 (Discussion)**：
      (a) 與理論值比較，分析差異
      (b) 說明系統性誤差與隨機誤差來源
      (c) 提出可能改進方法與對物理意義的解釋
   (7) **結論 (Conclusion)**：簡要重申主要發現，並指出是否符合物理原理或驗證假設。
   (8) **參考文獻 (References)**：列出引用資料，應採用標準格式（如 APA、IEEE），不可僅寫「課本」或「網路」。

二、數據處理與圖表呈現

1. **單位與有效數字**
   (1) 每筆數據必須標注單位。
   (2) 有效數字應與儀器精度相符。
2. **表格**
   (1) 上方必須有編號（如 Table 1、Table 2…）與標題。
   (2) 表頭需標明物理量名稱與單位。

3. **圖形**
   (1) 坐標軸必須清楚標示物理量名稱與單位。
   (2) 需加上擬合曲線與誤差棒（若適用）。
   (3) 圖片下方需有編號（如 Fig. 1、Fig. 2…）與圖說。

三、文字撰寫要點

1. **保持客觀**：避免「我覺得」「應該是」等主觀語氣，應以科學語言描述。
2. **內容完整**：不可僅繳交數據表，需有計算、圖表與討論。
3. **文字簡潔**：避免贅詞，內容需有邏輯順序。
4. **避免抄襲**：討論部分應展現個人理解，勿僅複製講義或網路資料。

四、誤差與討論

1. **誤差分析**：須明確指出誤差來源，如儀器精度、人為操作、環境因素。
2. **數據可信度**：比較理論值與實驗值，分析差異並解釋原因。
3. **改進方法**：提出具體改善方案，而非空泛的「多小心」。

五、常見錯誤提醒

1. **缺少單位**：若無單位，數據將失去科學意義。
2. **圖表不完整**：未標軸名稱、未附標題。
3. **結論空泛**：僅寫「符合預期」不足，應指出具體符合或不符合之處。
4. **討論不足**：不可僅寫「因為誤差」，應區分系統性與隨機性誤差並分析。
5. **照抄講義**：原理與方法應以自己的理解與文字呈現。

六、加分建議

1. 在討論部分延伸應用，連結至日常生活或相關科技。
2. 善用電腦工具（Excel、Python、Origin）繪圖與數據擬合，使結果更專業。
3. 結論可點出實驗設計的限制與未來改進方向。

Guidelines for Writing a General Physics Laboratory Report

I. Basic Format and Structure

1. **Cover Page**
   (1) Experiment title
   (2) Course name and code
   (3) Student's name, ID number, and group number
   (4) Instructor's name
   (5) Date of experiment and date of submission
2. **Content Sections**
   (1) **Abstract**: A concise summary of the experiment's objective, method, main results, and conclusion (about 150–200 words).
   (2) **Purpose**: Clearly state the physical principle or concept being verified or explored.
   (3) **Theory/Background**: Explain the relevant physical laws or models, including necessary equations, and discuss their connection to the experiment.
   (4) **Method/Procedure**: Describe the apparatus, materials, and procedure. Use diagrams where helpful, but avoid simply copying from the lab manual.
   (5) **Results**:
      a. Data tables (with units and titles)
      b. Graphs/figures (with titles, axis labels, units)
      c. Sample calculations, including error analysis
   (6) **Discussion**:
      a. Compare results with theoretical values and analyze discrepancies
      b. Identify sources of systematic and random error
      c. Interpret the physical meaning of the results and suggest improvements
   (7) **Conclusion**: Restate the key findings and clarify whether the experiment supports the theory or hypothesis.
   (8) **References**: Use a standard citation format (e.g., APA, IEEE). Do not list only "textbook" or "internet."

II. Data Handling and Presentation

1. **Units and Significant Figures**
   (1) Every value must include units.
   (2) Significant figures must match the precision of the measuring instrument.
2. **Tables**
   (1) Numbered (e.g., Table 1, Table 2…) with descriptive titles.
   (2) Column headers should include quantity names and units.
3. **Figures/Graphs**

(1) Axes must be clearly labeled with quantity names and units.

(2) Include best-fit lines/curves and error bars when appropriate.

(3) Numbered (e.g., Fig. 1, Fig. 2…) with captions.

III. Writing Style

1. **Objectivity**: Avoid subjective phrases such as “I think” or “it seems.” Use scientific and formal language.
2. **Completeness**: Reports must include data, calculations, figures, and discussion—not just raw tables.
3. **Clarity and Conciseness**: Avoid redundancy. Ensure logical flow between sections.
4. **Academic Integrity**: Do not copy text directly from the lab manual or online sources. The discussion should reflect your own understanding.

IV. Error Analysis and Discussion

1. **Error Sources**: Identify possible sources of error (instrument precision, human error, environmental factors).
2. **Reliability of Data**: Compare experimental and theoretical values, and explain discrepancies.
3. **Suggestions for Improvement**: Provide specific improvements, not vague comments such as “be more careful.”

V. Common Mistakes to Avoid

1. Missing units in data or calculations.
2. Incomplete tables or graphs (no titles, no axis labels).
3. Vague conclusions (e.g., “the results are as expected”).
4. Insufficient discussion (simply writing “due to error” is not acceptable).
5. Copying the lab manual instead of using your own words.

VI. Suggestions for Excellence

1. Extend the discussion to real-life applications or related technologies.
2. Use software tools (Excel, Python, Origin, etc.) for data analysis and plotting to enhance clarity and professionalism.
3. In the conclusion, highlight both the strengths and limitations of the experiment and suggest directions for improvement.