

## Rubric for the Experiment Write-Up

<p><b>Introduction:</b> Explain the physical variables to be studied and the goal.</p>	10
<p><b>Procedure:</b> Give enough description so that I could repeat your experimental method.</p>	10
<p><b>Diagrams:</b> Illustrate the procedures (hand-drawn pictures are fine). Each diagram needs a caption directly underneath. Each diagram must also be discussed in the main text of the report. Include:</p> <ul style="list-style-type: none"> <li>• Circuit diagram.</li> <li>• Ray diagram showing how you collimated (label the dimensions and the equipment).</li> <li>• Ray diagram showing how you observed the virtual image (label the dimensions and the equipment).</li> </ul>	10
<p>Justify your procedure. Show evidence that you thought about ways to minimize the uncertainty of your measurement.</p>	10
<p><b>Data tables:</b> Columns should be titled with the symbol of the variable and its unit. All data should be listed.</p>	10
<p><b>Graphs:</b></p> <ul style="list-style-type: none"> <li>• One (or more) graph showing current-voltage relationships for the LED.</li> <li>• One graph of photon energy vs frequency. Brackets are used to show uncertainty.</li> </ul> <p>Axes are labeled. Units are labeled.</p>	10
<p><b>Uncertainty analysis:</b> Document the standard uncertainty and how it propagates</p>	10
<p><b>Conclusion:</b> What value you find for Planck's constant, include your uncertainty.</p>	10
<p><b>General communication:</b> See below</p>	20

**Notes on general communication:**

- Make your paragraph structure and sentence structure easy to follow.
- Algebraic variables are defined the first time they are used.
- Algebraic variables are in italic. I need to tell the difference between *I* (current) and I (myself).
- Units are **not** in italic. I need to tell the different between 1 A (one ampere) and A (the area).
- All graphs/diagrams have helpful captions underneath.
- All tables have titles above.
- Each graph, diagram or table must be accompanied by a discussion in the main text.
- Equations are integrated into sentence of the main text (like you would find in a text book). For example

“Fractional uncertainties were added in using the rule

$$\frac{u(A)}{A} = \sqrt{\left(\frac{u(L)}{L}\right)^2 + \left(\frac{u(W)}{W}\right)^2}$$

where *A* is the area of the rectangle and *L* and *W* are the lengths of the two sides of the rectangle.”

- Continued on the next page...

## Tips for a professional lab write-up

Unprofessional or wrong	Professional	Comment
✗ The linear fit has $R^2 = 0.72$ and the inverse fit has $R^2 = 0.75$ , therefore, the inverse fit is correct.		$R^2$ is used for noisy data sets to verify that some correlation exists. It is not the best statistic for deciding which functional form is the best model.
✗ $h = 6 \times 10^{-34} \text{ J}\cdot\text{s} \pm 1 \times 10^{-34} \text{ J}\cdot\text{s}$	✓ $C = (6 \pm 1) \times 10^{-34} \text{ J}\cdot\text{s}$	The professional version is more compact, and easy to read at a glance.
✗ $\theta = 0.674740942 \pm 0.0106479$	✓ $\theta = 0.67 \pm 0.01$ or ✓ $\theta = 0.675 \pm 0.011$	Uncertainty is always rounded to 1 or 2 significant figures. Then the measured value stops at the same decimal place as the uncertainty.
✗ Wavelength= $d \cdot \sin(\theta)$	✓ $\lambda = d \sin \theta$	Notice the spaces around the equal sign. Italic is used for the symbolic variables. The sine function is not italic.
✗ VLED	✓ $V_{\text{LED}}$	Use subscript
✗ 1E12	✓ $10^{12}$	Use superscript. Never use E notation unless you're writing computer code.
✗ $4.11 * 10^{-19}$	✓ $4.11 \times 10^{-19}$	Use superscript.
✗ kiloOhm	✓ $k\Omega$	In Microsoft Word, you can use the font called "Symbol" to get Greek letters
✗ Voltage (v)	✓ Voltage (V)	Units are case sensitive.
✗ Graph with no axis labels		Graphs without axis labels have no meaning. The measured numbers need units. The variables need names. The named variables must be carefully defined in the text.