G483

Practical Skills in Physics 1

Evaluative Task Preparation

Beechen Cliff Physics Department

Objectives

- **Evaluate** the results and their impact on the experimental methodology.
- **Assess** the reliability and accuracy of the experiment by **calculating** percentage differences and uncertainties.
- **Evaluate** the methodology with a view to improving experimental precision and accuracy.
- **Identify** weaknesses in the experimental methodology and measurements.
- **Suggest** improvements to the experimental procedures and measurements.

Overview

	Qual	Quant	Eval
Task 1	/10	/20	/10
Task 2	/10	/20	/10
Task 3	/10	/20	/10

- The highest mark from each task counts towards your total mark /40
- There will be the opportunity to complete one task in class time with resits carried out for students who feel they could improve their mark.

Evaluative Format

- Task carried out under exam conditions by students working individually
- Evaluate results and the methodology of a previous task
- Teacher marks the work which is then moderated with other teachers
- A sample of work sent to OCR when they request it

What you could be asked

- How do you calculate percentage uncertainty and percentage difference?
- How can you tell if results were reliable?
- How can you tell if results are accurate?
- What kind of limitations can you identify in your method?
- How could these be improved?
- How did they affect the value you calculated?

Percentage Uncertainty

How to calculate percentage uncertainty

PU for a **single** reading $= \frac{\text{smallest interval of measuring device}}{\text{measured value}} \times 100$

PU for a **repeated** reading $= \frac{\text{half the range}}{\text{mean value}} \times 100$

Percentage Uncertainty

How to calculate percentage uncertainty in a gradient

$$\text{PU} = \frac{\text{gradient of } \textbf{best} \text{ fit line} - \text{gradient of } \textbf{worst} \text{ fit line}}{\text{gradient of } \textbf{best} \text{ fit line}} \times 100$$

How to calculate percentage uncertainty in a y-intercept

$$\text{PU} = \frac{\text{intercept of } \textbf{best} \text{ fit line} - \text{intercept of } \textbf{worst} \text{ fit line}}{\text{intercept of } \textbf{best} \text{ fit line}} \times 100$$

Final Uncertainty

Final uncertainty (FU) is equal to the sum of the percentage uncertainties (PU) in all the quantities that are involved in the equation.

- $y = ab$ $\quad FU = PU_a + PU_b$
- $y = a/b$ $\quad FU = PU_a + PU_b$
- $y = a^2$ $\quad FU = PU_a + PU_a$
- $y = b^3$ $\quad FU = PU_b + PU_b + PU_b$

Percentage Difference

Percentage difference (PD) is the difference between the experimental value obtained and the true value.

$$PD = \frac{\text{true value} - \text{experimental value}}{\text{true value}} \times 100$$

e.g. You conduct an experiment to determine the speed of light and calculate it to be 2.75×10^9 ms^{-1}

$$PD = \frac{3.00 \times 10^9 - 2.75 \times 10^9}{3.00 \times 10^9} \times 100 = 8.33\%$$

Your experimental value has a difference of 8.33% to the accepted value.

Reading

- OCR Practical Skills Handbook

  Just read Chapter 10