

# IB Physics Summer Lab Practical

**Task: Design a simple experiment to investigate the relationship between two variables in nature.**

**Examples (you cannot use) include:**

- the time it takes a person to walk 25 meters, measured in 5 meter increments
- temperature of a glass of water versus time in freezer

Each student's investigation must be unique. Your experiment should not be complicated and use household materials (stopwatch on cell phone, yardstick, thermometer, etc.). Toys make great lab equipment (remote-controlled cars, balls, dart guns, etc.).

**Design Aspect: Define problem and select variables**

- State your hypothesis indicating the relationship you expect between the variables.
- Indicate your dependent variable
- Indicate your independent variable
- Indicate your control variables

You do not need to know the outcome of your research question prior to the experiment. The identification of the relevant variables will tell you what to measure and graph.

**Data Collection and Processing (Aspect One): Data collection**

- Collect 3 samples (repeated measurements or trials) for each of the 5 different values of the independent variable.
- Record raw data in a data table that is easy to understand. Be sure to include the name of each variable and its units in column headers.

**Data Collection and Processing (Aspect Two): Processing raw data**

- Calculate an average of the 3 samples for each of your values of the dependent variable. The averages should be included in the data table.

**Data Collection and Processing (Aspect Three): Presenting processed data**

- Present processed (average) data in an appropriate graph. The graph should have a title, and both axes should be clearly labeled with variable names and units of measure. Unless there is a good reason, the graph should start at (0,0). The independent variable should be plotted on the x-axis and the dependent variable on the y-axis.

**Conclusion and Evaluation (Aspect One): Concluding**

- Explain whether or not your results support your original hypothesis.
- Comment on the overall quality of your data as well as a brief explanation of any random and systematic error.

## Data Table for Time vs. Distance Traveled

Distance (meters)	Trial 1 Time (seconds) $\pm .2$ s	Trial 2 Time (seconds) $\pm .2$ s	Trial 3 Time (seconds) $\pm .2$ s	Average Time (seconds) $\pm .2$ s
5	2.3	2.4	2.6	$2.4 \pm .2$ s
10	5.0	5.0	5.6	$5.2 \pm .3$ s
15	7.1	8.1	7.5	$7.6 \pm .5$ s
20	9.7	10.5	10.3	$10.0 \pm .4$ s
25	12.2	12.6	13.4	$12.7 \pm .6$ s

Information on the stopwatch and average value uncertainty handling can be found on page 2 in the “Student Guide for Measurement Error and Uncertainty Analysis” document.