IB Physics SL (Year Two) Internal Assessment #1

Due: Monday, August 25, 2014 (at the beginning of class) – NO LATE ASSIGNMENTS WILL BE ACCEPTED!
Objective: Investigate the relationship between the length and the period of oscillation of a pendulum.

CHECKLIST DESIGN CRITERION

Aspect 1: Defining the problem and selecting the variables. Have you:

- Focused the question into a clear aim. e.g. "I will investigate how <quantity A> affects <quantity B>"?
- Used research to find out about expected results or outcomes?
- Clearly identified the independent variable?
- Clearly identified the dependent variable?
- Clearly identified all the controls (there is normally more than one)?

Aspect 2: Controlling variables. Have you:

- Listed the apparatus you will use including the precision where relevant. e.g. meters and balances etc?
- Drawn a well-labeled and clear diagram showing precisely which measurements you will take?
- Written a clear numbered method so that another student could complete the experiment with no extra advice?
- Specifically mentioned how the controls will be kept constant?

Aspect 3: Developing a method for collection of data. Have you:

- Taken a good range of values for the independent variable?
- Enough data points to plot a good graph?
- Repeated readings?
- Constructed a proposed data table with the values for the independent variable that you will use inserted?
- Added to the table headings with units and the instrument error stated? Remember this error normally has a unit too.

CHECKLIST FOR DATA COLLECTION AND PROCESSING CRITERION

Aspect 1: Recording raw data

- This includes the actual data measured in the experiment before it is processed.
- Left hand column is **independent variable**. 7±2 is a good number for a graph - decide about **range and intervals**.
- After this the **dependent variable** and its **repetitions** (5 of them is good).
- If you will average the repetitions, do it here with a column for uncertainty using (max-min)/2.
- Each column heading has **quantity and unit**. e.g. Force/ N.
- **Uncertainty** in each measurement due to the measuring instrument (to one sig fig, with unit). e.g. ± 0.5 N.
- **Significant figures** in column are consistent with uncertainty. e.g. 23.0 if ±0.5; 3400 if ±100.
- Explain decisions taken for each uncertainty.
- Write down any **observations** (**qualitative data**) which may be significant later.

Aspect 2: Processing raw data

- The first two columns are independent variable and dependent variable (average of repetitions if it was repeated).
- Process the data in other columns to the right. The minimum needed is averaging of repetitions, but more is preferable. This decision is made on the basis of **linearizing the graph**. Typical processes are reciprocal; square; cube; root; sine; log.
- Each column header has units and uncertainty with unit if it is the same for the whole column.
- Uncertainties are propagated
- If the uncertainty is different for each reading, a new column is added e.g. Δ(F) or Δ(1/F).
- Accounted for any other errors. e.g. stop-start errors and looking at the spread of repeated readings? You need to explain your decisions clearly here. If the error is negligible, you need to say so.
- Averaged any repeated readings? The heading must be clear and have an uncertainty and usually a unit.
- A consistent number of decimal places for all averaged or processed data?
- Propagated errors, remembering that normally absolute errors have units?
- Clearly shown all the working for one data point?

- Clearly explained what you will plot on each axis and if appropriate, what the gradient and intercept represent?
- Drawn the correct graph (if applicable with the independent variable on the x axis) and put a best fit line on your graph?
- Labeled your graph correctly including units?
- Put error bars on the graph?
- Calculated the slope of your graph, if linear? Remember this normally has units.

Aspect 3: Presenting processed data. Have you:

- Used the error bars to draw maximum and minimum gradient lines? If error is not significant, you must say so.
- Calculated the slope of these lines (remember units) and found intercepts if appropriate?
- Used the slopes or intercepts to find a relevant constant?
- Found that constant with an absolute error? (Beware of significant figures and units in your final answer).

CHECKLIST FOR CONCLUSION AND EVALUATION CRITERION

Aspect 1: Concluding. Have you:

- Described fully any trends shown in the graph. e.g. are the variables in direct proportion - could the line go through zero if errors are taken into account?
- Commented on any systematic error?
- Commented on the direction of the systematic error?
- Commented on any further random errors. i.e. Does the best fit go through all the error bars or were your uncertainties too small?
- Found a literature value to compare your results to (and cited the source)?
- Found whether or not the literature value falls within your uncertainty range and commented on this? Found a percentage error between your experimental result and the literature value and commented on this?

Aspect 2: Evaluating procedure(s). Have you:

- Listed all possible sources of error and stated whether they were systematic or random?
- Looked at the relative uncertainties of your data? If a quantity has a large uncertainty, then it would be a weakness.
- Commented on any faults in the method and looked at each step of the procedure critically to determine where the method was not precise?
- Commented on time management?
- Commented on limitations with the method. e.g. limited data range, only investigating a very small part of an interesting field?
- Commented on any assumptions you made in your method which you made which might not have been correct, this would be a weakness?

Aspect 3: Improving the investigation. Have you:

- *Suggested improvements for the weakness stated above? This must include ways of reducing the most significant random error.*
- *Commented on how you could reduce the systematic error?*
- *Commented on how you could have had a better control of the variables?*

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Objective: Investigate the relationship between the mass of a pendulum and the period of oscillation of a pendulum.

CHECKLIST DESIGN CRITERION

Aspect 1: Defining the problem and selecting the variables. Have you:

- Focused the question into a clear aim. e.g. "I will investigate how <quantity A> affects <quantity B>"?
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- Taken a good range of values for the independent variable?
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