INTERNAL ASSESSMENT: WRITE-UPS

To make sure you get the best possible marks for an assessed criterion, you MUST make sure you have covered all of the 'Aspects' described - to the best of your ability.
Missing or incomplete aspects will result in reduced marks, so pay attention!

The easiest way to ensure you have covered everything is to lay out your write-up in a clear and logical order:

- Start with 'Design' and go through the aspects in order (easier for the moderator to find)
- Make sure everything has an appropriate title and is neatly presented
- Use tables to present information where possible—very helpful if you have difficulties with English or have terrible writing!

The following is an exemplar write-up.
See if you can spot where each aspect of each criterion is fulfilled.

AIM (or RESEARCH QUESTION):

- Make it absolutely clear what you are investigating (with a little *'why'* and '*how'*).
- The reader should be able to deduce the point of the investigation from this sentence alone.

E.g.
"*Osmosis: investigating the effect of solute concentration on the weight of potato discs, when submerged in a range of concentrations of salt solution for 2 hours.*"

VARIABLES:

		Units	Range
INDEPENDENT VARIABLE			
DEPENDENT VARIABLE			

CONTROLLED VARIABLES:	Units	Possible effect(s) on results
1.		
2.		
3.		
4.		

HYPOTHESIS (or BACKGROUND INFORMATION)

- If you are testing a hypothesis, make your prediction and give full, supported reasons for it
- If you are carrying out another type of investigation, give some background information or theory on the subject.
- *ACADEMIC HONESTY*: Remember to cite your sources of information properly!

METHOD FOR CONTROLLING VARIABLES:

- Include details of equipment used to control each variable

CONTROLLED VARIABLES:	Method for control:
1.	
2.	
3.	
4.	

METHOD FOR COLLECTING DATA:

- Include details of how to measure your independent and dependent variables.
- Give precise details of values, units and equipment
- Make sure you collect enough data - how large does your sample size need to be?
- How many times will you REPEAT your investigation to ensure reliable results?
- What will you do with your data? (Graph type/ statistical test?)
- Take a digital photo of the set-up and label all of the equipment and materials used.

RECORDING RAW DATA:

- Large, clear table for your raw (un-processed) results.
- Include possible errors/uncertainties in your measurement.
- Complete table as you go - don't leave it on scraps of paper.

E.g. (columns 1-4)

Clear labels units uncertainties

Solute Concentration (%) (=/- 0.5%)	RE-PEAT	Weight of discs BEFORE (g) (=/- 0.5g)	Weight of discs AFTER (g) (=/- 0.5g)	WEIGHT CHANGE (g)	% CHANGE IN WEIGHT (g) (=/- 1%)	MEAN % CHANGE (=/- 1%)
0	1					
	2					
	3					
3	1					
	2					
	3					
6	1					
	2					
	3					

PROCESSING RAW DATA (*e.g. columns 5-7 above*)

- How will you transform the data you have collected to make it useful?
- Include an example of any calculations performed.
- Check your calculations to avoid any silly mistakes.

PRESENTING PROCESSED DATA:

- Present your processed data in the most appropriate form
- Tables, charts and graphs must be titled, labeled, large and clear
- Remove any confusing formatting from computer-generated charts or graphs

TIP: *when plotting 'best fit' graphs using Excel, choose the 'scatter' option instead and complete the line of best fit by hand—it will look much better.*

- Don't forget units and errors/uncertainties (e.g. error bars on a bar chart).

For more detailed help with using and choosing graphs, see the next section.

CONCLUDING: *(you might not need to answer all of these questions)*

- Interpret your results, based on the data collected and with reference to your hypothesis or background information.
- What (if any) general trends do you observe? What do they suggest?
- Are there any anomalous (unusual) results? What might be their significance?
- Do the data you collected support your hypothesis? Why / Why not?
- What do your data suggest about the outcome of your research question?
- Do other sources of information or investigations support your findings? (Cite your source!)
- How could you develop this investigation for further study?

EVALUATING PROCEDURE(s):

This must be a worthwhile evaluation of the method chosen, rather than a superficial commentary on poor lab techniques and sloppy work. "I should measure more accurately" is a problem with your practical skills, rather than the method of the investigation.

- Did you record any anomalies in your practical work? How did they affect your results and what did you do to minimize their adverse effects?
- What weaknesses were present in the method chosen for the investigation and how could they have affected the outcome?
- Did anything occur during the investigation to compromise the reliability of your results?

IMPROVING THE INVESTIGATION:

- For each of the weaknesses or limitations mentioned above, describe a workable, realistic method to remedy the problems caused.

REFERENCES (OR BIBLIOGRAHY):

- Using the Harvard method, or something similar, cite all sources used in your research for this investigation.
- Be consistent in your method.
- For more information, see the section entitled 'Academic Honesty'.

APPENDIX:

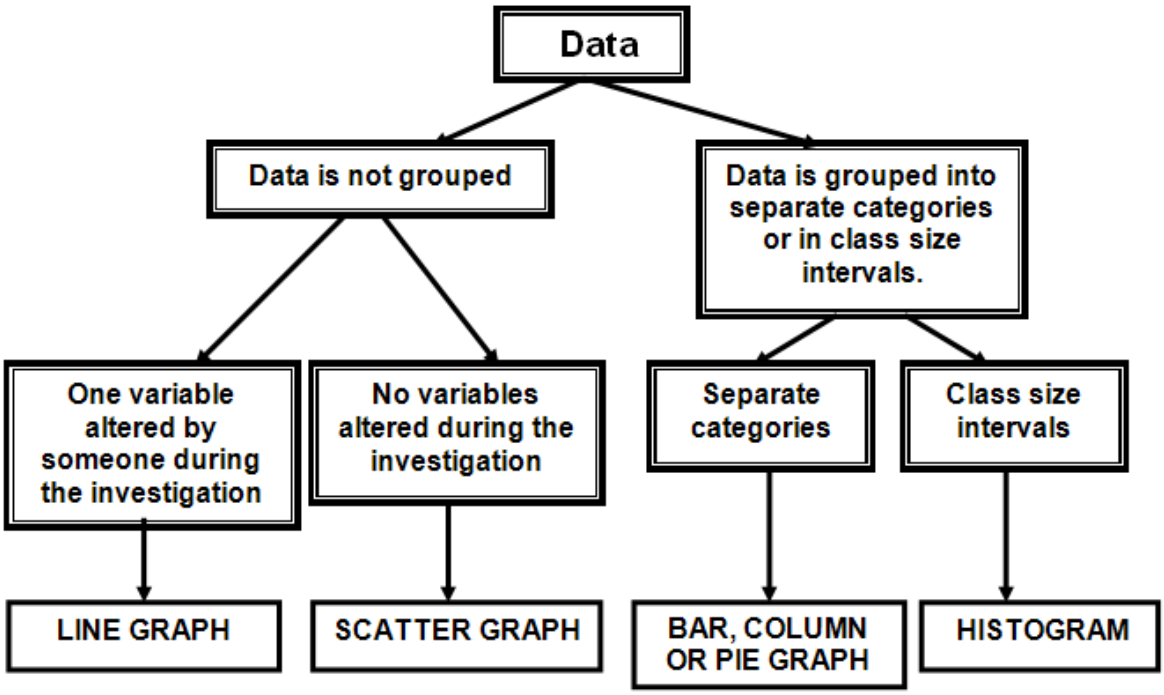
You may want to include:

- raw data or lab notes
- Article/ research cuttings
- Prac protocols from other sources (where 'Design is not being assessed)

CHOOSING AND USING GRAPHS

Graphs can help you to:-

- Understand what is happening in your data (analysis).
- See trends in different variabes (interpretation).
- See how one factor affects another (correlation).
- Communicate information to other people.



Basic Terms.

Data - is information that you collect when you measure or count objects (e.g. lengths of antennae on grasshoppers).

Variable - is the aspect or factor that you are taking measurements or counts of (e.g. eye colours, heights of individuals).

Continuous data - this is data which is obtained by taking measurements (e.g. height, temperature, heart rate). Continuous data always has units (e.g. °C, mm, beats/minute).

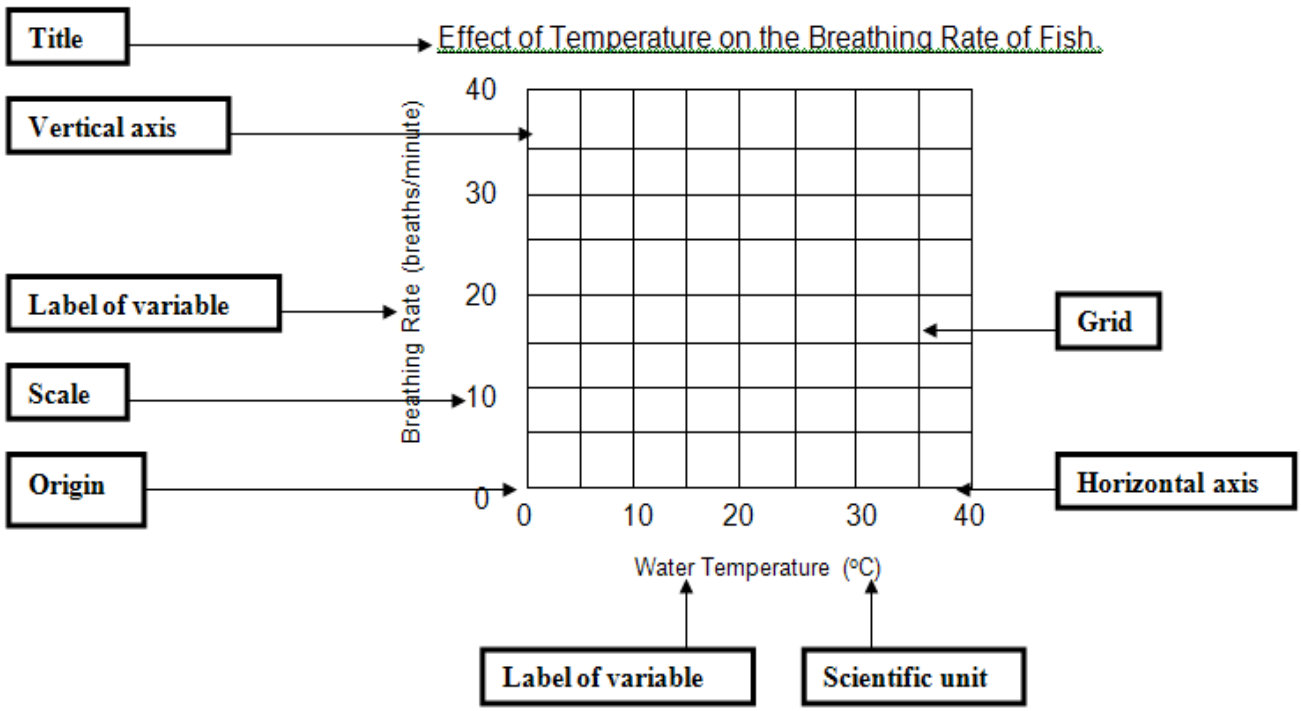
Discrete data - this is data which is collected by counting individual objects rather than by taking measurements. Discrete data has no units (e.g. number of each plant species in a lawn area).

Categories - are separate classes into which individuals can be grouped (e.g. male/female).

Size categories - this is when data is obtained by measuring (e.g. heights) and then individuals are placed into class size intervals (e.g. 1 to 5 mm/6 to 10mm/11 to 15 mm) and counted up.

Always use a pencil and ruler to draw graphs.
Some types of graph can have colour added after the basic graph is completed.

Constructing an Effective Graph.



Graph Checklist.

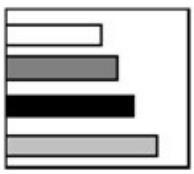
1. Use graph paper.
2. Use pencil and ruler.
3. Make your graph is a good size.
4. Draw in the two axes with a ruler.
5. Put the independent variable (if there is one) on the horizontal axis.
6. Scales on each axis should go up evenly (but they do not necessarily have to start at zero).
7. Scales increase upwards and from left to right.
8. Adjust the scale to fit the range of data (so that it covers the highest and lowest value).
9. Give your graph a title which explains what it is about (try to include the variables).
10. Plot the points accurately with a small 'x' or a dot.
11. Label both axes with the name of the variable and the units (use abbreviations for scientific units).
12. Use a key with plotting symbols if you plot several lines.

Types of Graphs.

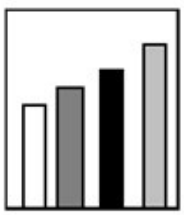
Pie Graph

Pie graphs are circles divided up into pieces or segments. The area of each segment represents the percentage of individuals which fall into a particular category.
Pie graphs should only be used with discrete data grouped in categories and then converted into percentages of the total number.

Bar Graph

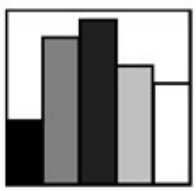


Column Graph



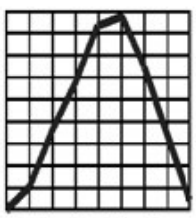
Bar graphs and column graphs have the data displayed in either vertical columns or horizontal bars.
The height of the column or the length of the bar represents the number of individual objects in a particular category.
Bar and column graphs should be used when the data is discrete and is grouped into separate categories (e.g. blood types).

Histogram



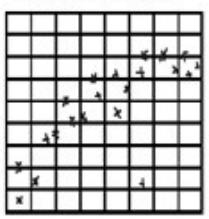
A histogram has columns which touch each other. The width of each column represents a class size interval (e.g. 5 to 10 mm in length). The height usually indicates the number of individuals (or %) which fall into each class interval.
Histograms should only be used with data grouped into class size intervals rather than data sorted into distinct categories.

Line Graph



A line graph consists of a series of points plotted on the grid and then connected together by a line or curve.
Line graphs are only used when both variables are continuous. They are very useful for showing how changing one variable (e.g. light intensity) affects another (e.g. rate of photosynthesis).

Scatter Graph



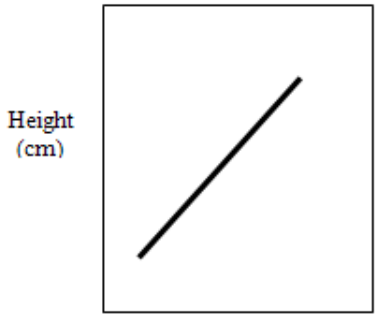
With a scatter graph the points are plotted on the grid but they are usually not joined with a line or curve.
Scatter graphs are only used when both variables are continuous.
These graphs are useful for showing if a relationship exists between two variables (e.g. a relationship between antennae length and number of body segments) especially when it is not possible to alter either of the variables involved.

Interpreting Graphs

In many scientific investigations you are trying to find out if there is any connection or relationship between two factors or variables. Interpreting graphs involves identifying patterns and trends. If a trend is present then it suggests some kind of relationship or connection between the two variables; and there are a variety of different kinds of relationships possible.

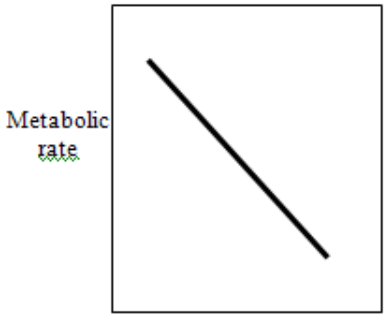
EXAMPLES:

Human Weight/Height



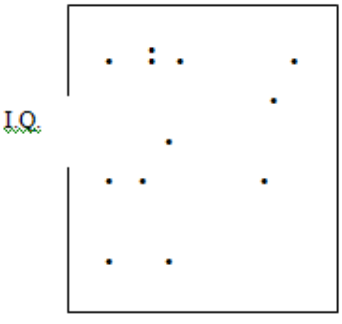
(a) Positive correlation - heavier people tend to be taller and lighter people tend to be shorter.

Animal Metabolic Rate and Weight



(b) Negative correlation - heavier animals have a lower metabolic rate.

Human IQ and Head Size



(c) No correlation - people with larger heads do not necessarily have higher IQ.

There are also some statistical tests that can be done to determine the strength of correlation between two variables (e.g. the "Coefficient of Linear Correlation" test).

Some terms and phrases that could be useful when describing trends in a line graph are:-

rapidly slowly regularly unevenly erratically smoothly

became constant reached a peak fluctuated levelled off

Example: *(for a line graph about photosynthesis with the variables being light intensity and the number of bubbles of oxygen given off per minute)*

"As light intensity increased, the rate of photosynthesis (as shown by the oxygen given off) increased rapidly initially but then levelled off to a constant value"

ACADEMIC HONESTY

It is ESSENTIAL that you are honest in your research and you cite your sources.

The penalties for plagiarism (passing another's work off as your own) are severe.

REFERENCING: A QUICK GUIDE

Academic honesty has two main factors:

1. **'In-text' citations**

   You let the reader know where you have used a piece of information in your work. There are two basic methods:

   - Superscripted numerical markers.
   - Name/date citations as part of your text.

2. **Bibliography**

   Supply complete details of the sources you have used – so that the reader could find them easily to check them or learn more.

IN-TEXT CITATIONS

You can choose which method you use, but make sure you are consistent in your piece of work. In the following passages, see how the different styles are used to convey the same information.

Superscripted numerical markers:

"Monkeys prefer ripe bananas to unripe bananas[(1)]. This is due to the extra sugars present in ripe bananas[(2)], and scientists think that monkeys may have a similar range of tastes to humans[(3)]. It has yet been unproven whether or not monkeys find it funny when someone slips and falls on a discarded banana skin[(1)]"

Name/date (Harvard method):

"Monkeys prefer ripe bananas to unripe bananas (Taylor, 2006). According to Pugh (2007), this is due to the extra sugars present in ripe bananas. Murphy et al (2006) propose that monkeys may have a similar range of tastes to humans. It has yet been unproven whether or not monkeys find it funny when someone slips and falls on a discarded banana skin (Taylor, 2006). "

BIBLIOGRAPHY

If you use numerical markers as in-text citation, then you must list your sources **in the order in which they are used in your piece of work**. The very first source you cite in your text listed in position 1 in your bibliography, the second in position 2 and so on. If you use a source again later on, cite it in the text with the same number as the first time you used it – you don't need to write it in the bibliography more than once. Below is an example of a bibliography for the passage above.

1. Taylor, S. 2006. *Monkey Nutrition Handbook*, 2nd Edition. pp198-199. Primate Press, Bandung.
2. Pugh, D. 2007. *BananaWeb – nutrition page*. Association of Bananas. Retrieved June 13, 2007 from www.banaweb.com/nutrition.htm
3. Murphy, R. et al. 2005. 'A study into the taste pallet of primates'. *Monkey Journal*, vol 2, issue 12. Dec 2005. pp 12-15.

If you are using the Harvard method (or another name/date method) to cite your source in-text, then you must present your bibliography in **alphabetical order of the last names** of the lead authors of the sources. All other formatting remains the same:

Murphy, R. et al. 2005. 'A study into the taste pallet of primates'. *Monkey Journal*, vol 2, issue 12. Dec 2005. pp 12-15.

Pugh, D. 2007. *BananaWeb – nutrition page*. Association of Bananas. Retrieved June 13, 2007 from www.banaweb.com/nutrition.htm

Taylor, S. 2006. *Monkey Nutrition Handbook*, 2nd Edition. pp198-199. Primate Press, Bandung.

Which one of the sources was used more than once in the passage?

Which one was written by more than one author? How can you tell?

Which one is a web-based source? Which one is a book? Which is a journal article?

There are many different types of sources of information which you can use in your work, and each one has a specific referencing style. There is a very helpful and complete list of examples of how to reference different sources of information at the website of Curtin University:

http://library.**curtin**.edu.au/referencing/**harvard**.pdf