**Graphing Rules**

* The **correct type of graph** is made for the type of data presented (i.e. bar, line, histogram, pie, etc…)
* Graph is neatly constructed, organized, and makes good use of space--at least **75 %** of the page. If used, colors make the graph more readable.
* For pie graphs, the wedges are clearly labeled or **color coded** with a key
* For **X-Y axis** graphs…
	+ the Y axis is labeled with the **DEPENDENT** (Responding) **Variable** and the X axis is labeled with the **INDEPENDENT** (Manipulated) **Variable**
	+ Units are clearly and correctly identified along the X and Y axis
	+ The graph axes are proportional to the data (meaning the data is spread over the span of the axis, not clumped)
	+ X and Y axis divisions/intervals are consistent and correct--they do not have to be the same size!
	+ All points are plotted clearly and correctly. In most cases, the average/mean of the data is graphed (not each individual trial)--**best fit** **line**--**NOT** dot to dot!
	+ When the mean is graphed, the **standard deviation** (math class in January!) of each mean is included and labeled
	+ If needed, best fit lines or curves are added to the graph to show trends or relationships
* A **specific title** is included. **Y vs X for the ...** The title indicates what data is presented, including scientific names if relevant.
* **“Series”** boxes are deleted from graphs created in Excel

**How do I know which type of graph to use?** Follow this key…

1. Is the data a percent that sums to 100% or a total amount of time?

 a. If yes .…………………………………Pie chart

 b. If no…………………………………....Go to #2

2. Are both your independent (manipulated) and dependent (responding) variables quantitative?

 a. If no………………………………….... Bar graph

 b. If yes …………………………………. Go to #3

3. Is your independent variable levels continuous (i.e. time in years) or clumped into ranges (i.e. 0-5 years, 6-

 10 years)?

 a. Continuous…………………………... Scatter plot/line

 b. Clumped .....…………………………. Histogram

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| **Pie Chart** | Picture | Designed to show a percent of a whole, where the whole equals 100%. Pie charts are used to compare data, but cannot be used to see how a manipulated variable affects a responding variable. Pie charts do not show change with respect to another variable. *Ex: Percent of time the cell spends in each phase of the cell cycle* |

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| **Bar Graph** | Picture | Designed to make comparisons of data. The data represented in bar graphs are not necessarily dependent on any other variables and the groupings are usually *qualitative* (i.e. grouped into categories, like blood types or color). The bars do NOT touch. *Ex: Comparison of the mean reaction rate for five different enzymes* |

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| **Histogram** | Picture | Histograms are similar to bar graphs except the data represented in histogram is usually in groups of continuous numerical (*quantitative*) data. In this case, the bars do touch. Histograms are often used to show frequency data.*Ex: Minimum Decibels (dBA) of sound heard by 20 people* |

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| **Line Graph** | Picture | A line graph consists of a series of points plotted on the grid and then connected together point to point by a line. Line graphs are only used when both variables are quantitative. Line graphs show trends, such as how things change over time. *Ex: Average mean temperature between the years 1900 and 2000* |

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| **Scatter Plot** | Picture | The points are plotted on the grid, but they are not joined point to point. A best fit line may be added to a scatter plot to show a trend. Line graphs are only used when both variables are quantitative. These graphs are useful for showing if a correlation exists between two variables, especially when it is not possible to alter either of the variables (i.e. in descriptive studies). *Ex: Reaction rate at various enzyme concentrations*  |