Chemistry 11/12
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Name:_____
Period:___ Date:_____

GRAPHING TECHNIQUES

A graph is a powerful tool in the search for patterns and regular relationships in numerical data. It consists of a title, axes, data points and an interpretive curve. The curve, being an interpretation, should be in pencil but the rest of the graph should be in ink. Print all labels of a graph. Use metric graph paper (subdivided in 10's). One graph per page unless specified.

The title should be of the form:

"*y-variable*" versus "*x-variable*"
for
"*situation*"

Here are some examples:

volume versus mass
for
water at 2 atm

period versus (length)^2
for
a simple pendulum

pressure versus (1/volume)
for
an ideal gas

The graph is said to show the y-variable "*as a function of*" the x-variable.

The axes should be **ruled in and labelled** with the name of the variable and its units. For example, Time (seconds), Temperature (degrees Celsius), length (mm), etc. At the end of each axis, there should be a small arrow and a label showing the symbol for the variable. For example: "t" for time, "T" for temperature, "m" for mass, etc. The scales should be chosen so that the axes will **fill the page** as nearly as possible and should always provide for **easy plotting.** Scales of ... 1/10, 1/5, 1/4, 1/2, 1, 2, 4, 5, 10 ... per large division are good but scales of ... 1/7, 1/6, 1/3, 3, 6, 7 ... are very inconvenient and should be avoided. The scale need only be marked occasionally and proportionally(on each large division usually).

Axes need not necessarily start at the origin (0, 0) unless the graph is suspected of passing through the origin or the y-intercept is required (in which case x must start at zero but not necessarily y). If the graph is not located in the vicinity of the origin, choose the scales so that only the relevant portion is shown.

The horizontal axis is usually the independent variable (i.e., the one you can control in regular steps) and the vertical axis is usually the dependent variable. Time **always** occupies the horizontal axis and variables such as pressure and temperature (which rise and fall) usually occupy the vertical axis.

The data points should be recorded as a small, **neat dot** surrounded by a circle (written **in ink**), triangle or other shape. They are **NEVER** recorded as crosses.

On occasion, the origin will be a theoretical data point even if no data was taken there. For example, if we plot the volume of an object as a function of its mass, we must realize the $v = 0$ when $m = 0$ since mass and volume exist together.

The interpretive curve, being not fact but speculation as to the ideal relationship between the variables, should be **in pencil**. It will always be a smooth, simple curve passing amongst the data points but not necessarily through all (or any) of them since any errors in measurement will have pulled the data points slightly out of their ideal positions.

The only certain data point will be an origin included as a result of theoretical considerations.

Graphs of simple physical phenomena are usually linear or a single curve. They are NEVER complicated and NEVER change abruptly or irregularly.

Any extrapolation should be indicated as a dotted line unless it is to an origin which is a theoretical data point

SAMPLE GRAPH: On the sample graph attached, the temperature changes of water is plotted as a function of time. The origin is included as a theoretical data point (the watch was started at zero degrees Celsius.