Investigation 101

1. **Problem Statement (Given):**
    a. Provides the objective for the investigation
2. **Background Research/Research Question:**
    a. Information gained by studying the properties, concepts, and/or theories of the given problem.
    b. Determine independent variable
        i. Only one
        ii. Variable that is incrementally changed
    c. Determine the dependent variable
        i. Only one
        ii. Variable that changes with respect to the independent variable
    d. Write a question that describes the relationship between the independent variable and dependent variable that will be investigated.
3. **Hypothesis:**
    a. Research-based prediction of relationship between independent and dependent variables.
4. **Materials:**
    a. Bulleted list of all materials needed to conduct investigation
5. **Procedure and Diagram:**
    a. Step-by-step (1, 2, 3, …) instructions that clear and detailed as well as provide methods for executing experiment and keeping controlling variables constant
    b. Labeled drawing of apparatus/lab set-up; Should be neat and precise (Use a ruler)
6. **Data Table:**
    a. All columns and rows should have titles and units.
    b. There should be room for at least 5 data points (5+ values of independent variable)
    c. There should be room for at least 3 trials for each data point (Values will be averaged)
    d. Minimum of 15 measurements
7. **Data Analysis (Calculations and Graphs):**
    a. Provide sample calculation per process data point using investigation data
    b. i.e. average time = $(t_1 + t_2 + t_3)/3$
    c. Raw data graph –Dependent variable (y-axis) vs. Independent variable (x-axis)
    d. Processed data graph – Averaged/Calculated dependent variable (y-axis) vs. Independent variable (x-axis)
    e. Line of best-fit (trend line) – a straight line that best represents the data on a scatter plot. This line may pass through some of the points, none of the points, or all of the points.
    f. Determine the equation of the line of best-fit in slope intercept form ($y = mx + b$; where y is the dependent variable, x is the independent variable, m is the slope, and b is the y-intercept)
    g. Determine the units of the slope and y-intercept.
    h. Error calculations
8. **Conclusion and Evaluations:**
    a. Summary of investigation with reference to data, analysis, and error as it relates to stated hypothesis.
    b. Evaluate investigation procedure and execution.
    c. Make suggestions for improving investigation.