Rubric: . **Experiments, Teamwork, Collaboration. Data Reproducibility, Data Analysis & Data Presentation** A student should be able to design appropriate experiments and prepare the requisite reagents as well as conduct the experiment (with whatever necessary skills are involved). They should understand the concept of a control, how to design controls into their experiments, and to understand what each control signifies or measures. Their experiments may involve teamwork or collaboration with another research group. They should be able to accurately record all necessary details of their experiments so that others can reproduce their work. They should understand the difference between collecting replicates of data for given samples in an experiment, and the need to reproduce the whole experiment. **Data Analysis & Presentastion**. The student should be able to convert raw data to appropriate meta data, to perform the appropriate statistical analysis and use graphical and tabular as well as visual representations of the data and parameters derived from appropriate mathematical models for the experiment. As a result of appropriate data analysis the student should be able to make evidence based conclusions and relate them to the predictions made in the proposal, providing support or refutation for appropriate aspects of their hypothesis

Criterion	Research Element Template	Exemplorary-Excellent	Adequate (add comment for student)	Inadequate (add comment for student)
Record Keeping/Lab Notebook	T1	Provides an appropriate index clearly indicating where the required details of each proposed experiment can be found and where necessary primary data is archived		
For each experiment described indicates appropriate safety information	T2	Cites location of MSDS, lists and uses appropriate ppe		
For each experiments indicates where necessary reagents were obtained and are stored	T3	Cites manufacturer and storage conditions/location		
Experiment Introduction	, T5	For each experiment gives an overview of the overall goal of the experiment, how the experiment was set up and what reagents were required including how these reagents were prepared		
Teamwork & Collaboration		Describes roles of each member of the lab group. If external collaboration was involved, describes Collaborator role, how samples were sent to collaborator, How data was received from Collaborator		
Experimental Details	T5	For each experiment documents how individual samples were made and how the data will be collected and archived		
Technical Ability: Badges				
Reagent Preparation: Use of Balance				
Solution Preparation				
Appropriate Liquid Handling				

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Instrument Use: Spectrophotometer				
Ability to use TOTALS Approach				
Identifies Variables	T5,T6	Discusses control experiments and clearly indicates dependent and independent variables and addresses issues of other variables that must be considered		
Data Analysis	T7	Clearly indicates how the data is analyzed to give as appropriate meta data, indicating any equations used to derive appropriate parameters and their error etc		
Data Comparisons	T7	Discusses how agreement or differences between experimental results is estimated and the degree of confidence in similarities or differences established		
Reproducibility	T6, T7	Identifies critical experiments and repeats them. Clearly indicates which experiments give critical data for the overall interpretation and discusses overall internal consistencies or inconsistencies in the project		
Data Display	T7, T8, T9	Uses appropriate ways to display the data including appropriate labels, legends etc. Clearly indicates what must be compared to appropriately test the hypothesis and how the significance of the comparison will. be established		
Appropriately Revises in response to Peer Review	T9	Uses peer review feedback to revise descriptions. Tables, Graphs etc		