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| Personal Engagement \_\_/2 |
| * The evidence of personal engagement with the exploration is clear with significant independent thinking, initiative or insight. * The justification given for choosing the research question and/or the topic under investigation demonstrates personal significance, interest or curiosity. * There is evidence of personal input and initiative in the designing, implementation or presentation of the investigation. |
| Exploration \_\_/6 Research question, Background, Variables, Methods |
| * The topic of the investigation is identified and a relevant and fully focused research question is clearly described. * Background information is entirely appropriate and relevant, and enhances the understanding of the context of the investigation. Includes binomial name of species studied (if applicable) and research of possible outcome of experiment (include citation and bibliography) * Independent and dependent variables are specifically identified and at least 5 levels/conditions of the independent variable are tested * All relevant controlled variables are identified (at least 5) * Specific methods to control these variables are given in table form: controlled variables/why controlled? /How controlled? * Appropriate method for collecting data is carried out * Standard methods are referenced that include large enough range, sufficient data in that range, sufficient repeats, and measurements allowing for sufficient precision * Reference is made to the outcome expected for each condition of the independent variable (hypothesis) * Shows awareness of safety, ethical or environmental issues relevant to the investigation (ex: research into tolerance limits of animal or consent form for Human subjects) * Procedure is detailed enough for a peer to follow and produce the same results |
| Analysis \_\_/6 Raw data and Processed Data, Graphs, Statistical analysis |
| * Relevant and sufficient quantitative data is collected * Relevant and sufficient qualitative data is collected * Quantitative raw data is processed correctly * Quantitative data is displayed clearly and easy to understand in a table (with ruled rows and columns) with appropriate significant digits, units, and uncertainties * Table has a meaningful title and headings for rows and column, units are included and a caption is present that describes the contents of table(s) * The report shows evidence of full and appropriate consideration of the impact of measurement uncertainty on the analysis. Uncertainties or problems are noted. * Suitable statistics are calculated and sample calculations are shown for every type of calculation carried out (i.e. averages , standard deviations, chi square) * Processed data is displayed in the form of a clearly labeled graph (title, labeled, axes, uncertainties, and error bars explained) * The processed data is correctly interpreted so that a completely valid and detailed conclusion to the research question can be deduced. |
| Evaluation \_\_/6 Conclusion and Evaluation |
| * A detailed conclusion is given which is relevant to the research question and fully supported by the data presented. * Conclusion is justified through comparison to accepted scientific context. (Experimental values are compared to published values and citation is included) * A discussion of strengths and weaknesses of the investigation, such as limitations of the data and sources of error, is made. * Discusses the control of variables, limitations on interpretation of the data, the design of the investigation, and the quality (precision, amount , range) of the data * Discusses realistic and relevant suggestions for the improvement and extension of the investigation. |
| Communication \_\_/4 |
| * The presentation of the investigation is clear. Any errors do not hamper understanding of the focus, process and outcomes. * The report is well structured and clear: the necessary information on focus, process and outcomes is present and presented in a coherent way. * The report is relevant and concise thereby facilitating a ready understanding of the focus, process and outcomes of the investigation. * The use of subject-specific terminology and conventions is appropriate and correct. Any errors do not hamper understanding |