|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Level (pts)** | **C** : Complete (2) | **P** : Partial (1) | **N** : Not at all (0) |  |
|  **Design**  |  |  |  **Level** |
| **Defining the problem and selecting the variables (Aspect 1)** | **C / P / N** |  |  |  |
| 1. question or problem is defined
 |  |  |  |  |
| 1. question or problem has a certain degree of complexity
 |  |  |  |  |
| 1. dependent variable is identified
 |  |  |  |  |
| 1. dependent variable is measurable
 |  |  |  |  |
| 1. independent variable is identified
 |  |  |  |  |
| 1. independent variable is measurable
 |  |  |  |  |
| 1. controlled variables are proposed
 |  |  |  |  |
| 1. controlled variables are sufficient and relevant
 |  |  |  |  |
| 1. non-controlled variable and/or uncontrollable variables are mentioned
 |  |  |  |  |
| 1. A hypothesis is stated
 |  |  |  |  |  |
| **Controlling variables (Aspect 2)** | **C / P / N** |  |  |  |
| 1. proposed materials are adequate
 |  |  |  |  |
| 1. proposed materials are well described (quantity/size/unit of measurement/etc.)
 |  |  |  |  |
| 1. proposed solutions include quantities, volumes and concentrations
 |  |  |  |  |
| 1. describe selection of participants in the investigation
 |  |  |  |  |
| 1. method describes in detail how the independent variable is measured
 |  |  |  |  |
| 1. method includes explicit reference to how the control of variables is achieved
 |  |  |  |  |
| 1. include copy of consent form in appendices
 |  |  |  |  |  |
| **Developing a method for collection of data (Aspect 3)** | **C / P / N** |  |  |  |
| 1. Each step is organized in correct sequence (use numbered list or bullets)
 |  |  |  |  |
| 1. method describes the measurements to be made
 |  |  |  |  |
| 1. method describes time needed to collect data
 |  |  |  |  |
| 1. method identifies equipment to be used
 |  |  |  |  |
| 1. diagram/photograph of apparatus is present and properly labelled
 |  |  |  |  |
| 1. method includes a minimum of 5 values for the independent variable
 |  |  |  |  |  |
| 1. method includes a minimum of 5 trials for each value
 |  |  |  |  |  |
| 1. method allows for the collection of relevant data
 |  |  |  |  |  |
|  |  |  |  |  |

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| **Data Collection and Processing**  |  | **Level** |  |  |
| **Recording raw data (Aspect 1)** | **C / P / N** |  |  |  |
| 1. raw data is recorded
 |  |  |  |  |
| 1. data table format is adequate
 |  |  |  |  |
| 1. title of the table is relevant and detailed
 |  |  |  |  |
| 1. data is centered and aligned in the table
 |  |  |  |  |
| 1. data is recorded precisely (sig. fig. and uncertainties)
 |  |  |  |  |
| 1. data table category headers include proper unit of measurement
 |  |  |  |  |
| 1. qualitative data is adequate
 |  |  |  |  |  |
| **Processing raw data (Aspect 2)** | **C / P / N** |  |  |  |
| 1. an example data processing is included
 |  |  |  |  |
| 1. data processing is error-free
 |  |  |  |  |
| 1. error processing is included
 |  |  |  |  |  |
| **Presenting processed data (Aspect 3)** | **C / P / N** |  |  |  |  |
| ***Graph Required*** |  |  |  |  |
| 1. graph type is appropriate
 |  |  |  |  |  |
| 1. graph title is appropriate
 |  |  |  |  |
| 1. axes are labelled according to the category headers in the data table
 |  |  |  |  |
| 1. units of measurement and uncertainties of the axes are included
 |  |  |  |  |
| 1. Data points are shown on the graph
 |  |  |  |  |
| 1. line of best-fit is appropriate
 |  |  |  |  |
| 1. units of measurement and uncertainties are appropriate
 |  |  |  |  |
| 1. error bars are included on data points
 |  |  |  |  |
| 1. significance of error bars is described
 |  |  |  |  |
| ***Calculations*** |  |  |  |  |
| 1. headings for all calculations are clear and detailed
 |  |  |  |  |
| 1. formulas are included for each sample calculation
 |  |  |  |  |
| 1. summarized results are included in table(s)
 |  |  |  |  |
| 1. units are included throughout calculations and table headings
 |  |  |  |  |
| 1. calculations are easy-to-follow
 |  |  |  |  |
| 1. uncertainty range for the final value is included
 |  |  |  |  |  |

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| **Conclusion and Evaluation** |  | **Level** |  |  |
| **Concluding (Aspect 1)** | **C / P / N** |  |  |  |
| 1. conclusion is proposed
 |  |  |  |  |
| 1. conclusion is based on an appropriate interpretation of the data
 |  |  |  |  |
| 1. conclusion is justified
 |  |  |  |  |
| 1. conclusion is compared to documented data
 |  |  |  |  |
| 1. conclusion justifies the purpose of the lab
 |  |  |  |  |  |
| 1. Confidence of results is discussed and supported from findings
 |  |  |  |  |  |
| 1. sources are properly referenced
 |  |  |  |  |  |
| **Evaluating procedure(s) (Aspect 2)** | **C / P / N** |  |  |  |
| 1. number of limitations and weaknesses is sufficient
 |  |  |  |  |
| 1. limitations and weaknesses are relevant
 |  |  |  |  |  |
| 1. Comment on weaknesses relating to Random Errors
 |  |  |  |  |  |
| 1. Comment on weaknesses relating to Systematic Errors
 |  |  |  |  |  |
| 1. Comment on significance of weaknesses with respect to reliability and accuracy of the data. (Discussion of Effect of limitations)
 |  |  |  |  |  |
| 1. Evaluation of limitations and weaknesses is appropriate
 |  |  |  |  |  |
| **Improving the investigation (Aspect 3)** | **C / P / N** |  |  |  |  |
| 1. Number of improvements are sufficient and complimentary to limitations
 |  |  |  |  |
| 1. Suggest a significant improvement to the limitations and weaknesses
 |  |  |  |  |
| 1. suggested improvements are realistic and specific
 |  |  |  |  |  |
| 1. suggested improvements will reduce random error or remove systematic error
 |  |  |  |  |  |