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| Marking Checklist: | * Completed & Correct
 | X Not complete/ incorrect |
| **Design** | **Aspect 1: Define the problem and select the variables** |
| * Research Question or Aim clearly stated
* RQ/Aim includes IV and DV
* Background to investigation included
* IV correctly identified with units/ range
* DV correctly identified with units and precision
 | *Hypothesis:** It is quantitative
* A sketch graph is included, with explanation
* Prediction is explained using scientific theory
* Sources are cited
 |
| **Aspect 2: Controlling variables** |
| * Method to manipulate IV, including specific details of range or increments
* Method for recording results, including units and uncertainty of tools (± \_\_\_\_\_\_\_\_\_\_\_ )
* Annotated photo of equipment or experimental set-up
* **Full citation** of published protocol, if used
 | *Controlled variables presented as a table:** **List all variables** to be controlled

***For each variable:*** * How could it impact the results?
* Exactly how will it be controlled? (Value, with method for achieving that value.
* Control group present (if applicable).
 |
| **Aspect 3: Developing a method for collection of sufficient relevant data** |
| * Results table designed before investigation was planned, to guide Design
* How will results be presented? Reason.
* What statistical test(s) will be used? Why?
* Does plan to collect data address RQ?
* **Min. 5 variations** over a suitable range for the IV (unless comparing populations)
* **Explain** how range of IV was selected
 | * **Explain** how raw data will be transformed into processed data for comparison/ plotting
* Sufficient repeats at each increment to ensure reliability and allow for stats. 5 trials recommended.
* Method clearly presented in step-wise format and can be repeated by others.
* **Safety/ ethics concerns addressed**, including *animal experimentation policy*.
 |

**Checklists modified slightly from i-Biology.net**

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| **Data Collection and Processing** | **Aspect 1: Recording Raw Data** |
| * Raw data clearly distinguished from processed data (possibly separate table)
* Units of IV and DV present and correct
* Uncertainties correct (± \_\_ )
* All data are recorded correctly and honestly
 | * Decimal points consistent throughout
* Decimal points consistent with precision of the measuring equipment
* **Associated qualitative data** (observations) MUST be recorded or zero awarded.
 |
| **Aspect 2: Processing Raw Data** |
| * Calculations to determine DV carried out, if necessary
* Calculations or statistical tests appropriate to investigation and address research question
* Mathematics correctly applied
* Worked example calculations given
 | * Standard deviations included where appropriate, with appropriate DP.
* Uncertainties adjusted to reflect any calculations carried out.
* Processed data (and decimal places) consistent with precision of recorded data
 |
| **Aspect 3: Presenting Processed Data** |
| * Tables & graphs do not break across pages
* Titles self-explanatory and complete
* Consistent decimal places
* Uncertainties/ errors included
* Appropriate choice of graph
* Graphs clear, colouring appropriate
* Effective use of space
 | * Axes labeled clearly, including metric/ SI units and uncertainties of values
* Axes scaled appropriately
* Error bars included, unless insignificant
* Error bar source (e.g. standard deviation) stated and s.d. data are correct
* Best fit line/curve with equation
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| **Conclusion and Evaluation** | **Aspect 1: Concluding** |
| * Patterns and trends in data stated, with reference to the graph/ tables.
* Comparisons, if appropriate, are made
* Data related to hypothesis or RQ – to what extent to they agree/ disagree?
* **Scientific explanation** for results
* Comparison with published data and theoretical texts, if possible.
 | * Appropriate language used *“Supports the hypothesis”* (not ‘proves’ or ‘is correct’)
* Associated qualitative data add value to explanations.
* Sources cited appropriately
* Suggestions for further investigation stated
 |
| **Aspect 2: Evaluating procedures** |
| * Reference to error bars (or STDEV) with regard to variability of results
* **Analysis** of reliability of results:
* Are data sufficient to address the RQ?
* Was the range of the IV appropriate?
* Identify & Explain anomalous data points
* Refer to quantitative data
 | Evaluate *random biological variation*, *measurement/ instrument errors*, *systematic error* (problems with the method) in terms of:* Possible effect on data
* Significance of the weakness or limitation in terms of the data set

*This can be clearly presented in a table.* |
| *Time management* or *human error* may be mentioned, though these are not scientific errors – they should be eliminated with good practical skills. The focus here should be on *the investigation*.  |
| **Aspect 3: Improving the investigation** |
| For each weakness or limitation mentioned above, how could improve experimental design remove or reduce the impact of the error in terms of:* Techniques used to collect and record data, including precision of equipment
* Design of the investigation, including range of values chosen and repeats of each IV data point
* Realistic, specific and achievable improvements
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