**Assessing Specific Features in Physics**

When assessing student work against the specific features described in the Physics subject outline, the following pointers may assist in making judgements about the quality of the evidence provided.

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| **Specific Feature** | **Evidence assessed** | **Higher quality evidence** | **Lower quality evidence** |
| **IAE1** Investigation design | * Deconstruction of a problem
* Hypothesis and variables, or an investigable question
* Materials/apparatus
* Method that outlines the trials and steps to be taken
* Controlled and uncontrolled factors
* Identification and management of safety and/or ethical risks
* Justification for the design
 | * Detailed deconstruction exploring range of aspects of a problem
* Design of an investigation for which outcome is uncertain
* Hypothesis expressed with single variable in conventional format
* Method is a valid test of the hypothesis proposed
* Method has sufficient detail to be implemented without further information (e.g. specific apparatus/equipment, data to be collected)
* Method could be realistically implemented
* Detailed justification for aspects such as
* selection of method
* variables
* quantities
* mode of measurement
* Explanation of how/why to control range of variables
* A suitable range of values/variations of the independent variables tested
* Suitable sample size for repeated measurements of the dependent variable
* Blank data table to show data to be collected
* Description of expected results or findings
* Discussion of relevant safety or ethics
 | * No evidence of deconstruction of a problem
* Outcome is known before the investigation is designed
* Hypothesis missing/unsuitable/inappropriately expressed
* Method is a commonly used procedure with no individual changes
* Method lacking detail (e.g. specific apparatus/equipment, data to be collected) / would be difficult to actually implement
* No justification for any aspect of the design
* Lacking consideration of how/why to control range of variables
* Minimal discussion of variables
* Unclear what data is to be collected
* No discussion of safety or ethics
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| **IAE2** Representation of data | * Tables with headings and units
* Significant figures
* Graphs formatted appropriately with axes labelled
* Line of best fit
 | * Tables clearly structured and labeled
* Graphs appropriate for the data, correctly labelled, suitable scale, easy to interpret
* Appropriate line of best fit
* Appropriate conventions for data e.g. averages, sig figs
 | * Tables difficult to interpret
* Huge amounts of raw data are tabulated without averages
* Graphs are difficult to interpret
* Incorrect type of graph/line of best fit was constructed
* Conventions such as sig figs, labels, units of measurement not/incorrectly used
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| **IAE3** Analysis | * Interpretation of data
* Trends, patterns, relationships
* Conclusion with justification
* Limitations of conclusion
 | * Trends in data described
* Effect of outlier(s) considered
* Interpretation of data relevant to the investigation
* Data related to relevant physics concepts
* Sample calculation of processed data included
* Uses findings from data analysis to form a relevant conclusion
* Possible explanations for causes of unexpected results explained
* Justification of conclusion by referring to results
* Discussion of limitations of conclusion(s) e.g. how widely they could be applied
 | * No reference to data in interpretation/justification
* Limited/no justification for the conclusion
* Little understanding of limitations of the conclusion
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| **IAE4** Evaluation | * Control of sources of uncertainty
* Effects of errors on reliability, accuracy, validity of data
 | * Accurate identification and discussion of specific systematic and random errors
* Relevant links between errors and method
* Explanation of how each of the errors affect precision and accuracy of results and reliability of conclusion.
* Clarity in discussion of precision, accuracy, reliability
* Evaluates the appropriateness of the method to meet the aim of the investigation
 | * Random errors simply listed/defined
* Mistakes confused with errors
* Confusion between random and systematic error (precision and accuracy)
* Very limited discussion or understanding of how significant the effects of errors have on the results
* Generic explanation of the effect on data, not related to the specific investigation
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| **KA1** Knowledge | * Depth and understanding of concepts
 | * Explanations of concepts show depth and detail (in specified tasks or sections)
* Only occasional inaccuracies
 | * Explanations of concepts lack depth and detail (in specified tasks or sections)
* Understanding of concepts (particular ones specified) very weak
* Questions often not attempted/partially answered
* Significant misunderstanding of concepts
* Mostly only recall of simple concepts correct
* Absence of more complex explanations
* Inaccuracies common
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| **KA2** Application | * Use of knowledge in new and familiar contexts
 | * Understanding of concepts (particular ones specified) demonstrated in application in both familiar and unfamiliar contexts
* Ability to solve problems, clearly communicating problem solving method
* Evidence of research in more complex explanations
 | * Weak problem-solving skills
* Difficulty applying understanding in an unfamiliar context
* Confused explanations
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| **KA3** SHE | * Interaction of science and society
* Examples of the key SHE concepts
 | * Answers to questions (in SATs) clearly show the interaction between science and society
* SHE concept(s) specifically addressed
* SHE concepts identified then further discussed
* SHE concepts linked to the topic
* Interaction between science and society integral to the discussion
* Selection of a focus for the SHE report linked to a Stage 2 topic, allowing relevant physics to be included
* SHE report focusses on exploring the interaction between science and society but with appropriate attention to the relevant physics
 | * Selected focus of SHE report not linked to Stage 2 Physics topic or has content that is too simple or too complex
* Interaction between science and society not discussed
* SHE concepts not specifically addressed or hidden in the report
* SHE concepts only stated and not specifically discussed
* SHE concepts not linked to any aspects of the topic
* An information report prepared rather than a SHE investigation report
* The focus of the SHE report limits the amount of physics that could be included
* SHE report focusses on the physics rather than exploring the interaction between science and society
* Lack of understanding/explanation of connection between science and society
* Very little physics in the SHE report
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| **KA4** Communication | * Representations such as vector diagrams, formulae, equations, diagrams
* Physics terminology and conventions
* Language skills
 | * Easy to read and interpret
* Conventions constructing vector diagrams, using formulae or equations, drawing and labelling diagrams clear and accurate
* Conventions for acknowledging sources (in-text, reference list) regularly applied
* Appropriate physics terminology correctly used
* Reports coherent
* Structure of practical report appropriate, including all parts specified in subject outline
* Concise explanations
* Remaining within word limit
 | * Sentences are very difficult to read and interpret
* Conventions constructing vector diagrams, using formulae or equations, drawing and labelling diagrams frequently inaccurate
* Conventions for acknowledging sources (in-text, reference list) not/irregularly applied
* Appropriate physics terminology rarely/incorrectly used
* Reports lack coherence
* Repetition
* Elements of practical report missing
* Exceeding word limit
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| **General comments for teachers** | Investigations folio | * Open ended tasks allow students to investigate problems *rather than* tweak existing methods
* task allows for exploration of situation with uncertain outcome
* Opportunities to ponder, discuss, and research problems leads to creative deconstructions.
* Task clearly directs students towards a SHE investigation *rather than* a research topic
* Highlighting that the focus of the task is the interaction between science and society
 | * The scaffolding in investigation(s) limit the ability of the student to show a high level of capability/analysis/evaluation.
* Task directs students towards an issues investigation rather than a SHE investigation
* Very prescriptive tasks not allowing students to provide evidence of their deconstruction and investigation design skills.
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| SATs | * Questions cover sufficient breadth of the subtopics being assessed
* Sufficient balance of descriptions, explanations, and calculations in questions
* Questions give the opportunity to analyse graphs and other data
* Questions provide opportunity to apply knowledge and understanding in unfamiliar contexts
* Some questions enable students to provide evidence of understanding of SHE
* Some questions elicit understanding of science inquiry skills
 | * No questions give the opportunity to analyse graphs and other data
* Questions focus too heavily on the routine and on recall.
* Set of tasks provide little opportunity to explain concepts in depth/ apply understanding in new contexts
* Set of task do not enable students to provide evidence of understanding of SHE
* Set of task do not enable students to provide evidence of understanding of science inquiry skills
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