**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 |
| **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 |
| **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 |
| **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 |
| **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 |
| **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 |
| **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 |
| **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 |
| **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. |
| 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 |