

Criterion C: Inquiring and designing

Maximum: 6

Students should be able to:

- **state** a focused problem or research question to be tested by a scientific investigation
- **formulate** a testable hypothesis and **explain** it using scientific reasoning
- **design** scientific investigations
- **analyse** the risks involved in scientific investigations taking into account the living and non-living environment

Achievement level	Level descriptor
0	The student does not reach a standard described by any of the descriptors below.
1–2	The student is able to state a problem or question The student is able to formulate a testable hypothesis The student's scientific investigation design has an incomplete method The student is able to list the risks involved in scientific investigations
3–4	The student is able to state a problem or question, including a relevant variable The student is able to formulate and explain a testable hypothesis using scientific reasoning The student is able to design a scientific investigation in which they select appropriate materials and equipment and write a method, mentioning some of the variables involved and how to manipulate them. The student is able to explain the risks involved in scientific investigations taking into account the living and non-living environment where appropriate
5–6	The student is able to state a problem or question, including relevant variables The student is able to formulate and explain a testable hypothesis using correct scientific reasoning The student is able to design a scientific investigation in which they select appropriate materials and equipment and write a clear, logical method, mentioning all of the relevant variables involved and how to control and manipulate them, and describing how the data will be collected and processed. The student is able to analyse the risks involved in scientific investigations taking into account the living and non-living environment where appropriate

Command terms

Analyse: Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions.

Describe: Give a detailed account or picture of a situation, event, pattern or process.

Design: Produce a plan, simulation or model.

Evaluate: To assess the implications and limitations; to make judgments about the ideas, works, solutions or methods in relation to selected criteria.

Explain: Give a detailed account including reasons or causes.

Formulate: Express precisely and systematically the relevant concept(s) or argument(s).

Identify: Provide an answer from a number of possibilities. Recognize and state briefly a distinguishing fact or feature.

List: Give a sequence of brief answers with no explanation.

State: Give a specific name, value or other brief answer without explanation or calculation.

(Command terms in the Middle Years Programme, December 2010: 7-9)

Notes

- To **formulate** and **explain** the hypothesis using scientific reasoning requires students to include in their explanations the scientific concepts, theories or understanding that support their thinking of why or how something might happen the way they have hypothesized or predicted.
- When students **design** a scientific investigation they should develop a method that will allow them to collect sufficient data so that the problem or question can be answered and the reliability of the data evaluated.
- To allow students to **design** scientific investigations independently teachers must ensure that they provide students with an open-ended problem to investigate. An open-ended problem is one that has several independent variables from which students can/could choose one as a suitable basis for the investigation. This should ensure that students formulate a range of plans and that there is sufficient scope to identify both independent and controlled variables. To ensure that the task is appropriate for the assessment of criterion C, teachers should not give students closed or very directed experiments, where the focused problem or research question and relevant variables are given.