

| CUNY Pathways Outcome  | Note   | Does Not Meet Expectations   | Approaches Expectations   | Meets Expectations   | Exceeds Expectations  |
|--|--|--|---|--|---|
| 1. Identify & apply the fundamental concepts & methods of a life or physical science.  | <i>Outcomes 2-4 cover application of concepts, so this row focuses on identification.</i>  | Does not demonstrate recognition or understanding of fundamental concepts & methods.   | Demonstrates recognition & some understanding of fundamental concepts & methods.  | Demonstrates a more complete understanding of fundamental concepts & methods, including some connection between concepts covered in lectures & demonstrated in the labs.   | Demonstrates a deep understanding of concepts & methods, including full connection between concepts covered in lectures & demonstrated in labs.   |
| 2. Apply the scientific method to explore natural phenomena, including hypothesis development, experimentation, measurement, data analysis, & data presentation. | <i>For gen ed purposes, hypothesis identification is a better fit than hypothesis development. Looks at: 1) Hypothesis identification; 2) data gathering; 3) experimentation; 4) measurement; 5) data analysis/interpretation (4b. covers presentation.)</i> | Inadequate demonstration of ability to apply the scientific method to explore natural phenomena in any of the five areas listed. No evidence of scientific reasoning. So many errors, task could not be completed. | Demonstrates ability to apply the scientific method in only one or two of the areas listed. Poor understanding and strategy lead to partial or unsatisfactory completion of the task/investigation. | Demonstrates the ability to apply the scientific method in three or four of the areas listed. Strategy leads to successful completion of tasks & recording of data; uses effective scientific reasoning; frames or uses testable questions, conducts experiment, & supports results with data. | Demonstrates the ability to apply the scientific method in all five of the areas listed. Uses a sophisticated strategy/ revises strategy as appropriate to complete tasks; employs refined & complex reasoning; demonstrates understanding of cause & effect; applies scientific method accurately. |
| 4a. Gather, analyze, & interpret data...   |  | 3. Use the tools of a scientific discipline to carry out collaborative laboratory investigations.  | 3a. Here we focus on the "tools of the discipline" component of the outcome.  | Does not use tools or methods appropriate to the current task, as assigned.  | Uses tools as directed, without showing understanding of why they are appropriate to the current task.  |
|  | 3b. Here, we focus on the collaborative component of the outcome   | Does not work collaboratively. Misses lab sessions, or leaves most tasks to partner(s).  | Works with others, but not in a true collaborative effort. Leaves tasks to partner(s); does not engage with partner.  | Collaborates well. Does fair share of lab work, including analysis and writing; Engages fully with partner(s).   | Works well collaboratively throughout the process.  |
| 4b. ...and present it in an effective written laboratory or fieldwork report.  | <i>Because other outcomes focus on the conduct of the laboratory work, this row focuses only on the written report.</i>  | Explanations cannot be understood; inappropriate use of scientific notation; conclusion unstated or data unrecorded.   | Incomplete or confusing explanation; attempts to use appropriate scientific representations & notations, but are incomplete; conclusions not supported or only partly supported by data.            | Presents a clear explanation; effectively uses scientific representations & notations to organize & display information; appropriately uses data to support conclusions.   | Provides clear, effective explanation detailing all tasks; precisely & uses appropriate scientific notations to organize & display information; interpretation of data supports conclusions & raises new questions or applies to new contexts; disagreements with data resolved as appropriate.     |
| 5. Identify & apply research ethics & unbiased assessment in gathering & reporting scientific data.  |  | Understanding of research ethics limited to matters of copying partner's work, or doing one's share of work in a collaboration; student might even fail in those.  | Demonstrates an understanding of collaboration vs. plagiarism, but not deeper ethical issues; if applicable, understands basics of human & animal rights in research.                               | Understands ethical concepts related to record-keeping, replicability, negative results; fuller understanding of human & animal rights; some understanding of deeper issues related to bias, unintended consequences.  | Shows a nuanced understanding of broader ethical concepts; as well as bias, unintended consequences, and other ethical areas.   |