

SCIENTIFIC PRACTICES RUBRIC

INITIATING THE INQUIRY

What is the evidence that the student can formulate questions and models that can be explored by scientific investigations as well as articulate a testable hypothesis?

SCORING DOMAIN	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT	P/A	ADVANCED
ASKING QUESTIONS	<ul style="list-style-type: none"> Formulates a general scientific question Provides limited or irrelevant content information 		<ul style="list-style-type: none"> Formulates a specific scientific question Provides general content information that is related to the question 		<ul style="list-style-type: none"> Formulates a specific and empirically testable scientific question Provides specific and relevant content information to lend support for the question 		<ul style="list-style-type: none"> Formulates a specific, testable, and challenging scientific question Provides specific and relevant content information to provide insight into the inquiry
STATING A HYPOTHESIS	<ul style="list-style-type: none"> Articulates a prediction that has limited relationship to the question under investigation 		<ul style="list-style-type: none"> Articulates a relevant prediction of the expected results, but variables are unclearly stated 		<ul style="list-style-type: none"> Articulates a hypothesis about the investigated question, with a basic and accurate description of the variables (“if.. then...”) 		<ul style="list-style-type: none"> Articulates a hypothesis about the investigated question, with accurate and specific explanation of the relationship between variables (“if.. then...because”)

PLANNING AND CARRYING OUT INVESTIGATIONS

What is the evidence that the student can design and perform investigations to explore natural phenomena?

SCORING DOMAIN	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT	P/A	ADVANCED
DESIGNING THE INVESTIGATION	<ul style="list-style-type: none"> Experimental design is not aligned to the testable question Discussion of how the model can guide or inform the design or an aspect of the design is missing 		<ul style="list-style-type: none"> Experimental design is related but not explicitly aligned to testable question States in general terms how model was used to guide, inform, or test the design or an aspect of the design 		<ul style="list-style-type: none"> Aligns experimental design with testable question Explains how model was used to guide, inform, or test the design, or an aspect of the design 		<ul style="list-style-type: none"> Explains the alignment between the experimental design and the testable question Explains how model was used to guide, inform, or test the design, or an aspect of the design
IDENTIFYING VARIABLES	<ul style="list-style-type: none"> Identifies variables of investigation but confuses dependent and independent variables Makes no connection between the plan and variables 		<ul style="list-style-type: none"> Accurately identifies the relevant independent and dependent variables States how the plan will control relevant independent OR dependent variables 		<ul style="list-style-type: none"> Accurately identifies and explains why the variables are dependent and independent in the investigation Explains how the plan will control relevant independent AND dependent variables 		<ul style="list-style-type: none"> Accurately identifies and explains why the variables are dependent and independent in the investigation and identifies possible confounding variables and effects and tries to control for them Explains how the plan will control relevant independent and dependent variables, and the possible confounding variables or effects
DEVELOPING PROCEDURES	<ul style="list-style-type: none"> Includes vague or incomplete lab procedures; or uses inappropriate tools, instruments, or types of measurement Amount of data to be collected is omitted 		<ul style="list-style-type: none"> Describes lab procedures including tools/ instruments used, but is not clear or detailed enough to be replicated States the amount of data to be collected with no rationale 		<ul style="list-style-type: none"> Describes detailed, clear, and replicable lab procedures including tools /instruments and types of measurements gathered Provides a rationale for the appropriate amount of data needed to produce reliable measurements 		<ul style="list-style-type: none"> Describes detailed, clear, and replicable lab procedures including rationale for using the tools /instruments and types of measurements gathered Provides a rationale for the appropriate amount of data needed to produce reliable measurements
COLLECTING DATA	<ul style="list-style-type: none"> Gathers data from a single trial of the experiment Limitations or precision of data are not mentioned 		<ul style="list-style-type: none"> Gathers data from several repetitions of the experiment that are clearly outside the reasonable range Mentions limitation or precision of data 		<ul style="list-style-type: none"> Gathers data from several repetitions of the experiment that are not consistent within a reasonable range Explains limitation or precision of data 		<ul style="list-style-type: none"> Gathers data from several repetitions of the experiment that are consistent within a reasonable range Explains limitation or precision of data and impact on conclusions

REPRESENTING, ANALYZING, AND INTERPRETING THE DATA							
<i>What is the evidence that the student can organize, analyze, and interpret the data?</i>							
SCORING DOMAIN	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT	P/A	ADVANCED
REPRESENTING THE DATA <i>Accurately labeled includes title, column titles, description of units, proper intervals.</i>	<ul style="list-style-type: none"> • Uses spreadsheets, data tables, charts, or graphs but does not accurately summarize and/or display data • Constructs spreadsheets, data tables, charts, or graphs with major omissions or errors 		<ul style="list-style-type: none"> • Uses spreadsheets, data tables, charts, or graphs to accurately summarize and display data; format does not allow for examining the relationships between variables • Constructs spreadsheets, data tables, charts, or graphs with minor errors (e.g., missing labels) 		<ul style="list-style-type: none"> • Uses spreadsheets, data tables, charts, or graphs to accurately summarize and display data to examine relationships between variables • Constructs accurately labeled and appropriately organized spreadsheets, data tables, charts, or graphs 		<ul style="list-style-type: none"> • Uses multiple methods (spreadsheets, data tables, charts, graphs) to accurately summarize and display data to examine relationships between variables • Constructs accurately labeled and expertly organized spreadsheets, data tables, charts, or graphs
ANALYZING THE DATA	<ul style="list-style-type: none"> • Analyzes data using inappropriate methods or with major errors or omissions • Consistency of outcome with initial hypothesis is not compared 		<ul style="list-style-type: none"> • Accurately analyzes data using appropriate methods with minor omissions • Compares consistency of outcome with initial hypothesis 		<ul style="list-style-type: none"> • Accurately analyzes data in using appropriate and systematic methods to identify patterns • Compares consistency of outcome with initial hypothesis and identifies possible sources of error 		<ul style="list-style-type: none"> • Accurately analyzes data in using appropriate and systematic methods to identify and explain patterns • Compares and explains consistency of outcome with initial hypothesis, and explains possible sources of error and impact of errors
GENERATING INTREPRETATIONS	<ul style="list-style-type: none"> • Inferences drawn from data are absent • Makes no mention of variables needing further investigation 		<ul style="list-style-type: none"> • Draws inferences from data without discussing strengths or weaknesses • Makes note of variables that need further investigation 		<ul style="list-style-type: none"> • Explains the strengths OR weaknesses of the inferences drawn from data using grade appropriate techniques • Suggests relationships or interactions between variables worth further investigation 		<ul style="list-style-type: none"> • Explains the strengths AND weaknesses of the inferences drawn from data using grade appropriate techniques • Suggests relationships or interactions between variables worth further investigation and poses new analysis

CONSTRUCTING EVIDENCE-BASED ARGUMENTS AND COMMUNICATING CONCLUSIONS

What is the evidence that the student can articulate evidence-based explanations and effectively communicate conclusions?

SCORING DOMAIN	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT	P/A	ADVANCED
CONSTRUCTING EVIDENCE-BASED ARGUMENTS	<ul style="list-style-type: none"> Argument is missing or unclear; supporting data or scientific theory are missing Counterclaim (possible weaknesses in scientific arguments or in their own argument) is missing 		<ul style="list-style-type: none"> Constructs a scientific argument and mentions data OR acceptable scientific theory but does not explain how it supports the claim Identifies a counterclaim (possible weaknesses in scientific arguments or in one's own argument) without mentioning evidence 		<ul style="list-style-type: none"> Constructs a scientific argument, explaining how data and acceptable scientific theory support the claim Identifies a counterclaim (possible weaknesses in scientific arguments or in one's own argument) using evidence 		<ul style="list-style-type: none"> Constructs and evaluates a scientific argument explaining how data and acceptable scientific theory support the claim Explains and evaluates a counterclaim (possible strengths and weaknesses in scientific arguments or in one's own argument) using evidence
COMMUNICATING FINDINGS	<ul style="list-style-type: none"> Attempts to use multiple representations to communicate conclusions with inaccuracies or major inconsistencies with the evidence Implies conclusions with no discussion of limitations 		<ul style="list-style-type: none"> Uses multiple representations (words, tables, diagrams, graphs and/or mathematical expression) to communicate conclusions with minor inconsistencies with the evidence States conclusions and general discussion of limitations 		<ul style="list-style-type: none"> Uses multiple representations (words, tables, diagrams, graphs, and/or mathematical expressions) to communicate clear conclusions consistent with the evidence Explains conclusions with specific discussion of limitations 		<ul style="list-style-type: none"> Uses multiple representations (words, tables, diagrams, graphs, and/or mathematical expressions) to communicate clear and specific conclusions consistent with the evidence Explains conclusions and impact of limitations or unanswered questions
FOLLOWING CONVENTIONS	<ul style="list-style-type: none"> Uses language and tone inappropriate to the purpose and audience Attempts to follow the norms and conventions of scientific writing with major, consistent errors, for example in the use of scientific/technical terms, quantitative data, or visual representations 		<ul style="list-style-type: none"> Uses language and tone appropriate to the purpose and audience with minor lapses Follows the norms and conventions of scientific writing with consistent minor errors, for example in the use of scientific or technical terms, quantitative data, or visual representations 		<ul style="list-style-type: none"> Uses language and tone appropriate to the purpose and audience Follows the norms and conventions of scientific writing including accurate use of scientific/technical terms, quantitative data, and visual representations 		<ul style="list-style-type: none"> Uses language and tone appropriate to the purpose and audience Consistently follows the norms and conventions of scientific writing, including accurate use of scientific/technical terms, quantitative data, and visual representations