SMT Assessment in the Major Rubrics

Please *fill in* the circle that best reflects your assessment of each of the following expectations for students' work. Refer to the rubric for the appropriate evaluative criteria for each expectation.

Vocabulary rubric (from 2005)

Note: in 2005 the rubric was titled "vocab rubric" and the text of the guidelines item on which it was based was not included. The rubric table itself is directly from the 2005 AitM.

Vocabulary RUBRIC

A working knowledge of the vocabulary of a field

Objectives	Does Not Meet	Approaches	Meets	Exceeds	N.A.
Student can define scientific or technical terms.	Definitions are incomplete or incorrect.	Gist of an idea is present but some aspect is incomplete or misstated.	Definitions are sound.	Definitions are sound and subtleties and limitations are discussed.	
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Students can illustrate and provide examples about what terms mean.	Applications are incomplete or missing.	Some applications are appropriate, but some do not illustrate the idea in question.	Applications and illustrations are sound.	Applications and illustrations are sound and how and why the idea in question is appropriate is articulated clearly.	
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Technical Vocabulary of the field is used to explain ideas and to answer questions.	Vocabulary is not used or used inappropriately.	An idea or concept is occasionally misused.	Ideas are expressed clearly in appropriate terms.	Ideas are expressed appropriately and either implications or limitations of a concept are discussed.	
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Principles rubric (from 2005)

Note: in 2005 the text of the guidelines item on which it was based was not included. The rubric table itself is directly from the 2005 AitM.

Principles RUBRIC

An understanding of fundamental principles by applying them to a variety of problems or situations

Objectives	Does Not Meet	Approaches	Meets	Exceeds	N.A.
Student can state principles clearly and correctly.	Principles are stated incorrectly or so incompletely as to suggest no understanding.	The gist of a principle is present, but some aspect is either missing or incorrect.	Basic principles and laws are stated clearly and correctly.	Principles are stated clearly and correctly and consequences or limitations are explored.	
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Students can illustrate principles with specific examples.	Examples either are not present or do not illustrate the principle in question.	Examples are mostly appropriate, but some are either incomplete or are not clearly related to the principle in question.	Examples are appropriate.	Examples are appropriate, reasoning is clear, and any idealizations or approximations are explained.	
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The student can apply appropriate principles to problems, situations, or scenarios.	An appropriate principle is not identified, or an appropriate principle is used incorrectly.	Appropriate principles are usually identified, but there are some situations for which a principle is misapplied.	Appropriate principles are consistently applied to the question at hand.	Appropriate principles are consistently identified, and why they are appropriate is clearly articulated.	
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Experimental techniques rubric (from 2005)

Note: a couple of spelling errors were fixed; the document is otherwise directly from 2005

EXPERIMENTAL TECHNIQUES RUBRIC

Objectives	Does Not Meet	Approaches	Meets	Exceeds	N.A.
Hypothesis generation and/or testing	There is evidence only that the student has followed a procedure in a routine manner; no evidence that the student has grasped an underlying question or purpose for a technique or protocol.	Some evidence that the student understands the question; not clear that he/she has fully connected the procedure in question with the underlying question or hypothesis.	Evidence that the student grasps underlying question or hypothesis to be tested and understands why a particular protocol or procedure is appropriate.	Evidence that the student has formulated a hypothesis in the context of underlying theory and identified or designed a way to test this hypothesis, or evidence that the student has considered a variety of ways to test a hypothesis and has designed or chosen one for sound reasons.	
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Data collection and use of equipment	Little or no evidence of the use of standard equipment or techniques.	Evidence of the use of some but not all standard equipment to collect data.	There is evidence of the use of standard equipment and techniques to collect data appropriate for a question or hypothesis.	There is evidence of the use of a wide variety of equipment and techniques to collect data relevant to a question or hypothesis.	
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Understanding of the purposes and capabilities of equipment and techniques	Appropriate techniques do not appear to be used with any consistency.	Some equipment and techniques are used appropriately, but no evidence that others are considered.	Equipment and techniques are consistently applied in standard ways.	Evidence of novel, but sound, use of equipment and/or clever applications of techniques.	
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Data Acquisition and Interpretation	No evidence that data was systematically handled.	Data is recorded but not fully analyzed.	Data reported systematically with basic analysis leading to conclusion.	Sophisticated data analysis including reports of uncertainties.	
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Mathematics rubric (from 2005)

Note: manual hyphen in a word was changed; the document is otherwise directly from 2005

WORKING KNOWLEDGE OF NEEDED MATHEMATICAL TECHNIQUES RUBRIC

Objectives	Does Not Meet	Approaches	Meets	Exceeds	N.A.
Student knows the mathematical ideas appropriate for his/her concentration.	Based on the student's work, there appear to be important mathematical ideas that the student either does not use or uses inappropriately.	There is evidence that the student has been exposed to appropriate mathematical ideas but that he/she does not consistently use these ideas appropriately.	Student's work contains evidence that the student is using the mathematical ideas appropriate for his/her concentration.	Student's work contains evidence that the student's mathematical knowledge is beyond the minimal expectations for his/her concentration.	
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Student can formulate models and theories in appropriate mathematical language (Students can use mathematics actively)	There is no evidence that the student can formulate his/her own mathematical model.	The outline of an appropriate model is present, but either notation is not clear or a significant idea is missing.	Appropriate models are constructed in standard notation; notation is sufficiently clear for an informed reader to infer the student's reasoning.	Sound mathematical models are constructed. Notation is fully and clearly defined and conforms to conventions of the field.	
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Student can apply appropriate mathematical techniques to problems/questions related to his/her concentration	Questions requiring a quantitative analysis are either not answered or answered qualitatively.	Evidence exists that the student is aware that quantitative techniques are relevant but an appropriate technique is not specifically identified.	Appropriate techniques are used with little or no explanation.	Student articulates clearly how and why which mathematical techniques are being used, and there is clear evidence that these techniques are in fact appropriate.	
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Student can apply and carry through appropriate computational techniques	There is no evidence that the student can use the technique in question; either no solution is begun or what is presented does not address the question.	There is evidence that the student has some idea about how to carry through a computation, but the work is either not complete or contains a significant error or omission.	Appropriate techniques are carried through correctly with sufficient detail for an informed reader to infer the reasoning behind the computation.	Appropriate techniques are carried through correctly and the reasoning behind these techniques is clearly articulated.	
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Student can critically evaluate the results of his/her computations	Results which are inconsistent with general principles or implausible are presented without comment.	Results are not transparently incorrect, but some have errors which could be detected by checking or careful examination.	Results are consistent with general principles and are plausible but no explicit check or discussion is presented.	Results are explicitly checked for plausibility and consistency with general principles.	
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Computer use rubric (from 2005)

Note: in 2005 the text of the guidelines item on which it was based was not included. The rubric table itself is directly from the 2005 AitM.

Computer Use RUBRIC

Familiarity with established computer applications to the particular field of interest

Objectives	Does Not Meet	Approaches	Meets	Exceeds	N.A.
Student selects appropriate software appropriate for his/her concentration.	Either an inappropriate or no software tool is identified.	Tools that can accomplish the assignment are selected.	The most efficient or appropriate tool reasonably available to the student is identified.	Appropriate tools are selected and reasons why they are appropriate are clearly articulated.	
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Student can use software tools.	Software is not used appropriately.	Software is used to accomplish the task, but not necessarily in the most efficient manner available.	Software tools are used appropriately and efficiently to address the problem at hand.	Software is used appropriately and either advanced features (such as writing macros) are used or a more general question than the original is answered in addition to the original question.	
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Student can critically evaluate results from software.	Results which are inconsistent with general principles or implausible are presented without comment.	Results are not transparently incorrect, but there are some errors which could have been detected by checking or careful examination.	Results are plausible and consistent with general principles but no explicit check or discussion is presented.	Results are explicitly checked for plausibility and consistency with general principles.	
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Critical perspective rubric (from 2005)

Critical Perspective -

which allows them to evaluate assertions or hypotheses in light of theory and experiment.

Objectives	Does Not Meet	Approaches	Meets	Exceeds	N.A.
Understanding of problem or situation	Distinctions are not made among general ideas, specific consequences, hypotheses, speculations, and experimental results.	Distinctions among general principles, specific consequences of a theory or model, hypotheses, speculations, and experimental results can be inferred but are not always explicit.	There are clear distinctions among general principles, specific consequences of a theory or model, hypotheses, speculations, and experimental results.	While distinguishing among general theory, specific consequences, hypotheses, speculations, and experimental results, the interplay among such statements is discussed.	
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Sound Reasoning	Specific statements are either not consequences of a theory or are stated with inadequate explanation.	Statements about consequences of theory are valid but the derivation or process of deduction is not clear.	Specific consequences of a theory or model are derived or deduced from general principles by a sound and clear argument.	Specific consequences of a theory or model are developed clearly and limitations, approximations, or extensions are discussed.	
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Awareness of limits	Results are stated as facts without any explicit discussion of uncertainties or limits of validity.	Only vague or general statements are made about uncertainties and/or limits of scientific ideas.	Uncertainties in data or experimental results are noted; limits of validity of theories, models, and experimental results are specified; approximations and assumptions are articulated.	Uncertainties, limits of validity, approximations, and idealizations are discussed clearly, and the consequences of modifying or sharpening an idea are explored.	
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Evaluation of hypotheses or claims	An assertion is not confronted by an appropriate scientific idea.	Some relation between an assertion and relevant scientific ideas is present, but there is no clear comparison or contrast.	An assertion is discussed from a variety of theoretical perspectives, or various interpretations of the assertion are compared with theory and experiment.	An assertion or question (whether theoretical, speculative, or experimental) is compared to relevant theories, models, or experiments and a sound judgment is made about consistency of the assertion with theory and experiment.	
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Use of scientific literature	Necessary data is not located.	Data readily available in texts or other materials the student has on hand is used, but reference material beyond that is not consulted.	Appropriate handbooks and standard reference works are used to find necessary data and formulae.	In addition to “meets”, various sources are used and the conditions under which data or formulae are valid are explicitly noted.	
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Science, Technology, and Society rubric (from 2005)

Note: in 2005 rubric was titled “Sci Tech Soc rubric” and the text of the guidelines item on which it was based was not included. The rubric table itself is directly from the 2005 AitM.

Science, Technology, and Society rubric

An awareness of the wider context in which science and technology operate, i.e. understand the relationships between science, technology, and society.

Objectives	Does Not Meet	Approaches	Meets	Exceeds	N.A.
Science, technology, and society connection	Does not show an awareness of relationships between society and science and technology or denies that there is a relationship between society and science and technology.	Demonstrates factual knowledge that science, technology, and society mutually influence each other or can explain only that science and technology influence society or the converse, but does not demonstrate an ability to explain a mutual interaction.	Demonstrates an ability to explain that science, technology, and society mutually influence each other.	Demonstrates an ability to analyze and apply mutual influences among science, technology, and society.	
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Ethics	Does not show an awareness of the ethical considerations of scientific and technical work or denies that scientists and technologists have responsibilities.	Demonstrates factual knowledge that the work of scientists and technologists has an effect on the well being of others but does not explicitly connect to responsibilities of scientists.	Demonstrates an ability to explain that scientists and technologists have a responsibility to consider effects of their work on society and can identify ethical dilemmas related to science, technology, and society.	Demonstrates an ability to analyze and apply ethical responsibilities of scientists and technologists and ethical dilemmas related to science, technology, and society or to discuss how society influences ethical standards.	
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Interested parties / stakeholders	Does not show any awareness that scientific and technological change affects groups within society in various ways or denies that there are impacts on various groups.	Demonstrates an ability to identify individuals and groups whose interests are affected by changes in science and technology.	Demonstrates factual knowledge that some groups are affected by scientific and technological change.	Demonstrates an ability to identify individuals and groups whose interests are affected by changes in science and technology.	
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