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Senior 2

**Appendix 6:  
Assessment Rubrics and  
General Learning Outcomes**

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## Rubric for the Assessment of Class Presentations

Student Name(s) \_\_\_\_\_

Topic/Title \_\_\_\_\_

Criteria	Performance Levels			
	Level 1	Level 2	Level 3	Level 4
<b>Content</b>	<input type="checkbox"/> No understanding of the topic was evident.	<input type="checkbox"/> Basic understanding of the topic was evident. <input type="checkbox"/> Student(s) did not relate the material presented to their own experiences.	<input type="checkbox"/> Good understanding of the topic was evident. <input type="checkbox"/> Thorough and detailed knowledge was evident. <input type="checkbox"/> Student(s) attempted to relate the material presented to their own experiences.	<input type="checkbox"/> Excellent depth of understanding was evident. <input type="checkbox"/> Student(s) presented material that was further than what was required, and conducted excellent research. <input type="checkbox"/> Student(s) showed how the material presented relates to their own experiences.
<b>Interest and Enthusiasm</b>	<input type="checkbox"/> Little interest and enthusiasm for the topic was displayed in the presentation.	<input type="checkbox"/> Some interest and enthusiasm was evident in the presentation. <input type="checkbox"/> The class was not very interested or enthusiastic.	<input type="checkbox"/> The presenters were clearly interested in their topic and their enthusiasm was quite evident. <input type="checkbox"/> The class was noticeably attentive during the presentation.	<input type="checkbox"/> The interest of the presenter(s) was exceptional as was their enthusiasm. <input type="checkbox"/> The class was keenly attentive during the presentation.
<b>Clarity and Organization of Material</b>	<input type="checkbox"/> The information presented was confusing.	<input type="checkbox"/> The information was somewhat vague. <input type="checkbox"/> There was some organization.	<input type="checkbox"/> The information was clearly presented. <input type="checkbox"/> The presentation was well organized.	<input type="checkbox"/> All information was relevant and clearly presented. <input type="checkbox"/> The presentation was extremely well organized. <input type="checkbox"/> Main points were emphasized and reinforced with appropriate examples.
<b>Use of Visual Aids</b>	<input type="checkbox"/> Visual aids were not used.	<input type="checkbox"/> Visual aids were used. <input type="checkbox"/> Visual aids were not well done. <input type="checkbox"/> Visual aids used were somewhat relevant to the presentation.	<input type="checkbox"/> Visual aids were used. <input type="checkbox"/> Visual aids were quite well done. <input type="checkbox"/> Visual aids were relevant to the presentation.	<input type="checkbox"/> Strong visual aids were used. <input type="checkbox"/> Visual aids were extremely well done with colour, clarity, and care. <input type="checkbox"/> Visual aids were designed to emphasize and strengthen the presentation and were successful.

*\*Teachers are reminded that this rubric would vary with the assignment and format of the presentation.*

## Rubric for the Assessment of a Research Project

Student Name(s) \_\_\_\_\_

Topic/Title \_\_\_\_\_

Criteria	Performance Levels			
	Level 1	Level 2	Level 3	Level 4
Source of Information	<input type="checkbox"/> Student(s) used only one source of information.	<input type="checkbox"/> Student(s) used two sources of information.	<input type="checkbox"/> Student(s) used a variety of sources.	<input type="checkbox"/> Student(s) used a wide variety of sources in a unique manner.
Information Collected	<input type="checkbox"/> The information collected was not relevant.	<input type="checkbox"/> The information collected was relevant to the topic but was not blended into a cohesive piece.	<input type="checkbox"/> The information collected was relevant to the topic and was somewhat organized into a cohesive piece.	<input type="checkbox"/> The information collected was relevant to the topic and was carefully organized into a cohesive piece of research.
Organization of Material	<input type="checkbox"/> The information collected was not organized.	<input type="checkbox"/> The information was somewhat organized.	<input type="checkbox"/> The information was organized and contained recognizable sections.	<input type="checkbox"/> The information was organized and contained recognizable sections that included an introduction, a main body with supporting evidence, and a conclusion that summarized the report.
Presentation of Material	<input type="checkbox"/> The report was handwritten, contrary to established guidelines.	<input type="checkbox"/> The report was neatly handwritten. <input type="checkbox"/> The report contained a bibliography that was not correctly formatted.	<input type="checkbox"/> The report was typed. <input type="checkbox"/> The report contained graphics. <input type="checkbox"/> The report contained a bibliography that was not correctly formatted.	<input type="checkbox"/> The report was typed and appropriately formatted. <input type="checkbox"/> The report contained a title page. <input type="checkbox"/> The report contained relevant graphics. <input type="checkbox"/> The report contained a complete, correctly formatted bibliography.

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## Rubric for the Assessment of a Decision-Making Process Activity

Student Name(s) \_\_\_\_\_

Topic/Title \_\_\_\_\_

Criteria	Performance Levels			
	Level 1	Level 2	Level 3	Level 4
Identification of STSE Issue	<input type="checkbox"/> Student(s) cannot identify an STSE issue without assistance.	<input type="checkbox"/> Student(s) have a basic understanding that an issue could have STSE implications, not necessarily differentiating among the four areas.	<input type="checkbox"/> Student(s) have a good understanding of a connection between an issue and its STSE applications. <input type="checkbox"/> Student(s) demonstrate some evidence of awareness of an individual response.	<input type="checkbox"/> Student(s) have excellent depth and sensitivity in connecting an issue with its STSE implications. <input type="checkbox"/> Student(s) demonstrate a level of social responsibility.
Evaluates Current Research on Issue	<input type="checkbox"/> Student(s) able to access a small amount of current research, with no evaluation of that research evident.	<input type="checkbox"/> Student(s) demonstrate some ability to recognize the positions taken in the research data, with no clear evaluative statements.	<input type="checkbox"/> Student(s) have secured an array of research, narrow in its scope, but clearly identify the positions taken. <input type="checkbox"/> Student(s) can offer personal opinions on issue, not necessarily evaluation.	<input type="checkbox"/> Student(s) present research that is current, relevant, and from a variety of perspectives. <input type="checkbox"/> Student(s) demonstrate insight into the stated positions, and can frame an evaluation.
Formulates Possible Options	<input type="checkbox"/> Student(s) unable to clearly identify the possible options. <input type="checkbox"/> Student(s) can form options that are not clearly connected to the problem to be solved.	<input type="checkbox"/> Student(s) can offer at least one feasible option that is connected to the problem. <input type="checkbox"/> Student(s) can offer other options that may be more or less related directly to the problem.	<input type="checkbox"/> Student(s) develop at least two feasible options that are internally consistent, and directly address the problem. <input type="checkbox"/> Student(s) recognize that some options will fail.	<input type="checkbox"/> Student(s) display level of sophistication of feasible options that is beyond expectations. <input type="checkbox"/> Student(s) present options that all demonstrate a reasonable chance of succeeding in being chosen.
Identifies Projected Impacts	<input type="checkbox"/> Student(s) not able to foresee the possible consequences of the options selected. <input type="checkbox"/> Student(s) appear to have a naïve awareness of consequences.	<input type="checkbox"/> Student(s) identify potential impacts of decisions taken in a vague or insubstantial way. <input type="checkbox"/> Student(s) view most of the feasible options as having projected impacts.	<input type="checkbox"/> Student(s) identify potential impacts of decisions taken in an organized way. <input type="checkbox"/> Student(s) view all of the feasible options as having projected impacts, some beneficial, some not.	<input type="checkbox"/> Student(s) are capable of offering a cost/benefits/risks analysis of each feasible solution. <input type="checkbox"/> Student(s) construct an organized report that clearly outlines the impacts of each.

(continued)

## Rubric for the Assessment of a Decision-Making Process Activity (continued)

Student Name(s) \_\_\_\_\_

Topic/Title \_\_\_\_\_

Criteria	Performance Levels			
	Level 1	Level 2	Level 3	Level 4
<b>Selects an Option and Makes a Decision</b>	<input type="checkbox"/> Unable to come to a decision that clearly connects with the problem to be solved <input type="checkbox"/> Requires direction from the outside to make a choice	<input type="checkbox"/> Can identify a feasible option, but is faced with the inability to clearly decide on a plan <input type="checkbox"/> Still requiring outside influences to stand by a decision to proceed	<input type="checkbox"/> Clearly selects an option, decides on a course of action, but others can identify that a better course of action remains untried <input type="checkbox"/> Recognizes potential safety concerns	<input type="checkbox"/> A thorough analysis of all options was done collaboratively <input type="checkbox"/> Decision was firm, justified by the research base, and recognizes most of the safety concerns
<b>Implements the Decision</b>	<input type="checkbox"/> Unable to fully implement the decision, but there remains opportunity to modify it <input type="checkbox"/> Decision lacks the clarity to proceed	<input type="checkbox"/> Implements the decision with a recognition that not all details are laid out in advance <input type="checkbox"/> Some lack of clarity in having a plan for implementation	<input type="checkbox"/> Implements with some visible clarity of purpose <input type="checkbox"/> Confidence is demonstrated that the plan will be one that can be of a scientific inquiry approach	<input type="checkbox"/> Implements a plan with visible clarity of purpose, backed by the research base <input type="checkbox"/> It is clearly demonstrated that the plan will be one that can be carried to completion as inquiry
<b>Identifies and Evaluates Actual Impacts of Decision</b>	<input type="checkbox"/> Unable to clearly recognize more than one possible actual impact <input type="checkbox"/> Cannot effectively evaluate the effects of the decision(s) taken	<input type="checkbox"/> Can clearly recognize more than one possible actual impact for the decision taken <input type="checkbox"/> Cannot effectively evaluate the effects of the decision(s) taken in most instances	<input type="checkbox"/> Able to recognize and comment upon the actual impacts observed <input type="checkbox"/> Some ability in evaluating the impacts of the decision	<input type="checkbox"/> Able to recognize and comment deeply upon the actual impacts observed, noting unforeseen or unique outcomes <input type="checkbox"/> Facility in evaluating the impacts of the decision
<b>Reflects on the Decision Making and Implementation of a Plan</b>	<input type="checkbox"/> Begins to demonstrate an awareness of the need to review the plan <input type="checkbox"/> A reluctance to consider a re-evaluation of the plan	<input type="checkbox"/> Reflects and intends to communicate the results of the implementation plan <input type="checkbox"/> Has some difficulty in how to proceed with a re-evaluation of the problem-solving plan	<input type="checkbox"/> Reflects upon and does communicate the results of the implementation plan <input type="checkbox"/> Recognizes how to proceed with a re-evaluation of the problem-solving plan	<input type="checkbox"/> A higher order synthesis was visible in the reflection process <input type="checkbox"/> Evidence of a sophisticated environmental awareness that informs this post-implementation period

\* Teachers are reminded that the above criteria are suggestions only, and will be adapted according to the needs of the assignment. It is preferable if this rubric is modified in consultation with the students, leading to clarity of purpose.

## Lab Report Assessment

Project Title \_\_\_\_\_ Date \_\_\_\_\_

Team Members \_\_\_\_\_

Area of Interest	Possible Points	Self	Teacher
<p><b>Formulates Testable Questions:</b> Question is testable and focused with cause and effect relationship identified.</p>			
<p><b>Formulates a Prediction/Hypothesis:</b> Independent and dependent variables are identified and the prediction/hypothesis clearly identifies a cause and effect relationship between these two variables.</p>			
<p><b>Creates a Plan:</b> All steps are included and clearly described in a logical sequence. All required materials/equipment are identified. Safety considerations are addressed; major intervening variables are controlled.</p>			
<p><b>Conducts a Fair Test and Records Observations:</b> There is evidence of repeated trials and the inclusion of all data. Detailed data are recorded, and appropriate units are used; data are recorded in a clear/well-structured/appropriate format for later reference.</p>			
<p><b>Interprets and Evaluates Results:</b> Patterns/trends/discrepancies are identified. Strengths and weaknesses of approach and potential sources of error are identified. Changes to the original plan are identified and justified.</p>			
<p><b>Draws a Conclusion:</b> Conclusion explains cause and effect relationship between dependent and independent variables; alternative explanations are identified; hypothesis is supported or rejected.</p>			
<p><b>Makes Connections:</b> Potential applications are identified and/or links to area of study are made.</p>			
<p><b>Total Points</b></p>			

## Observation Checklist—Scientific Inquiry Conducting a Fair Test

Project Title \_\_\_\_\_ Date \_\_\_\_\_

*Note: A group of students can be selected as a focus for observation on a given day, and/or one or more of the observational areas can be selected as a focus. The emphasis should be on gathering cumulative information over a period of time.*

Names	Safe Work Habits (workspace, handling equipment, goggles, disposal)	Ensuring Accuracy/ Reliability (repeating measurements/ experiments)	Observing and Recording (carried out during experiment)	Follows a Plan	Evidence of Perseverance and/or Confidence	Comments

## Assessing Region Explanations

A region that is prone to a severe weather-related event can be part of the Earth's surface that has similar physical and/or human characteristics and differs from other regions around it.

What defines a region can vary from physical factors (such as rock types, climate, meteorology, hydrology, soils, types of vegetation, or landforms) to human factors (such as population density, incomes, economic activities, agricultural activities, or industrial areas). Regions can be defined by considering only one factor at a time, like climate regions, or a combination of different factors, like the Great Lakes region, which considers both physical (lakes, drainage) and human characteristics (high density of population, similar economic activities). In fact, the choice of factors can be almost endless, with the major consideration being: can it be mapped?

Once a map is produced, geographers look for patterns of location. Do the events mapped seem to cluster in one or more areas or are they evenly distributed over the map. In either case, explanations are sought to help explain the patterns found. We can apply these regional map characteristics to severe weather events such as ice storms, tornadic activity, hurricane storm tracking, and precipitation patterns.

The student's map should follow the general guidelines established and listed in Appendix 6.9: Rubric for Map Drawing.

### Use the following framework to assess answers:

Score each of the three factors on a scale of 0–4 with 4 representing the greatest agreement with the statement.

The student answer...	0	1	2	3	4
stated clearly that the region defined is part of the Earth's surface					
explained that feeling comfortable, having many friends, and/or knowing many neighbours are common characteristics of this "neighbourhood"					
stated it was a region because these characteristics were different from those of the areas lying outside its boundaries					



## Peer/Self Assessment Sheet for Poster Project in Solving an Environmental Problem

Name of Peer Evaluator: \_\_\_\_\_

Name of Author/Presenter: \_\_\_\_\_

Total Mark: \_\_\_\_\_

Score the poster you are assessing, using the following scales. Circle only one number per category. The higher the number circled, the better that poster project is at showing what environmental problem is being dealt with and how to reduce its negative effects.

<b>Title</b> clearly states what information is shown on the poster	None 0	1	Incomplete 2	3	Complete 4
<b>Content</b> makes clear which environmental problem is being dealt with in the poster and the solution to that problem is practical	Unclear, impractical 0	1	Somewhat clear, somewhat, practical 2	3	Very clear, very practical 4
<b>Legends/Labels</b> —symbols/features identified by labels or legend	None 0	1	Some 2	3	All 4
<b>Printing</b> —labels are neatly printed so they are easy to read	No 0	1	Somewhat 2	3	Yes 4
<b>Organization</b> —information is carefully organized so reader understands it easily	No 0	1	Somewhat 2	3	Yes 4
<b>Overall Appearance</b> —general impression of poster related to its neatness, care in drawing, ease of understanding	Poor 0	1	Good 2	3	Excellent 4

## Rubric for Student Presentation

Student Name(s) \_\_\_\_\_

Topic/Title \_\_\_\_\_

Criteria	Performance Levels			
	Level 1	Level 2	Level 3	Level 4
<b>Organization</b>	<input type="checkbox"/> Presentation shows poor organization and lack of preparation.	<input type="checkbox"/> Presentation shows signs of organization but some parts do not seem to fit the topic.	<input type="checkbox"/> Presentation is organized, logical, and interesting.	<input type="checkbox"/> Presentation is very well organized, logical, interesting, and lively.
<b>Preparation</b>	<input type="checkbox"/> Some student preparation is shown.	<input type="checkbox"/> A fair amount of student preparation is shown.	<input type="checkbox"/> An adequate amount of student preparation is shown.	<input type="checkbox"/> A great deal of student preparation is shown.
<b>Content</b>	<input type="checkbox"/> A small amount of presented material is related to the topic.	<input type="checkbox"/> Some material presented is not related to the topic.	<input type="checkbox"/> Almost all material presented is related to the topic.	<input type="checkbox"/> All material in the presentation is related to the topic.
<b>Language</b>	<input type="checkbox"/> Language used is hard to follow and understand.	<input type="checkbox"/> Some language used is hard to follow and understand.	<input type="checkbox"/> Most language used is easy to follow and understand.	<input type="checkbox"/> Language used is well chosen, easy to follow and understand.
<b>Format</b>	<input type="checkbox"/> Poor use of aids and support materials (diagrams, overheads, maps, pictures); does not support the topic.	<input type="checkbox"/> Adequate use of aids and support materials; most support the topic.	<input type="checkbox"/> Good use of aids and support materials; almost all support the topic.	<input type="checkbox"/> Excellent use of aids and support materials; all aids support the topic.
<b>Delivery</b>	<input type="checkbox"/> Many words unclear; voice is monotonous; spoke too quickly or slowly; no pausing for emphasis; voice too low to be heard easily.	<input type="checkbox"/> Some words unclear; voice somewhat varied; spoken too quickly at times; some pausing for emphasis; voice sometimes too low to be heard easily.	<input type="checkbox"/> Most words clear; voice often varied, interesting, generally spoken at the correct speed; frequent pausing for emphasis; voice loud enough to be heard easily.	<input type="checkbox"/> Words clear; voice frequently varied, interesting, generally spoken at the correct speed; effective pausing for emphasis; voice loud enough to be heard easily.
<b>Audience</b>	<input type="checkbox"/> Audience is not involved or interested.	<input type="checkbox"/> Audience is somewhat involved, sometimes interested.	<input type="checkbox"/> Audience is involved and interested.	<input type="checkbox"/> Audience is very involved and interested.

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## Rubric for Map Drawing

Student Name(s) \_\_\_\_\_

Topic/Title \_\_\_\_\_

Criteria	Performance Levels			
Title	Level 1	Level 2	Level 3	Level 4
Title	<input type="checkbox"/> Written and not printed <input type="checkbox"/> Does not accurately describe the contents of the map	<input type="checkbox"/> Printed somewhere on the map and not easy to find	<input type="checkbox"/> Printed at the top of the page <input type="checkbox"/> States the purpose of the map adequately	<input type="checkbox"/> Printed neatly at the top of the map <input type="checkbox"/> Highlighted inside a box or underlined <input type="checkbox"/> Purpose clearly stated
Labels	<input type="checkbox"/> Written and not printed; not positioned carefully or accurately <input type="checkbox"/> Many inaccuracies <input type="checkbox"/> Spelling errors	<input type="checkbox"/> Printed, but hard to read, messy <input type="checkbox"/> Not very orderly <input type="checkbox"/> Some inaccuracies, spelling errors	<input type="checkbox"/> Printed neatly in an orderly fashion <input type="checkbox"/> Few inaccuracies or spelling errors	<input type="checkbox"/> Printed neatly in an accurate and orderly fashion <input type="checkbox"/> No missing, inaccurate, or misspelled labels
Legend	<input type="checkbox"/> Poorly positioned <input type="checkbox"/> Poor appearance <input type="checkbox"/> Written labels <input type="checkbox"/> Many inaccuracies <input type="checkbox"/> Difficult to use	<input type="checkbox"/> Well positioned <input type="checkbox"/> Frame/box is missing <input type="checkbox"/> Most symbols used on map are present <input type="checkbox"/> Several inaccuracies	<input type="checkbox"/> Well-positioned frame containing almost all symbols used on the map <input type="checkbox"/> Few inaccuracies	<input type="checkbox"/> Well-positioned frame with a neat and complete set of symbols <input type="checkbox"/> A compass indicator
Scale	<input type="checkbox"/> Missing or hard to find on the map <input type="checkbox"/> A poor choice of scale <input type="checkbox"/> Inaccurate, sloppy, hard to read	<input type="checkbox"/> Visible on the map <input type="checkbox"/> Hard to read <input type="checkbox"/> Features on map are not drawn to scale	<input type="checkbox"/> Relatively easy to find on the map <input type="checkbox"/> Most features are drawn to scale <input type="checkbox"/> Neat and easy to use	<input type="checkbox"/> Clearly visible on the map <input type="checkbox"/> Very easy to read <input type="checkbox"/> Neat and easy to use
Frame	<input type="checkbox"/> Frame drawn freehand <input type="checkbox"/> Appears hastily drawn	<input type="checkbox"/> Frame not neatly drawn	<input type="checkbox"/> Some deficiencies such as inaccurate right angles or join marks visible	<input type="checkbox"/> Lines meet at right angles and no joining marks visible
Appearance	<input type="checkbox"/> Inconsistent use of colour <input type="checkbox"/> Shading is inconsistent <input type="checkbox"/> Appears hastily drawn	<input type="checkbox"/> Mainly correct use of colour <input type="checkbox"/> Shading of varying intensity <input type="checkbox"/> Some care taken to be neat and accurate	<input type="checkbox"/> Correct use of colour <input type="checkbox"/> Neat and even shading <input type="checkbox"/> Care taken to be consistent in colouring	<input type="checkbox"/> Correct use of colour throughout <input type="checkbox"/> Great care taken to be consistent in colouring/shading <input type="checkbox"/> Stimulates interest, captures attention

\*Teachers are reminded that this rubric would vary with the assignment and format of the presentation.

## Rubric for Research Skills

Student Name(s) \_\_\_\_\_

Topic/Title \_\_\_\_\_

Research Skills	Performance Levels			
	Level 1	Level 2	Level 3	Level 4
Ability to formulate questions to identify problems for research purposes	<input type="checkbox"/> Shows limited ability	<input type="checkbox"/> Shows some ability	<input type="checkbox"/> Shows general ability	<input type="checkbox"/> Shows consistent and thorough ability
Ability to locate relevant primary and secondary sources of information	<input type="checkbox"/> Unable to locate	<input type="checkbox"/> Somewhat able to locate	<input type="checkbox"/> Generally able to locate	<input type="checkbox"/> Always or almost always able to locate
Ability to locate and record relevant information from a variety of sources	<input type="checkbox"/> Unable to locate and record	<input type="checkbox"/> Somewhat able to locate	<input type="checkbox"/> Generally able to locate and record	<input type="checkbox"/> Always or almost always able to locate and record
Ability to organize information related to identified problem(s)	<input type="checkbox"/> Shows limited ability	<input type="checkbox"/> Shows some ability	<input type="checkbox"/> Shows general ability	<input type="checkbox"/> Shows consistent and thorough ability
Ability to analyze, synthesize information related to identified problems	<input type="checkbox"/> Shows limited ability	<input type="checkbox"/> Shows some ability	<input type="checkbox"/> Shows general ability	<input type="checkbox"/> Shows consistent and thorough ability
Ability to communicate results of inquiries using a variety of appropriate presentation forms (oral, media, written, graphic, pictorial, other)	<input type="checkbox"/> Unable to communicate	<input type="checkbox"/> Somewhat able to communicate	<input type="checkbox"/> Generally able to communicate	<input type="checkbox"/> Always or almost always able to communicate

\*Teachers are reminded that this rubric would vary with the assignment and format of the presentation.

## General Learning Outcomes

The purpose of Manitoba science curricula is to help students gain a measure of scientific literacy that will assist them in becoming informed, productive, and fulfilled members of society. As a result of their Early, Middle, and Senior Years science education, Manitoba students will be able to:

### **Nature of Science and Technology**

- A1. recognize both the power and limitations of science as a way of answering questions about the world and explaining natural phenomena
- A2. recognize that scientific knowledge is based on evidence, models, and explanations, and evolves as new evidence appears and new conceptualizations develop
- A3. distinguish critically between science and technology in terms of their respective contexts, goals, methods, products, and values
- A4. identify and appreciate contributions made by women and men from many societies and cultural backgrounds towards increasing our understanding of the world and in bringing about technological innovations
- A5. recognize that science and technology interact with and advance one another

### **Science, Technology, Society, and the Environment (STSE)**

- B1. describe scientific and technological developments, past and present, and appreciate their impact on individuals, societies, and the environment, both locally and globally
- B2. recognize that scientific and technological endeavours have been and continue to be influenced by human needs and the societal context of the time
- B3. identify the factors that affect health, and explain the relationships among personal habits, lifestyle choices, and human health, both individual and social
- B4. demonstrate a knowledge of and personal consideration for a range of possible science- and technology-related interests, hobbies, and careers
- B5. identify and demonstrate actions that promote a sustainable environment, society, and economy, both locally and globally

### **Scientific and Technological Skills and Attitudes**

- C1. recognize safety symbols and practices related to scientific and technological activities and to their daily lives, and apply this knowledge in appropriate situations
- C2. demonstrate appropriate scientific inquiry skills when seeking answers to questions
- C3. demonstrate appropriate problem-solving skills while seeking solutions to technological challenges

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- C4. demonstrate appropriate critical thinking and decision-making skills when choosing a course of action based on scientific and technological information
- C5. demonstrate curiosity, skepticism, creativity, open-mindedness, accuracy, precision, honesty, and persistence, and appreciate their importance as scientific and technological habits of mind
- C6. employ effective communication skills and utilize information technology to gather and share scientific and technological ideas and data
- C7. work cooperatively and value the ideas and contributions of others while carrying out scientific and technological activities
- C8. evaluate, from a scientific perspective, information and ideas encountered during investigations and in daily life

### **Essential Science Knowledge**

- D1. understand essential life structures and processes pertaining to a wide variety of organisms, including humans
- D2. understand various biotic and abiotic components of ecosystems, as well as their interaction and interdependence within ecosystems and within the biosphere as a whole
- D3. understand the properties and structures of matter, as well as various common manifestations and applications of the actions and interactions of matter
- D4. understand how stability, motion, forces, and energy transfers and transformations play a role in a wide range of natural and constructed contexts
- D5. understand the composition of the Earth's atmosphere, hydrosphere, and lithosphere, as well as the processes involved within and among them
- D6. understand the composition of the universe, the interactions within it, and the impacts of humankind's continued attempts to understand and explore it

### **Unifying Concepts**

- E1. describe and appreciate the similarity and diversity of forms, functions, and patterns within the natural and constructed world
- E2. describe and appreciate how the natural and constructed world is made up of systems and how interactions take place within and among these systems
- E3. recognize that characteristics of materials and systems can remain constant or change over time, and describe the conditions and processes involved
- E4. recognize that energy, whether transmitted or transformed, is the driving force of both movement and change, and is inherent within materials and in the interactions among them

**NOTES**