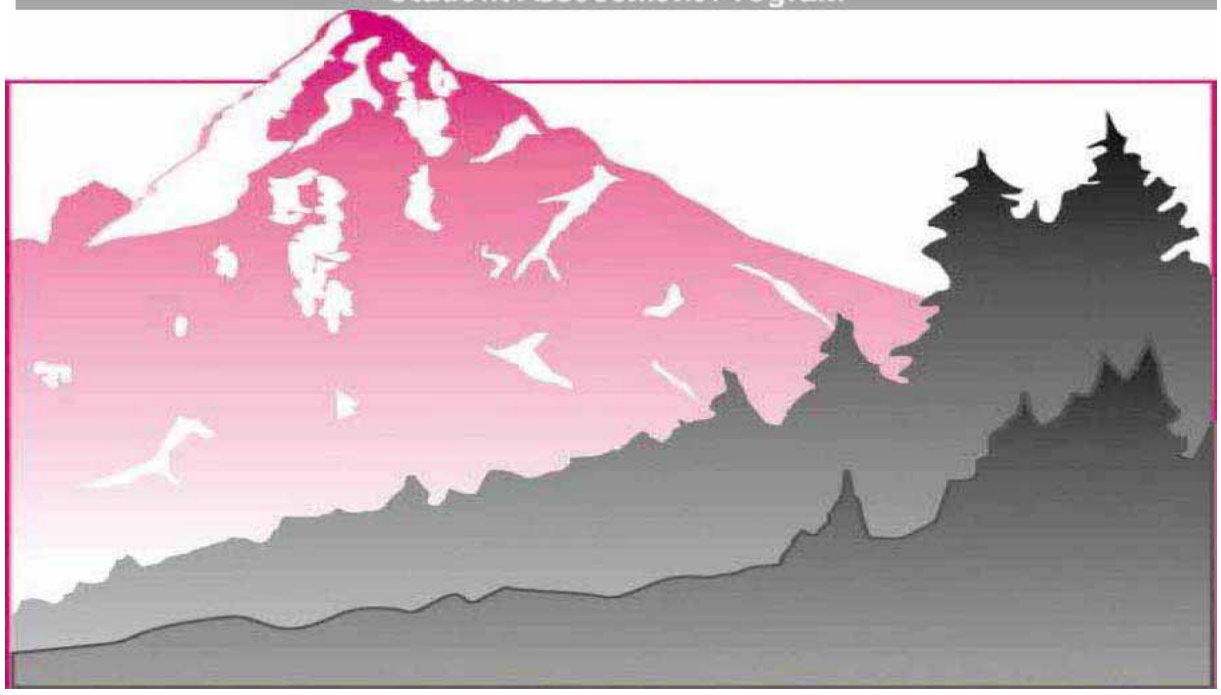
COLORADO

Student Assessment Program



2005-2006 CSAP DEMONSTRATION PACKET

Science Grade 8

CSAP

This page is left intentionally blank.

Table of Contents

The purpose of this document is to inform Colorado teachers of the structure and focus of the new grades 5 and 10 Science CSAP tests and review the grade 8 Science CSAP test that has been administered since 2000. Examples of items already released on the 8th grade Science CSAP tests are provided in this document. The complete demo packet also contains examples from grades 5 and 10. The Unit of Student Assessment, Colorado Department of Education, prepared this packet.

A special thank you to the following science educators: Nancy Kellogg, Don Uhland and Linda Block-Gandy, for their assistance in developing the science demonstration packet, defining the necessary contents of this packet, and their continued dedication to all students in Colorado.

Jeanette Thompson: Science Consultant, Unit of Student Assessment
Elizabeth Celva: Director, Unit of Student Assessment
Colorado Department of Education

Colorado Model Content Standards - Science

Adopted 5-10-95; Amended 11-09-95

Standard 1 Students understand the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations.

Standard 2 **Physical Science:**
Students know and understand common properties, forms, and changes in matter and energy.

Standard 3 **Life Science:**
Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment.

Standard 4 **Earth and Space Science:**
Students know and understand the processes and interactions of Earth's systems and structure and dynamics of Earth and other objects in space.

Standard 5 Students know and understand interrelationships among science, technology, and human activity and how they can affect the world.

Standard 6 Students understand that science involves a particular way of knowing and understanding common connections among scientific disciplines.

The numerical order of the six science standards does not imply any particular judgment regarding their relative importance or teaching priorities. In fact, as the document emphasizes, Standards 1, 5 and 6 should be addressed through the subject matter in the content areas of physical, life and earth/space sciences (Standards 2, 3 and 4). Even though the six science content standards are identified separately, they represent interconnected understanding and knowledge of science.

Rationale statements and Benchmarks for Grades K-4, 5-8 and 9-12 may be found on the CDE website. www.cde.state.co.us

Explanation of Assessment Frameworks

Colorado Model Content Standards contain benchmark statements that define the knowledge and skills Colorado students should acquire in grade level ranges K-4, 5-8, and 9-12. These grade level ranges in science are measured in Colorado's schools using the Colorado Student Assessment Program (CSAP) at grades 5, 8 and 10.

Assessment Frameworks were developed by a group of experienced Colorado science educators to define what will be assessed on the state's paper and pencil, standardized, timed CSAP assessments.

On the CSAP Assessment Frameworks, each benchmark is further refined using example performance tasks and activities. These bulleted statements:

- help clarify the intent of the benchmark while building toward the important ideas and concepts encompassed in the standard.
- guide the development of appropriate questions for the CSAP:
  - ✓ multiple choice
  - ✓ constructed response
- demonstrate the application of varying depth of knowledge in performance tasks and activities reflected on the CSAP:

  Level 1 – Recall and Reproduction

  Level 2 – Skills and Concepts

  Level 3 – Strategic Thinking

  Level 4 – Extended Thinking (*This level requires extended time and is not included in a standardized assessment).*
- demonstrate growing sequential development of student understanding of science concepts from K-10th grade.
- support the development of school level classroom opportunities with multiple assessment options at appropriate levels of difficulty and in alignment with the expectations of the CSAP.
- compliment and encourage best practices in science education in the state of Colorado.

CSAP Frameworks for each grade and content area tested may be found on the CDE website. www.cde.state.co.us

Fact Sheet for Science CSAP – Grades 5, 8 and 10

Test Construction Information

July, 2005

Tests are designed to be given in three 55-minute sessions and each session has a similar composition of item types.

	Grade 5	Grades 8 and 10
Number of Items	70-75	80-83
Number of Points	88	98-100
▪ Number of multiple choice items *(multiple choice items value 1 point each)*	52	60
▪ Number of constructed response items *(constructed response items value from 1-4 points each)*	18	23
Total test score points	88	98-100

Weighting of Standards by Grade Level for Science CSAP

Notes: Standard 6 is combined with Standard 1 during test construction.
Standard 5 is combined with Standards 2, 3, and 4 during test construction.

	Grade 5	Grade 8	Grade 10
Standard	%ScrPts	%ScrPts	%ScrPts
1 *Scientific Inquiry and Investigations*	30	30	30
6 *Connections Between Scientific Disciplines*	4	4	4
2 *Physical Science*	20	20	20
3 *Life Science*	20	20	20
4 *Earth and Space Science*	20	20	20
5 *Science and Technology relating to Human Activity*	6	6	6

Test Scoring

- multiple choice are machine scored
- constructed response are scored by readers hired and trained by the test contractor under specific guidelines from CDE personnel and Colorado teachers
- performance category cut-points are set using the Bookmarking Process (description on CDE website)

Associated materials available on the CDE website www.cde.state.co.us

- Science CSAP Demonstration Packet (available September 2005)
- Assessment Frameworks
- CSAP Item Maps (Grade 8 available now, Grades 5 and 10 available fall 2006)
- Released Items (Grade 8 available now, Grades 5 and 10 available fall 2006)
- Technical Reports and Information

Subcontent Areas:

Standard	Grade 5	Grade 8	Grade 10
1	Experimental Design & Investigation Results and Data Analysis	Experimental Design & Investigation Results and Data Analysis	Experimental Design & Investigation Results and Data Analysis Applied Inquiry
2	*No subcontent area designated	Physics Concepts Chemistry Concepts	Physics Concepts Chemistry Concepts
3	*No subcontent area designated	Life Processes Organisms and their Interactions	Life Processes Organisms and their Interactions
4	*No subcontent area designated	Geology & Astronomy Meteorology & Hydrology	Geology & Astronomy Meteorology & Hydrology

*As a general science assessment, Grade 5 has items categorized within subcontent areas within Standard 1 only.

Points to Ponder about CSAP

or

Be Science Savvy with CSAP

Preparations for CSAP testing are ongoing throughout the school year. The following suggestions will assist you in integrating CSAP with classroom instruction.

1. The Colorado Content Science Standards and Assessment Frameworks are the road maps to success for your students taking the Science CSAP. http://cde.state.co.us/index_assess.htm
2. The vocabulary used in the assessment frameworks is what the teacher may expect the students to understand and verbalize at the appropriate grade levels (5^{th}, 8^{th} & 10^{th}).
3. Science should be taught in a deliberate way. Science standards represent high expectations for **all students** and science instruction should be provided in **all grades.**
4. The teacher is encouraged to:
   - utilize programs and resources that emphasize conceptual development and scientific inquiry
   - give students practice in being assessed using constructed response (CR) items and multiple choice (MC) items
   - include in your classroom standards-based assessment "Item Sets" which involve several items that relate to one standard and may include CR and MC items that incorporate graphs and tables around a topic
5. An on going variety of standards-based assessments should be embedded in the science program such as:
   - teacher observables
   - presentations on research/investigations
   - written explanations in journals/notebooks with teacher feedback
   - teacher prepared standard-based assessments
   - time limits set to give students practice working with time restrictions
6. An assessment objective may be assessed on the CSAP test even though it has not been previously assessed. The objectives are tested on a cyclical basis over time.
7. The Fact Sheet will help the teacher understand how CSAP was constructed. Constructed response items can be assigned more points than multiple choice items. It is important for students to answer both types of items to do well on the test. Encourage your students to answer all items and if time permits review their work.
8. To provide consistency throughout the 5^{th}, 8^{th} and 10^{th} grade CSAP testing:
   - metric units of measurement will be used
   - food webs and food chains should have arrows that describe the path of energy flow through the food web/chain (e.g. grass → cricket → frog)
   - students should always use titles and labels even when not told explicitly to do so when constructing graphs, tables and charts
9. The demonstration items can be modified for different grade levels and expanded to include hands-on inquiry-based investigations.

Hints for Students Taking the CSAP Science Test

The Science CSAP is a standardized test. That means the test is given to all students at your grade level in the entire state of Colorado. It is given to every student exactly the same way with the same amount of time.

- ✓ Learn how to answer each kind of question. CSAP Science tests have two types of questions: multiple choice and constructed response. A constructed response may be a short response, extended response, or a response using tables, graphs, or pictures.
- ✓ Read each question carefully.
- ✓ Check each of your answers to make sure it is the best answer for the question asked.
- ✓ Answer the questions you are sure about first. If a question seems too difficult, skip it and go back to it later.
- ✓ Write your response in the space provided and do not write in the margins.
- ✓ Be sure to fill in the answer bubbles correctly. Do not make any stray marks around answer spaces. Only use a # 2 pencil so the scanner can read your answer.
- ✓ Think positively. Some questions may seem hard to you, but you may be able to figure out what to do if you reread the question carefully and think about what you already know.
- ✓ When you finish the test with time to spare, review your answers to make sure they are reasonable.
- ✓ **RELAX**. Some people get *nervous* about tests. Do your best work.
- ✓ These strategies are not just for CSAP. They will help you do better in all your work.

How to Answer a Constructed Response Question

A constructed response question may require a short answer or an extended response. It has a value of 1 to 4 score points and you can receive full or partial credit. You should try to answer these questions even if you are not sure of the correct answer. If a part of the answer is correct, you may get a portion of the points.

Strategies to help you succeed on the test:

- ✓ Allow more time to answer the constructed response. You are expected to take time to read and think about the question before you write your answer. A short answer response may take you 5 minutes and an extended response may take you longer.
- ✓ When the clock starts on a timed test, glance through the assessment before you begin to see how many items are in the session, how many items are constructed responses, and how much time you have.
- ✓ Read each question carefully and determine what the question asks you to answer.
- ✓ If you do not understand the question, read it again and try to answer one part at a time.
- ✓ Be sure to answer every part of the question.
- ✓ Use the information provided to answer the question.
- ✓ Write your explanations in clear, concise language. Use the space provided for the answer.
- ✓ Do your best to spell words correctly; but if it is not the exact spelling, you may still get credit for your answer.
- ✓ Reread your explanation to make sure it says what you want it to say.
- ✓ Always strive to do your best on every assessment in school whether it is a CSAP test, classroom test, driving test, or a college entrance exam.

Resources from the Web
Released Items for Classroom Assessment

When you are planning your classroom assessments, work with your colleagues in developing assessments and/or choosing assessments aligned to your curriculum, instruction and grade level frameworks. It can be very helpful to find an item in the demonstration packet that is a good fit with your curriculum, instruction and lab investigations. If there is no item available in the demonstration packet, you may look at released items from other states, NAEP and TIMSS. By examining released items and sample items from many standardized assessments, you will be able to create a wide-range of formats that will enable you to choose:

- ✓ the level of difficulty,
- ✓ the level of content depth and knowledge, and
- ✓ the type of item (e.g., multiple choice or constructed response items that meet your needs for a classroom assessment).

Colorado Released Items and Assessment Frameworks
http://www.cde.state.co.us/index_assess.htm

National Assessment of Educational Progress (NAEP), grades 4, 8 & 12
http://nces.ed.gov/nationsreportcard/ITMRLS/NQT_Search.asp?NumSearchResults=1&SearchSubject=Science&SearchIndex=1&SearchStartIndex=1&QuestionsPerPage=20&SearchQuestionSet=0&

Trends in Mathematics and Science Study (TIMSS), grade 4 & 8
http://timss.bc.edu/timss2003i/released.html

Other states have sample or released items. Each state aligns the items to their state standards. It will be important to align your work with CSAP Assessment Frameworks. This is not a complete list but a few websites to get started.

Florida: grades 5, 8 & 10
http://firn.edu/doe/sas/fcat/fcatsmpl.htm

Washington: grades 5, 8 & 10
http://www.k12.wa.us/assessment/WASL/ScienceAssessment.aspx

Michigan: high school released items
http://www.michigan.gov/documents/2003SReleasedSciHST_94240_7.pdf

Michigan: Elementary, Middle and High School Items
http://www.michigan.gov/documents/science02-part2_96915_7.pdf

Massachusetts: released items grades 5, 8, 9 &10
http://www.doe.mass.edu/mcas/2005/release/

Depth-of-Knowledge-Levels – SCIENCE *

The four levels represent a hierarchy based on complexity (rather than difficulty). This difference takes some time to ponder and refine. The hierarchy is based on two main factors: 1) sophistication and complexity, and 2) the likelihood that students at the grade level tested would have received prior instruction or would have had an opportunity to learn the content. Some performance tasks have a low depth-of-knowledge level because the knowledge required is commonly known and student with normal instruction at a grade level should have had the opportunity to learn how to routinely perform what is being asked.

Please note that, in science, "knowledge" can refer both to content knowledge and knowledge of scientific processes. This meaning of knowledge is consistent with the *National Science Education Standards* (NSES), which terms "Science as Inquiry" as its first Content Standard.

Level 1 (Recall and Reproduction)	**Level 2 (Skills and Concepts)**	**Level 3 (Strategic Thinking)**	**Level 4 (Extended Thinking)**
Requires the recall of information, such as a fact, definition, term, or a simple procedure, as well as performance of a simple science process or procedure. Level 1 only requires students to demonstrate a rote response, use a well-known formula, follow a set procedure (like a recipe), or perform a clearly defined series of steps. A "simple" procedure is well defined and typically involves only one step. Verbs such as "identify," "recall," "recognize," "use," "calculate," and "measure" generally represent cognitive work at the recall and reproduction level. Simple word problems that can be directly translated into and solved by a formula are considered Level 1. Verbs such as "describe" and "explain" could be classified at different DOK levels, depending on the complexity of what is to be described and explained. A student answering a Level 1 item either knows the answer or does not: that is, the item does not need to be "figured out" or "solved." In other words, if the knowledge necessary to answer an item automatically provides the answer to it, then the item is at Level 1. If the knowledge needed to answer the item is not automatically provided in the stem, the item is at least at Level 2. Some examples that represent, but do not constitute all of, Level 1 performance are: ▪ Recall or recognize a fact, term, or property. ▪ Represent in words or diagrams a scientific concept or relationship. ▪ Provide or recognize a standard scientific representation for simple phenomenon. ▪ Perform a routine procedure, such as measuring length.	Includes the engagement of some mental processing beyond recalling or reproducing a response. The content knowledge or process involved is **more complex** than in Level 1. Items require students to make some decisions as to how to approach the question or problem. Keywords that generally distinguish a Level 2 item include "classify," "organize," "estimate," "make observations," "collect and display data," and "compare data." These actions imply **more than one step**. For example, to compare data requires first identifying characteristics of the objects or phenomena and then grouping or ordering the objects. Level 2 activities include making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts. Some action verbs, such as "explain," "describe," or "interpret," could be classified at different DOK levels, depending on the complexity of the action. For example, interpreting information from a simple graph, requiring reading information from the graph, is a Level 2. An item that requires interpretation from a complex graph, such as making decisions regarding features of the graph that need to be considered and how information from the graph can be aggregated, is at Level 3. Some examples that represent, but do not constitute all of, Level 2 performance, are: • Specify and explain the relationship between facts, terms, properties, or variables. • Describe and explain examples and non-examples of science concepts. • Select a procedure according to specified criteria and perform it. • Formulate a routine problem, given data and conditions. • Organize, represent, and interpret data.	Requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. The cognitive demands at Level 3 are complex and abstract. The complexity does not result only from the fact that there could be multiple answers, a possibility for both Levels 1 and 2, but because the multi-step task requires more demanding reasoning. In most instances, requiring students to explain their thinking is at Level 3; requiring a very simple explanation or a word or two should be at Level 2. An activity that has more than one possible answer and requires students to justify the response they give would most likely be a Level 3. Experimental designs in Level 3 typically involve more than one dependent variable. Other Level 3 activities include drawing conclusions from observations; citing evidence and developing a logical argument for concepts; explaining phenomena in terms of concepts; and using concepts to solve non-routine problems. Some examples that represent, but do not constitute all of Level 3 performance, are: • Identify research questions and design investigations for a scientific problem. • Solve non-routine problems. • Develop a scientific model for a complex situation. • Form conclusions from experimental data.	Involves high cognitive demands and complexity. Students are required to make several connections—relate ideas within the content area or among content areas—and have to select or devise one approach among many alternatives to solve the problem. Many on-demand assessment instruments will not include any assessment activities that could be classified as Level 4. However, standards, goals, and objectives can be stated in such a way as to expect students to perform extended thinking. "Develop generalizations of the results obtained and the strategies used and apply them to new problem situations," is an example of a grade 8 objective that is a Level 4. Many, but not all, performance assessments and open-ended assessment activities requiring significant thought will be Level 4. Level 4 requires complex reasoning, experimental design and planning, and probably will require an extended period of time either for the science investigation required by an objective, or for carrying out the multiple steps of an assessment item. However, the extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. For example, if a student has to take the water temperature from a river each day for a month and then construct a graph, this would be classified as a Level 2 activity. However, if the student conducts a river study that requires taking into consideration a number of variables, this would be a Level 4. Some examples that represent, but do not constitute all of, a Level 4 performance are: • Based on data provided from a complex experiment that is novel to the student, deduct the fundamental relationship between several controlled variables. • Conduct an investigation, from specifying a problem to designing and carrying out an experiment, to analyzing its data and forming conclusions.

* *Webb, N. University of Wisconsin (2002; Revised 2005). Used with permission.*

CSAP

Science

8th Grade CSAP Demonstration Items

Helpful resources:

Science Assessment Frameworks, Grade 8
http://cde.state.co.us/index_assess.htm

Definition of Terms used in Item Description:

Depth of Knowledge Definitions*: Level of Complexity
Level 1 – Recall and Reproduction
Level 2 – Concepts
Level 3 – Strategic Thinking
Level 4 – Extended Thinking
**Refer to page 12 of this Demonstration Packet for complete definition.*

Level of Difficulty:
E – Easy
M – Moderate
H – Hard

Item Set: A set of items grouped around a common Standard or Content area.

ITEM SET (Items 1- 2)

Directions

Three high school students wanted to investigate how far they could drive if the gas tanks of the cars were full of gasoline. The students went to the same gas station to fill the tanks of the cars. They drove the cars until the gas tanks were nearly empty.

The table below shows all the information the students collected during their investigation. Study the table. Then do Numbers 1 and 2.

Miles Driven by Different Cars

Student	Type of Car	Speed Driven (miles per hour)	Gasoline Tank (gallons)	Type of Road	Miles Driven
1	Trans W	20	12	city streets	380
2	Mark 2002	40	15	country roads	310
3	Apex GXE	60	14	highway	420

1 Based on the investigation, the conclusion was that they could drive farther on a full tank of gasoline in an Apex GXE than they could in the other cars. Give **one** reason the conclusion may be incorrect.

_____

_____

Standard 1 / Assessment Objective 1.6.c
Depth of Knowledge: 2 **Difficulty Level**: M **Type**: Constructed Response

Elements of Correct Answer:

One of the following:
- Experimental conditions for the cars were not the same.
- Any answer that indicates the conclusion may be incorrect due to uncontrolled variables (e.g. amount of gasoline, speed, type of road, etc.)

One-point Rubric

1 point one key element
0 point incorrect key element or no response

Examples of Student Work
(2004 Released Items showing student response and point scores)

Example of a 1 point score:

67 Based on their investigation, the students concluded that they could drive farther on a full tank of gasoline in an Apex GXE than they could in the other cars. Give one reason their conclusion may be incorrect.

They didn't test each car under the same conditions.

Example of a 0 point score:

67 Based on their investigation, the students concluded that they could drive farther on a full tank of gasoline in an Apex GXE than they could in the other cars. Give one reason their conclusion may be incorrect.

one reason this is correct is because that car went the farthest on its tank of gas.

2 Describe **three** specific changes the students could make to improve their experiment.

1) _____

_____

2) _____

_____

3) _____

_____

Standard 1 / Assessment Objective 1.4.b
Depth of Knowledge: 2 **Difficulty Level**: M **Type**: Constructed Response

Elements of Correct Answers:

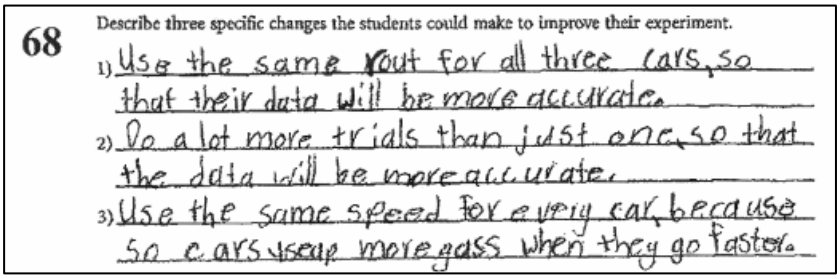
- Drive the cars at the same speed.
- Drive the cars on the same road.
- Put the same amount of gasoline in each car.
- Monitor the amount of gasoline more closely (student may define when the tank is considered empty).
- Conduct more trials of the experiment to obtain more reliable data.
- Have the same person drive each car.

Three-point Rubric

3 points	three correct key elements
2 points	two correct key elements
1 point	one correct key element
0 points	incorrect or no response

Examples of Student Work
(2004 Released Items showing student response and point scores)

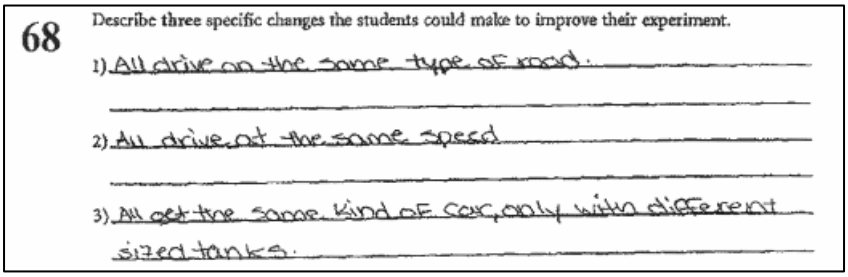
Example of 3 point score:



68 Describe three specific changes the students could make to improve their experiment.

1) Use the same rout for all three cars, so that their data will be more accurate.
2) Do a lot more trials than just one, so that the data will be more accurate.
3) Use the same speed for every car, because so cars useup more gass when they go faster.

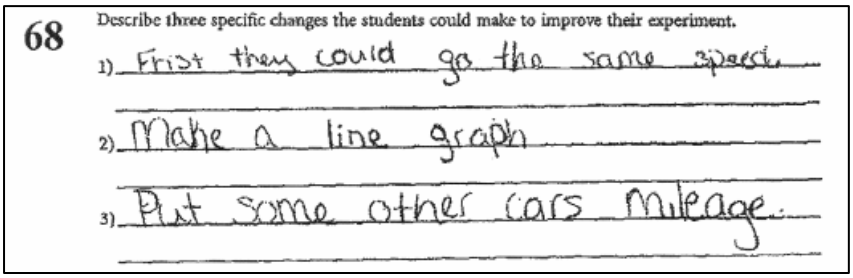
Example of a 2 point score:



68 Describe three specific changes the students could make to improve their experiment.

1) All drive on the same type of road.
2) All drive at the same speed
3) All get the same kind of car, only with different sized tanks.

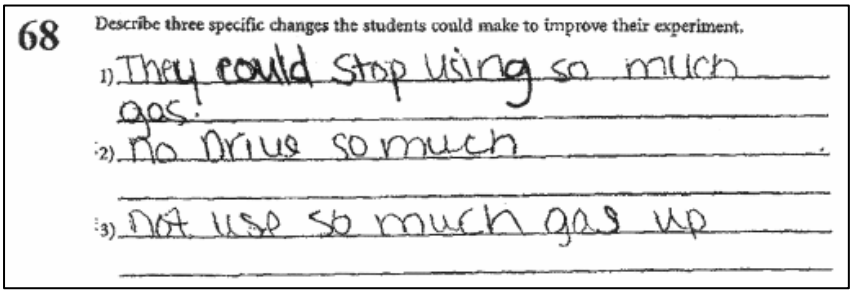
Example of a 1 point score:



68 Describe three specific changes the students could make to improve their experiment.

1) Frist they could go the same speed.
2) Make a line graph
3) Put some other cars mileage.

Example of a 0 point score:



68 Describe three specific changes the students could make to improve their experiment.

1) They could stop using so much gas.
2) No Drive so much
3) Not use so much gas up

Student Name: _____ Date: _____

CSAP

Science

Directions

Three high school students wanted to investigate how far they could drive if the gas tanks of the cars were full of gasoline. The students went to the same gas station to fill the tanks of the cars. They drove the cars until the gas tanks were nearly empty.

The table below shows all the information the students collected during their investigation. Study the table. Then do Numbers 1 and 2.

Miles Driven by Different Cars

Student	Type of Car	Speed Driven (miles per hour)	Gasoline Tank (gallons)	Type of Road	Miles Driven
1	Trans W	20	12	city streets	380
2	Mark 2002	40	15	country roads	310
3	Apex GXE	60	14	highway	420

1

Based on the investigation, the conclusion was that they could drive farther on a full tank of gasoline in an Apex GXE than they could in the other cars. Give **one** reason the conclusion may be incorrect.

_____

_____

Standard 1 / Assessment Objective 1.6.c
Depth of Knowledge: 2 **Difficulty Level**: M **Type**: Constructed Response

2 Describe **three** specific changes the students could make to improve their experiment.

1) _____

_____

2) _____

_____

3) _____

_____

Standard 1 / Assessment Objective 1.4.b
Depth of Knowledge: 2 **Difficulty Level**: M **Type**: Constructed Response

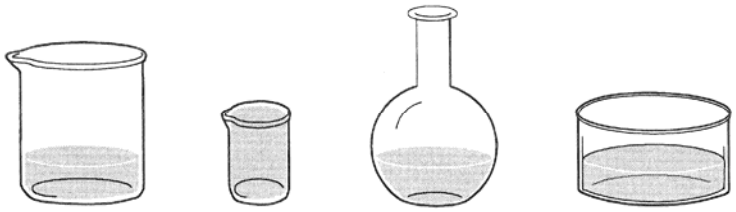
ITEM SET (Items 3 – 9)

Note to Teachers: *Provide opportunities for inquiry-based investigation. Students conduct investigation related to evaporation and then follow up with evaporation investigation set.*

Evaporation Investigation

Three groups of students decided to design experiments to learn more about the process of evaporation.

One group of students used the four different containers shown below.



The students poured 100 milliliters of water at 20°C into each container.
The containers were placed side by side on a table near the window for 24 hours.
The next day the students used a graduated cylinder to measure the amount of water left in each container.

Standard 1
Assessment Objective 1.3.b
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

3 Write **one** question the students were probably trying to answer in their investigation.

_____

_____

Elements of Correct Answers:

One of the following:

- Does container size have any effect on evaporation rate?
- Does container shape have any effect on evaporation rate?
- In what type/kind of container will water evaporate fastest?
- Any question that relates containers' shape or size to evaporation rate.

One-point Rubric

1 point	one correct key element
0 points	incorrect or no response

Standard 1
Assessment Objective 1.1.a
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

4 Explain why the students put the containers side by side instead of putting each container in a different room.

Elements of Correct Answers:

One of the following:
- The containers are put next to one another to reduce error.
- The containers are put next to one another to control for extraneous variable.
- The containers are put next to one another to make the results more comparable/reliable.
- The containers are put next to one another so that experimental conditions are the same for all containers.

One-point rubric

1 point	one correct key element
0 points	incorrect or no response

The second group of students decided to see if different liquids evaporate at the same rate at room temperature. The students decided to test three liquids: freshwater, saltwater, and rubbing alcohol. The students poured 50 mL of each liquid into a separate beaker. All the beakers were placed next to one another on a shelf.

After two days, the students used a graduated cylinder to measure the amount of liquid remaining in each beaker. The table below shows the results.

Results
– After Two Days -

Type of Liquid	Amount of Liquid (mL)
freshwater	35.3
saltwater	38.6
rubbing alcohol	22.7

Standard 1
Assessment Objective 1.6.c
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

5 Before the experiment, the students had the hypothesis that saltwater would evaporate faster than the other liquids. Do the results of the experiment support the hypothesis? Explain your answer.

Element of Correct Answers:

One of the following:

- No, the table shows that less of the freshwater and rubbing alcohol were left.
- No, more liquid evaporated from the beakers containing freshwater and rubbing alcohol.
- No, the amount of freshwater and rubbing alcohol left in the beakers was less than the saltwater.
- No, 11.4 mL of saltwater evaporated which is less than the evaporated freshwater (14.7 mL) and rubbing alcohol (27.3 mL).
- Any explanation that data does not support the hypothesis since more saltwater was left or less saltwater evaporated than the other two liquids.

One-point Rubric

1 point	one correct key element
0 points	incorrect or no response

The third group of students wanted to investigate the effect of temperature on the evaporation rate of water.

The students obtained twelve beakers from the teacher.
They poured 100 milliliters of water at room temperature into each beaker.
The beakers were divided into four groups of three.
Each group of beakers was placed on a separate hot plate.
The water temperatures were maintained at 30°C, 45°C, 60°C, and 75°C respectively.
After four hours, the students measured the amount of water remaining in each beaker.
They calculated the amount of water that had evaporated.

Standard 1
Assessment Objective 1.3.e
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

6 Write a possible hypothesis for the students' experiment.

_____

_____

Elements of Correct Answers:

One of the following:

- Temperature has no effect on the evaporation rate.
- Evaporation will be maximum at 75°C.
- Evaporation will be maximum at 30°C.
- Evaporation will be same at different temperatures.
- Any statement (not a question) relating temperature and evaporation rates.

One-point Rubric

1 point one correct key element
0 points incorrect or no response

Standard 1
Assessment Objective 1.4.d
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

7

Explain why the students used three beakers of water at each temperature rather than just one beaker.

Elements of Correct Answers:

One of the following:

- A bigger sample size leads to reliable, more accurate, data.
- Students used three beakers of water to reduce errors.
- Students used three beakers of water to determine the average result for the experimental data.
- Any answer indicating larger sample sizes yield more reliable results.

One-point Rubric

1 point one correct key element
0 points incorrect or no response

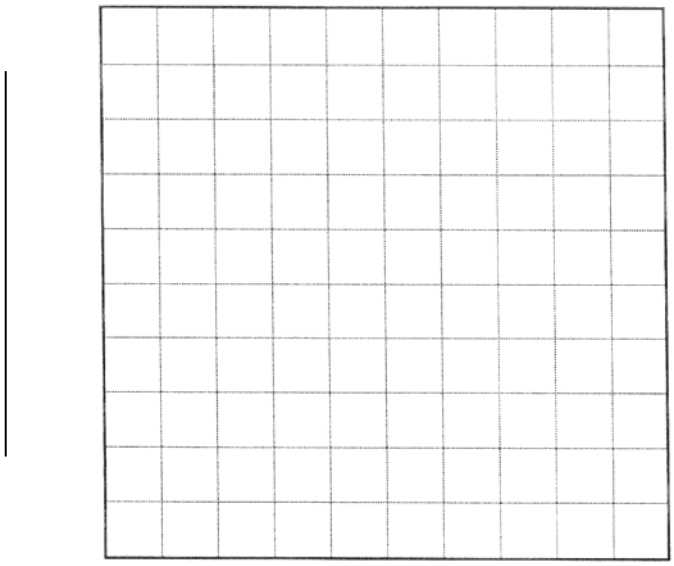
The table below shows the results of the experiment.

Evaporation

Temperature (°C)	Amount of Water Evaporated (mL)			Average Amount of Water Evaporated (mL)
30	1.8	2.1	2.1	2.0
45	6.3	5.6	6.1	6.0
60	11.5	11.0	10.5	11.0
75	21.1	21.2	19.7	21.0

Standard 1
Assessment Objective 1.5.d
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

8 On the grid below, construct a **line graph** to show the relationship between the temperatures of the water and the average amount of water that evaporated.
Be sure to title your graph, label each axis, and indicate the appropriate units for each axis.



Elements of Correct Answers:

	Acceptable examples:	***Unacceptable examples:***
Title	• Temperature vs. Amount of Water Evaporated • Evaporation of Water at Different Temperatures • Degrees vs. mL Evaporated	• Graph • Data Table • Average evaporation • Averages • Evaporation Investigation
Length of Line	• Line may extend beyond points in either direction.	• If the line begins at 0 and connects with the four points, it is incorrect.
Space Utilization	• Scaled from 0-100 on *x*-axis (each line 10) and 0-25 on the *y*-axis (each line 2.5 mL). • Other scales that utilize a majority of graph space are acceptable.	• Scaled less than 0-100 on the *x*-axis with each line being more than 10 or scaled less than 0-25 on the *y*-axis with each line being more than 2.5 mL.
Correct information on both *x*- and *y*-axis	• Temperature on the *x*-axis, Average Amount of Water Evaporated on the *y*- axis.	• Words such as trials, tests, or times are not acceptable.
x-axis labeled with units	• Degrees C (mL if *x*-axis label is average amount of water evaporated).	• Incorrect or no label.
y-axis labeled with units	• mL (Degrees C if the *y*-axis label is Temperature)	• Incorrect or no label.
Data Plotted	• Only the four average amounts of water evaporated may be plotted.	• Any other information plotted on either axis.

Four-point Rubric

Graph Format

2 points six or more correct key elements
1 point four or five key elements
0 points three or less key elements/irrelevant, unclear, or inaccurate information

Graph Accuracy

2 points four data points plotted correctly with a line connecting the points

1 point three data points plotted correctly with a line connecting the points
or
all data points plotted correctly but not connected with a line

0 points three data points plotted correctly but not connected with a line
or
two or fewer data point plotted correctly with a line connecting the points,
or
irrelevant, unclear or inaccurate information

Standard 1
Assessment Objective 1.6.c
Depth of Knowledge: 2 **Difficulty Level:** D **Type:** Constructed Response

9 Using the data table or your graph, predict the amount of water that would evaporate after 4 hours if 100 mL of water were kept at 90°C. Explain your answer.

Element of Correct Answers:

Any amount between 27 and 50 mL.

One of the following:
- As temperature increased from 60 to 75°C, evaporation rate doubled.
- Any explanation indicating extrapolation of the line/curve.
- Any explanation indicating that evaporation rate is increasing with increasing temperature.

Two-point Rubric

2 points	two correct key elements
1 point	one correct key element
0 points	incorrect or no response

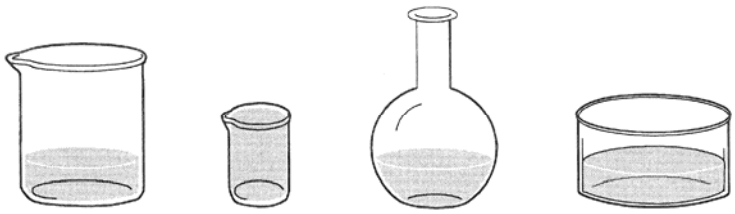
Student Name: _____ Date: _____

CSAP SCIENCE	Item Set 3-9	8th Grade

Evaporation Investigation

Three groups of students decided to design experiments to learn more about the process of evaporation.

One group of students used the four different containers shown below.



The students poured 100 milliliters of water at 20°C into each container. The containers were placed side by side on a table near the window for 24 hours. The next day the students used a graduated cylinder to measure the amount of water left in each container.

3 Write **one** question the students were probably trying to answer in their investigation.

_____

_____

4 Explain why the students put the containers side by side instead of putting each container in a different room.

_____

_____

_____

Item 3

Standard 1 / Assessment Objective 1.3.b		
Depth of Knowledge: 2	**Difficulty Level:** M	**Type:** Constructed Response

Item 4

Standard 1 / Assessment Objective 1.1.a		
Depth of Knowledge: 2	**Difficulty Level:** M	**Type:** Constructed Response

The second group of students decided to see if different liquids evaporate at the same rate at room temperature. The students decided to test three liquids: freshwater, saltwater, and rubbing alcohol. The students poured 50 mL of each liquid into a separate beaker. All the beakers were placed next to one another on a shelf.

After two days, the students used a graduated cylinder to measure the amount of liquid remaining in each beaker. The table below shows the results.

Results
– After Two Days -

Type of Liquid	Amount of Liquid (mL)
freshwater	35.3
saltwater	38.6
rubbing alcohol	22.7

5 Before the experiment, the students had the hypothesis that saltwater would evaporate faster than the other liquids. Do the results of the experiment support the hypothesis? Explain your answer.

_____

_____

_____

_____

Standard 1 / Assessment Objective 1.6.c
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

The third group of students wanted to investigate the effect of temperature on the evaporation rate of water.

The students obtained twelve beakers from the teacher.
They poured 100 milliliters of water at room temperature into each beaker.
The beakers were divided into four groups of three.
Each group of beakers was placed on a separate hot plate.
The water temperatures were maintained at 30°C, 45°C, 60°C, and 75°C respectively.
After four hours, the students measured the amount of water remaining in each beaker.
They calculated the amount of water that had evaporated.

6 Write a possible hypothesis for the students' experiment.

_____

_____

7 Explain why the students used three beakers of water at each temperature rather than just one beaker.

_____

_____

_____

Item 6

Standard 1 / Assessment Objective 1.3.e		
Depth of Knowledge: 2	**Difficulty Level:** M	**Type:** Constructed Response

Item 7

Standard 1 / Assessment Objective 1.4.d		
Depth of Knowledge: 2	**Difficulty Level:** M	**Type:** Constructed Response

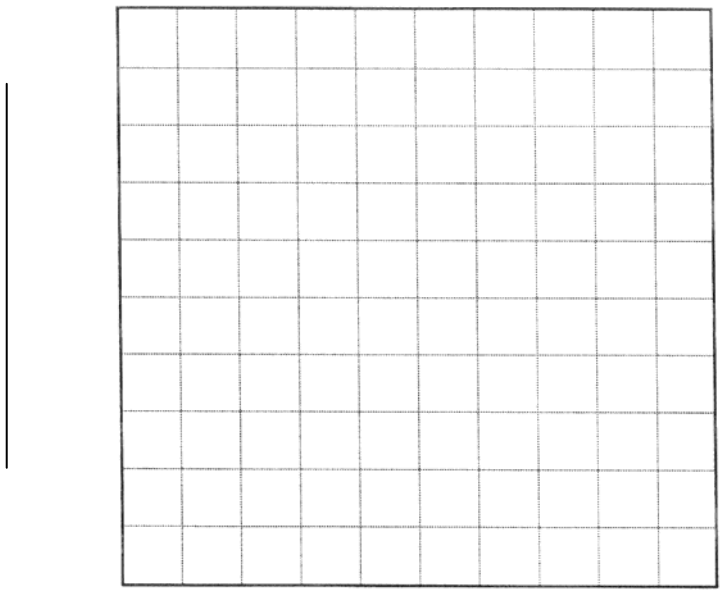
Directions

Below shows the results of the experiment.

Evaporation

Temperature (°C)	Amount of Water Evaporated (mL)			Average Amount of Water Evaporated (mL)
30	1.8	2.1	2.1	2.0
45	6.3	5.6	6.1	6.0
60	11.5	11.0	10.5	11.0
75	21.1	21.2	19.7	21.0

8 On the grid below, construct a **line graph** to show the relationship between the temperatures of the water and the average amount of water that evaporated. **Be sure to title your graph, label each axis, and indicate the appropriate units for each axis.**



Standard 1 / Assessment Objective 1.5.d
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

9

Using the data table or your graph, predict the amount of water that would evaporate after 4 hours if 100 mL of water were kept at 90°C. Explain your answer.

_____

_____

_____

_____

_____

Standard 1 / Assessment Objective 1.6.c
Depth of Knowledge: 2 **Difficulty Level:** D **Type:** Constructed Response

10 Use four steps to describe a process to separate a mixture of iron filings, wood shavings, and salt.

1) _____

_____

2) _____

_____

3) _____

_____

4) _____

_____

Standard 2 / Assessment Objective 2.1.2.a
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

Elements of Correct Answers:

- Any response indicating separating the iron filings - *e.g., using a magnet (1*)
- Any response indicating separating the wood shavings - *e.g., adding water to dissolve the salt (2) and filtering off the wood shavings (3*)
- Any response indicating separating the salt - *e.g., evaporating the water (4*)

Two-Point Rubric

2 points	4 steps in the correct order
1 point	3 steps in the correct order
0 points	2 or fewer steps in the correct order

Student Name: _____ Date: _____

CSAP

Science

10 Use four steps to describe a process to separate a mixture of iron filings, wood shavings, and salt.

1) _____

_____

2) _____

_____

3) _____

_____

4) _____

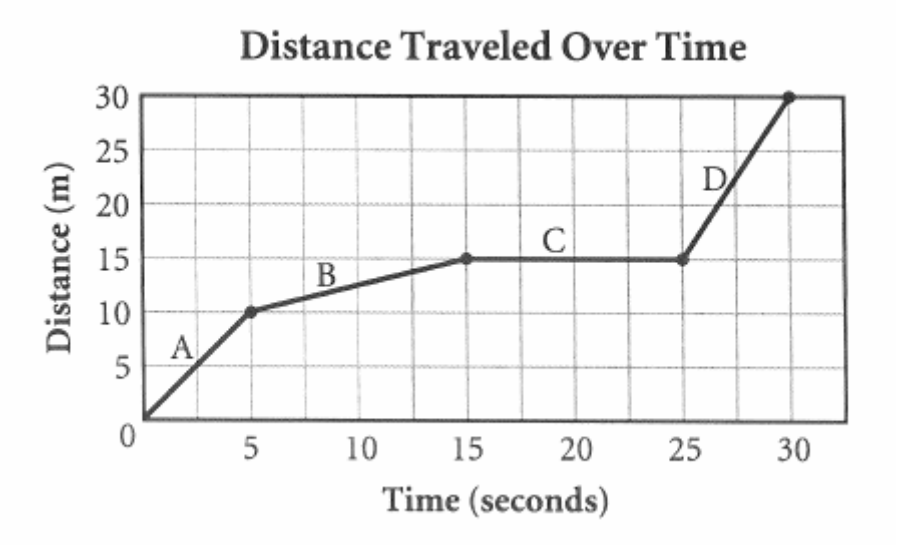
_____

Standard 2 / Assessment Objective 2.1.2.a
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

ITEM SET (Items 11 – 12)

Directions

The graph below shows the distance a student walks down a hall over time. Use the information shown on the graph to do Numbers 11 and 12.



11 During which time interval was the student moving the fastest?

- O A
- O B
- O C
- ● D

Standard 1 / Assessment Objective 1.6.b
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Multiple Choice

12 What was the average speed of the student from 0 to 5 seconds?

Average Speed _____

Standard 2 / Assessment Objective 2.3.5.a
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

Correct Answers:

- 2 meters/second
- 2m/s

One-point Rubric

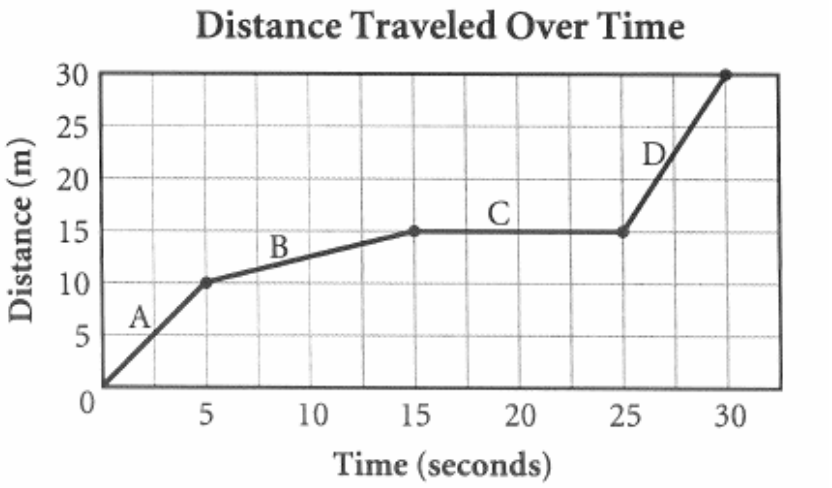
1 point	one correct key element
0 points	incorrect or no response

Student Name: _____ Date: _____

CSAP Science

Directions

The graph below shows the distance a student walks down a hall over time. Use the information shown on the graph to do Numbers 11 and 12.



11 During which time interval was the student moving the fastest.

- o A
- o B
- o C
- o D

12 What was the average speed of the student from 0 to 5 seconds?

Average Speed _____

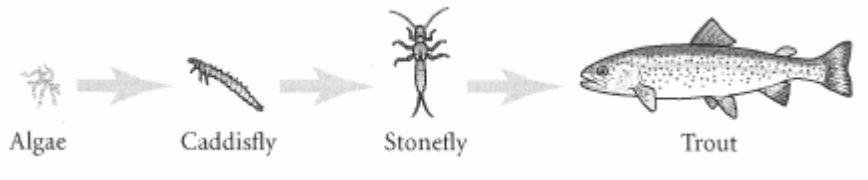
Item 11

Standard 1 / Assessment Objective 1.6.b
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Multiple Choice

Item 12

Standard 2 / Assessment Objective 2.3.5.a
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

13 Study the food chain below.



What two pieces of information about the caddisfly does this food chain provide?

1) _____

2) _____

Explain the effects on the algae and stonefly populations in this food chain if all the caddisflies were killed by a disease. Base your explanations on the food chain.

Algae _____

Stonefly _____

Standard 3 / Assessment Objective 3.1.3.c
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

Elements of Correct Answers:

- Caddisflies eat algae.
- Stoneflies eat caddisflies.
- It tells us what caddisflies eat.
- The feeding relationship.
- The flow of energy/matter from caddisfly to stonefly.
- The flow of energy/matter from algae to caddisfly.
- Where the caddisflies get their energy.

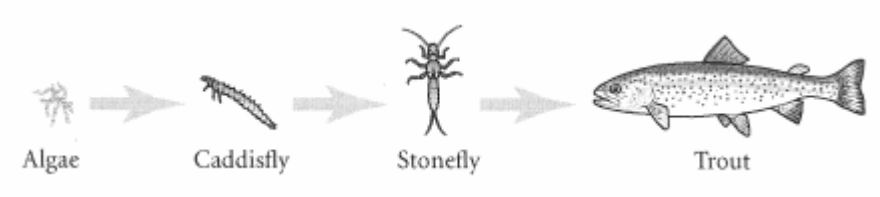
Algae: increase
Stonefly: decrease

Two-point Rubric

2 points	two correct key elements
1 point	one correct key element
0 points	incorrect or no response

CSAP
Science

13 Study the food chain below.



What two pieces of information about the caddisfly does this food chain provide?

1) _____

2) _____

Explain the effects on the algae and stonefly populations in this food chain if all the caddisflies were killed by a disease. Base your explanations on the food chain.

Algae _____

Stonefly_____

Standard 3 / Assessment Objective 3.1.3.c
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

ITEM SET (Items 14 and 15)

Directions

The following table lists characteristics of five different types of animals. Use the information in the table to do Numbers 14 and 15.

Characteristics	Type I	Type II	Type III	Type IV	Type V
Segments	fewer than 5 segments	5 or more segments	fewer than 5 segments	fewer than 5 segments	5 or more segments
Antennae	one pair of antennae	one pair of antennae	no antennae	two pairs of antennae	no antennae
Number of Legs	fewer than 10 legs	10 or more legs	fewer than 10 legs	10 or more legs	no legs
Mandibles	yes	yes	no	yes	no
Exoskeleton	yes	yes	yes	yes	no
Wings	yes	no	no	no	no

14 An animal has 20 body segments and has no mandibles.
Which type of animal is it?

- O Type II
- O Type III
- O Type IV
- ● Type V

Standard 3 / Assessment Objective 3.1.1.e
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Multiple Choice

15 An animal has 12 legs and an exoskeleton.
Which two types of animals could it be?

1) _____

2) _____

What additional information would allow you to decide which type of animal it is?

_____

_____

Standard 3 / Assessment Objective 3.1.1.e
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Multiple Choice

Elements of Correct Answers:

Type II and Type IV

Any answer indicating one of the following:
- Number of antennae
- Number of body segments

Two-point Rubric

2 points	two correct key elements
1 point	one correct key element
0 points	incorrect or no response

Student Name: _____ Date: _____

CSAP
Science

Directions

The table below lists characteristics of five different types of animals. Use the information in the table to do numbers 14 and 15.

Characteristics	Type I	Type II	Type III	Type IV	Type V
Segments	fewer than 5 segments	5 or more segments	fewer than 5 segments	fewer than 5 segments	5 or more segments
Antennae	one pair of antennae	one pair of antennae	no antennae	two pairs of antennae	no antennae
Number of Legs	fewer than 10 legs	10 or more legs	fewer than 10 legs	10 or more legs	no legs
Mandibles	yes	yes	no	yes	no
Exoskeleton	yes	yes	yes	yes	no
Wings	yes	no	no	no	no

14 An animal has 20 body segments and has no mandibles. Which type of animal is it?

- O Type II
- O Type III
- O Type IV
- O Type V

Standard 3 / Assessment Objective 3.1.1.e
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Multiple Choice

15 You observe an animal that has 12 legs and an exoskeleton.
Which two types of animals could it be?

1) _____

2) _____

What additional information would allow you to decide which type of animal it is?

_____

_____

Standard 3 / Assessment Objective 3.1.1.e
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Multiple Choice

16 Describe one natural process that plays a key role in the formation of **sedimentary** rock.

Describe one natural process that plays a key role in the formation of **metamorphic** rock.

Standard 4 / Assessment Objective 4.1.1.c
Depth of Knowledge: 1 **Difficulty Level:** M **Type:** Constructed Response

Elements of Correct Answers:

Sedimentary rock

Any process that describes one of the following:

- Cementation
- Compaction
- Deposition
- Erosion
- Transportation
- Weathering

Metamorphic rock

One of the following:

- Heat
- Pressure
- Chemical transformation/change

Two-point Rubric

2 points	two correct key elements
1 point	one correct key element
0 points	incorrect or no response

Student Name: _____ Date: _____

CSAP
Science

16 Describe one natural process that plays a key role in the formation of **sedimentary** rock.

_____

_____

Describe one natural process that plays a key role in the formation of **metamorphic** rock.

_____

_____

Standard 4 / Assessment Objective 4.1.1.c
Depth of Knowledge: 1 **Difficulty Level:** M **Type:** Constructed Response

17 Which of these is an immediate result of the movement of tectonic plates?

- o ocean currents
- ● earthquakes
- o glaciers
- o tides

Standard 4 / Assessment Objective 4.1.4.a
Depth of Knowledge: 1 **Difficulty Level:** E **Type:** Multiple Choice

CSAP Science

17 Which of these is an immediate result of the movement of tectonic plates?

- O ocean currents
- O earthquakes
- O glaciers
- O tides

Standard 4 / Assessment Objective 4.1.4.a
Depth of Knowledge: 1 **Difficulty Level:** E **Type:** Multiple Choice

18 Choose one of the technologies listed below. Describe one way scientists use it to study Earth.

- **Satellite**
- **Seismograph**

Standard 5 / Assessment Objective 5.4.a
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

Elements of Correct Answers:

- *Satellite*

One of the following:
- Map of the Earth
- Study weather
- Take photographs of earth
- Any other way scientists use satellites

- *Seismograph*

One of the following:
- Study earthquakes
- Study the composition of the earth
- Any other way scientists use seismographs

NOTE: Give credit if the student does not specifically list the technology but it can be inferred from the description.

One-point Rubric

1 point	one correct key element
0 points	incorrect or no response

Student Name: _____ Date: _____

CSAP SCIENCE	Item 18	8th Grade

CSAP
Science

18 Choose one of the technologies listed below. Describe one way scientists use it to study Earth.

- **Satellite**
- **Seismograph**

_____

_____

_____

Standard 5 / Assessment Objective 5.4.a		
Depth of Knowledge: 2	**Difficulty Level:** M	**Type:** Constructed Response

19 Explain why it is practical to use solar energy in Colorado.

Give **one** advantage of using solar energy instead of using natural gas.

Standard 5 / Assessment Objective 5.1.a
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

Elements of Correct Answers:

Any response indicating the abundance of sunlight in Colorado.

One of the following:

- Solar energy is renewable/natural gas is nonrenewable.
- Using solar energy does not give off any harmful substances/burning natural gas gives off harmful substances into the air.
- Solar energy is cheaper over time.

Two-point Rubric

2 points	two correct key elements
1 point	one correct key element
0 points	incorrect or no response

CSAP
Science

19 Explain why it is practical to use solar energy in Colorado.

Give **one** advantage of using solar energy instead of using natural gas.

Standard 5 / Assessment Objective 5.1.a
Depth of Knowledge: 2 **Difficulty Level:** M **Type:** Constructed Response

Colorado Department of Education
Office of Learning and Results
Unit of Student Assessment
201 E. Colfax Ave
Denver, CO 80203
(303) 866-6929