PASS

Partnership for the Assessment of Standards-based Science

Frequently Asked QUESTIONS and Sample Assessment Items

WestEd

P A S S

Partnership for the Assessment of Standards-based Science

Are your schools and students making meaningful progress toward science literacy?

The PASS Science Assessment helps you answer that question—PASS measures your students' growth against national and local science standards.

PASS meets all the NCLB requirements for science assessment.

Frequently Asked Questions **Page**

If you do not find the information you need in the following pages, please call the PASS office at 415-615-3223 to discuss any science assessment question you might have.

I. General Information

Q ***What is PASS?***

A PASS is a valid and reliable standards-based science assessment for elementary, middle and secondary levels. It is effective, reasonably priced, and easy to use. Aligned to the *National Science Standards* and the *Benchmarks for Science Literacy*, PASS is the only widely available assessment product designed specifically for standards-based science programs.

Q ***Why should I use PASS?***

A PASS helps you determine whether your efforts to improve science curriculum and instruction are helping your students make meaningful progress toward science literacy.

Q ***How does PASS differ from other science assessments?***

A PASS is not a standardized, norm-referenced test. PASS is standards-based, and includes a balance of measures. PASS Assessments are developed through a collaboration of teachers, science educators, scientists, and measurement specialists, and are thoroughly tested, valid, and reliable. In contrast, off-the-shelf publisher-developed tests are composed largely of standardized multiple-choice items, and may not be aligned to the national standards.

Q ***Does PASS meet the science assessment requirements of the No Child Left Behind Act?***

A Yes. PASS is valid and reliable, and meets the NCLB requirements, including: grade-level testing; alignment to local and national standards; administration and reporting of multiple measures, including hands-on performance tasks; disaggregation of data; reporting; and dissemination. PASS can work with states and districts to meet the NCLB requirements within the context of local needs and standards.

Q ***Who has used the PASS Assessments?***

A PASS has been used successfully in 22 states and Puerto Rico.

Q ***Is it possible to talk with people who have used this test?***

A Yes. Call PASS at 415-615-3223; we will put you in touch with previous PASS users.

II. Description of the PASS Science Assessment

Q ***Are the PASS Assessments aligned to the National Standards?***

A All PASS assessment items, questions, and tasks are aligned to the content recommendations of both the *National Science Education Standards* and to the *Benchmarks for Science Literacy*. The PASS Development Team analyzed each item, question and task to determine the degree to which its content matches the intent of the *Standards* or *Benchmarks.*

Q ***Can we use the PASS Assessment even if we have developed our own state or local standards for science?***

A Yes. PASS has developed a process to help sites to align their local standards to the PASS Assessments.

Q ***How are the PASS Science Assessments developed?***

A The work of PASS is accomplished by an Assessment Advisory Board in conjunction with an Assessment Development Team. The Development Team, made up primarily of grade-level teachers, also includes scientists, measurement specialists, science resource teachers and science supervisors. They develop, pilot, field test, and revise all assessment components. The Assessment Advisory Board, consisting of systemic initiative leaders, representatives from science reform efforts, scientists, measurement specialists, testing contractors, and business and university representatives, oversees both the progress of the Development Team and the administration, scoring, and reporting of the assessments, ensuring the scientific and psychometric quality of all items and tasks.

Q ***At what grade levels are the PASS Science Assessments available?***

A The PASS Assessments are currently available at the elementary, middle and high school levels, and are usually administered at grades five, eight and ten. Please contact the PASS office if you need to administer the PASS Assessments at an alternate grade level.

Q ***What types of measures are included in the PASS Science Assessments?***

A The standards-based assessments developed by PASS provide a unique balance of measures that are not generally available through standardized, off-the-shelf, test publisher instruments. The PASS Assessments contain hands-on performance tasks, constructed response investigations, open-ended questions and enhanced multiple-choice questions. See Page 8 for a chart outlining the PASS Assessment components.

Q ***Can we view PASS Assessments?***

A Examples of PASS Assessments can be found beginning on Page 9.

III. Administration of the PASS Science Assessments

Q ***How are the PASS Assessments administered?***

A PASS will train the teacher or other test administrator in the set-up and administration of the assessments. The PASS grade level *Test Administration Manuals* contain detailed instructions and a script for administration. Sites can administer the assessments in a classroom, science laboratory, school multi-purpose room, library or cafeteria.

Q ***How long does it take to administer the PASS Assessments?***

A At each grade level, the PASS Assessment consists of three assessment components and some pre-assessment activities. The assessments take about two hours and forty minutes to administer; schools can choose to administer them in one, two, or three days.

Q ***When are the PASS Assessments administered?***

A PASS is generally administered in the Spring of each year. We can also adjust the testing schedule to meet your individual assessment needs. For further information, contact the PASS office at 415-615-3223.

Q ***Do I have to administer the PASS Assessments to a minimum or maximum number of students?***

A PASS encourages potential participants to consider how they plan to use their results when selecting the sample size for testing. For example, if a large urban district with a fifth-grade population of 5,000 students chooses to test only one 30-student class, the sample size will not produce representative data.

Since PASS does not distribute single copies of the assessment, participants should enroll at least one classroom per school. There is no maximum number—states, districts and schools are invited to test all students within a grade level if they choose.

Please call the PASS office at 415-615-3223 if you need assistance in determining the number of students to enroll.

Q ***Can we use the PASS Assessments over multiple years?***

A Yes. PASS encourages regular administration of the PASS Assessments so that sites can measure their growth from year to year. Measurement specialists on the PASS Advisory Board scaled and equated the 1997 and 1998 results to produce scale scores for 1999. The scale score provides a "standard" or "benchmark" that allows sites to examine their growth and performance over multiple years. PASS standards-based assessments provide valuable information and data for schools working to continually improve science education.

IV. Scoring

Q ***How are student results from the performance components of the PASS Science Assessment scored?***

A Participants return all materials to the PASS testing contractor. For the multiple-choice component, students mark their choices on computerized forms which are scanned for correct answers. For the performance tasks, open-ended questions, and constructed response investigations, students write responses directly in their test booklets. PASS uses a carefully constructed scoring procedure to score these responses.

Q ***What is done to ensure that PASS scoring is reliable?***

A PASS conducts large-scale scoring sites to ensure reliable scoring of the performance tasks, constructed response investigations, and open-ended questions. PASS ensures scoring reliability of these performance measures by: developing and piloting scoring rubrics with initial versions of all tasks and questions; training and calibrating all readers at PASS scoring sites; and designing and implementing mechanisms such as double reads and consensus folders.

V. Reporting

Q ***How are PASS scores reported?***

A The PASS standards-based reporting methodology was developed by PASS users in conjunction with the measurement specialists on the Advisory Board to best meet the needs of participating states, districts and schools. The PASS reporting strategy allows sites to measure their own growth against the content recommendations of the *National Science Education Standards* instead of comparing themselves to each other.

PASS reports contain both scale scores and the results of the three assessment components: performance task, constructed response investigation or open-ended question, and enhanced multiple choice. A sample report is included on page 22.

PASS sites can contract with PASS to design and produce individual student reports, reports disaggregated by target group, class profiles, and the like. Sites can purchase their data on a disk in order to design and run their own analyses.

Q ***How are proficiency levels determined?***

A PASS works with states and/or districts to develop and implement their own proficiency levels for reporting PASS results. PASS also conducts standards-setting for states and/or districts to set their performance levels.

Q ***Does PASS provide any materials to help users interpret results?***

A Yes. Along with the PASS *Reports of Results*, which reports data from each assessment component, PASS provides all users with the document *Use of Data*.

VI. Use of Results

Q ***How can we use the PASS results?***

A Participants use PASS results to gather baseline and trend data; demonstrate student achievement; inform instruction; guide professional development; show program impact; and report program impact to funding organizations. Additionally, sites are disaggregating PASS results to determine the effectiveness of their programs for different groups of students; including PASS results in their district accountability matrix as part of school report cards; using PASS results to compare student achievement in schools that are and are not participating in teacher quality activities; and using PASS results to evaluate the quality of curricula and to help change practice.

Q ***Can we use the PASS results as an additional measure to demonstrate program effectiveness?***

A Yes. Along with other indicators of program effectiveness, PASS results can serve as valid and reliable data providing the evidence to inform practice as required by NCLB.

VII. Training and Professional Development

Q ***Does PASS provide training in the set-up and administration of the assessments?***

A Yes. PASS offers training by conference call or video conferencing. Sites may also contract with PASS to conduct on-site training. In addition, detailed and scripted information is provided in the PASS Administration Manuals.

Q ***Does PASS provide training in the use of results?***

A Yes. PASS can provide training in the use of test results. Please contact the PASS office at 415-615-3223 for details.

Q ***What other kinds of training and professional development does PASS provide? (Also see Section IX.)***

A PASS has expanded its professional development services to include the participation of a nationally recognized network, including WestEd staff, with expertise in standards-based curriculum, instruction, and assessment in science. The PASS network can assist participants in the following areas and more: (1) development and scoring of classroom assessments to match school/district curriculum and instruction; (2) use of assessment results and student work to inform instruction; (3) use of targeted classroom interventions; (4) alignment of state and/or district standards to the PASS Assessments; (5) alignment of state and/or district standards to the *National Standards*; (6) workshops on various aspects and types of standards-based science assessment, curriculum, and instruction to help increase assessment literacy skills of teachers and district personnel; and (7) development of scoring rubrics and the scoring of performance assessments.

PASS also provides professional development focusing on the relationship between large-scale and local assessment.

VIII. Research and Technical

Q ***Are the PASS Science Assessments valid and reliable?***

A The PASS Assessments are valid in that they measure the content recommended by the *National Science Education Standards* and the *Benchmarks for Science Literacy*. There is strong consensus on the match of the PASS Assessments to national standards and local standards.

The PASS Assessments are reliable. In analyzing test results, the PASS testing contractor produces item analyses, item bias analyses, statistical summaries and scale scores. Data from these analyses are used in the construction of all final forms, questions and tasks.

For further information about methods used to ensure the validity and reliability of the PASS Assessments, contact the PASS office at 415-615-3223.

Q ***Are the PASS Assessments research-based?***

A The standards-based assessments developed by PASS build on previous research. Please contact the PASS office at 415-615-3223 to obtain a list of relevant references.

IX. Custom Products and Services

Q ***How can PASS customize its products and services?***

A PASS contracts with states, districts, and projects to develop, test, administer, score, and report custom versions of PASS tailored to local needs. VT–PASS was the Vermont state science assessment for grades 5, 9, and 11, meeting all the NCLB science assessment requirements.

PASS has also developed custom versions for a number of science reform and teacher quality projects.

PASS provides comprehensive professional development services (see page 5) to help schools, districts, states and science reform projects with their standards-based science assessment needs. Staff will help states and districts with standards alignment and with correlations of their standards to the PASS assessment. PASS can help teachers and district personnel learn how to use assessment data to inform instruction, improve performance, and monitor growth and progress. PASS staff can also help with the development of classroom-based science assessments aligned to local and national standards. PASS can also provide technical assistance in the development of performance levels and standards setting within the context of state frameworks and standards.

X. PASS Projects

Q ***Does PASS conduct ongoing science assessment research?***

A RISSA, Research in Standards-based Science Assessment, was an NSF-funded project working with science education reform efforts to better measure the impact of their work and also to more effectively use assessment results to inform and improve instruction. RISSA's research will help to expand the existing knowledge base about student learning and assessment practices by investigating questions centered on: (1) the relationship(s) among assessment, instructional practices, and student achievement; and (2) teacher understanding and use of assessment results to inform instruction and change classroom practice.

The study results will support our hypothesis that by training teachers in the interpretation and use of data, and by using targeted classroom interventions based on those data, student achievement scores improve.

The PASS/CSIAC Data Study explored achievement gap issues in science learning. Using 1996–2001 PASS/CSIAC assessment data, the project examined the characteristics of achievement gaps along racial, ethnic, and gender lines. A panel of experts in both measurement and science education reviewed results, summarized findings, and suggested further research in this important area. A comprehensive literature review and final report are being completed.

XI. Using PASS as a Measure of Teacher Content Growth

Q ***How can PASS be used to measure growth in teacher science content?***

A By using a customized version of PASS, programs (e.g., Math-Science Partnerships) are able to demonstrate program effectiveness with PASS results. These customized assessments measure growth in teacher science content knowledge over the life of the targeted teacher learning opportunities. One purpose of the NCLB Title II, Part B, funding is to improve teacher content knowledge in science.

XII. How to Contact PASS

Q ***How do we contact PASS?***

A Contact the PASS office at 415-615-3223, or at PASS@wested.org.

Q ***How do we learn more about PASS?***

A Visit www.wested.org/cs/we/view/serv/84.

XIII. PASS Assessment Components

Component	Description	Purpose
Enhanced Multiple-choice Items (EMC) **(elementary, middle, and high school)**	Each grade level contains six forms of EMC. Each form contains twenty-nine items. A matrix approach is used to sample across students and content standards. Students take one form and record answers on the Student Information Form (SIF).	These questions assess students' understanding of important scientific facts, concepts, principles, laws, and theories, and probe analytical reasoning skills.
Hands-on Performance Tasks (HPT) **(elementary, middle, and high school)**	Hands-on performance tasks provide students the opportunity to construct the "big ideas" of science through inquiry and investigation. These tasks are presented to students with a scenario or story line that identifies a problem to solve in the investigation. Students record answers in a booklet. Responses are scored with a rubric.	Students are provided with hands-on equipment and materials and are asked to: perform short experiments; communicate scientific information; make scientific observations; generate and record data; and analyze their results based on this data.
Open-ended Questions (OEQ) **(elementary, middle, and high school)**	Students are presented with a problem and construct their own answer by writing a short paragraph, drawing a picture, and/or manipulating data. Students record answers in a test booklet. Responses are scored with a rubric.	These questions explore students' ability to communicate scientific information, inquire, reason scientifically, and use science to express positions on societal issues.
Constructed Response Investigations (CRI) **(elementary, middle, and high school)**	Similar to performance tasks, but do not require hands-on materials. Students record answers in a test booklet. Responses are scored with a rubric.	Students are presented with a problem that students in another school are trying to solve. They are provided with data sets and questions. They must analyze the problem, conduct a secondary analysis, revise a hypothesis, construct questions, and recommend solutions.
Student Information Form (SIF)	One-page machine-scorable document. Student background information is reported in their "School Profile."	To collect: student supplied demographic information and answers to multiple-choice items.

XIV. Options for Administration of the PASS Assessment

Option 1 One Day	Option 2 Two Days	Option 3 Three Days
Day 1 (2 hours, 40 minutes) ◆ Pre-assessment Activities 30 minutes ◆ Enhanced Multiple-choice 40 minutes ◆ Open-ended Questions or Constructed Response Investigation 20 minutes ◆ Setup of Performance Task 20 minutes ◆ Instructions for Performance Task 10 minutes ◆ Performance Task 40 minutes	**Day 1 (1 hour, 10 minutes)** ◆ Preassessment Activities 30 minutes ◆ Enhanced Multiple-choice 40 minutes **Day 2 (1 hour, 30 minutes)** ◆ Open-ended Questions or Constructed Response Investigation 20 minutes ◆ Setup of Performance Task 20 minutes ◆ Instructions for Performance Task 10 minutes ◆ Performance Task 40 minutes	**Day 1 (1 hour, 10 minutes)** ◆ Preassessment Activities 30 minutes ◆ Enhanced Multiple-choice 40 minutes **Day 2 (20 minutes)** ◆ Open-ended Questions or Constructed Response Investigation 20 minutes **Day 3 (1 hour, 10 minutes)** ◆ Setup of Performance Task 20 minutes ◆ Instructions for Performance Task 10 minutes ◆ Performance Task 40 minutes

XV. Sample Assessment Items

This section provides samples from previous PASS Assessments at each grade level—elementary, middle, and high school.

The elementary sample includes an enhanced multiple-choice question, an open-ended question, a scoring rubric, and associated *Standards* and *Benchmarks*.

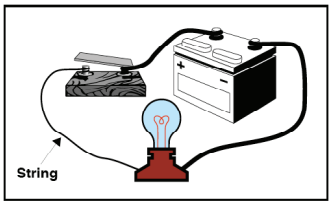
The middle school sample includes a performance task, a scoring rubric, and associated *Standards* and *Benchmarks*.

The high school sample includes an enhanced multiple-choice question, a constructed response investigation, a scoring rubric, and associated *Standards* and *Benchmarks*.

PASS — Sample Assessment Items: Elementary Level

Sample Enhanced Multiple-choice Question

Javier made a complete circuit with some wire, a bulb, a switch, and a battery.



27. Javier decided to replace one of the wires in his circuit with a piece of string. What will happen to the bulb when the switch is pushed down?

A. It will blink.
B. It will not light.
C. It will light immediately.
D. It will light after several minutes.

National Science Education Standard

PS 3.3 – Electricity in circuits can produce light, heat, sound and magnetic effects. Electrical circuits require a complete loop through which electrical current can pass.

Benchmarks for Science Literacy

4E (3-5) 1 – Things that give off light often also give off heat. Heat is produced by mechanical and electrical machines, and any time one thing rubs against something else.

Sample Open-ended Question

Directions:
These are open-ended questions. Your answers will be judged on how well you show your understanding of science and how well you can explain it to others. Please write your responses in the spaces after each question. You may include a picture to help explain your answers.

Wei and Lucia put snails and plants together in a jar of pond water. She sealed the jar and put it under a bright light. After several days she checked the jar and found that the snails and plants were alive and healthy.

1. Explain why they stayed alive

Sample Rubric

Page	Item	Score Range	Scoring Rubric	Other Considerations
2	1	0 – 3	**1 point** for describing relationship between the (sun, plants and animals), (sun and plants), or (plants and animals).	Energy flow: Sun—plants—animals. Photosynthesis.
			1 point for identifying/describing basic needs of living organisms (food/energy, water, support/shelter, oxygen).	
			1 point for identifying/describing the carbon cycle.	$CO_2 + H_2O — C_6H_{12}O_6 + O_2$ $O_2 + C_6H_{12}O_6 — CO_2 + H_2O$

National Science Education Standards

LS 3.1 – All animals depend on plants. Some animals eat plants for food. Other animals eat animals that eat the plants.

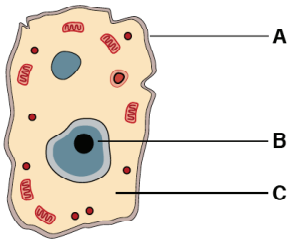
Benchmarks for Science Literacy

5 C (3-5) 1 – Some living things consist of a single cell. Like familiar organisms, they need food, water, and air; a way to dispose of waste; and an environment they can live in.

PASS — Sample Assessment Items: Middle School

Sample Enhanced Multiple-choice Question

Questions 4 and 5 refer to the cell diagram below.



4. In the cellular diagram above, what would be the result of the removal of structure B?

   A. The cell would no longer be able to carry on the life processes and would die.
   B. There would be no consequence from the removal of structure B.
   C. The nucleus would move to another cell.
   D. None of the above.

National Science Education Standards

LS 1.1 – Living systems demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, organs, tissues, organ systems, whole organisms, and ecosystems.

LS 1.3 – Cells carry on the many functions needed to sustain life. They grow and divide, thereby producing more cells. This requires that they take in nutrients, which they use to provide energy for the work that cells do and to make the materials that a cell or an organism needs.

Benchmarks for Science Literacy

5C (6–8) C – Within cells, many of the basic functions of organisms--such as extracting energy from food and getting rid of waste--are carried out. The way in which cells function is similar in all living organisms.

PASS — Sample Assessment Items: Middle School

Sample Performance Task *(Students receive kits of hands-on materials to complete this task.)*

☺ ☺ **with your partner**

Chemical Reactions

Part 1—Partners

Investigation 2
Chemical Reactions

Directions:

In this investigation you will work with your partner to set up and observe three different chemical reactions.

Bag 1:

1. Put into this bag:
   1 level spoonful of Chemical X
   10 ml of Phenol Red
2. Seal this bag.
3. Shake this bag to completely mix the chemicals.

Record your data and observations on your "Chemical Reactions Data Sheet"(next page).

Bag 2:

1. Put into this bag:
   1 level spoonful of Chemical Y
   10 ml of Phenol Red
2. Seal this bag.
3. Shake this bag to completely mix the chemicals.

Record your data and observations on your "Chemical Reactions Data Sheet" (next page).

Bag 3:

1. Fill this bag with:
   1 level spoonful of Chemical X
   1 level spoonful of Chemical Y
   10 ml of Phenol Red
2. Seal this bag.
3. Shake this bag to completely mix the chemicals.

Record your data and observations on your "Chemical Reactions Data Sheet" (next page).

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☺ ☺ **with your partner**

Part 1—Partners

Investigation 2
Chemical Reactions

Chemical Reactions Data Sheet

Observations

Bag 1 Chemical X & Phenol Red	
Bag 2 Chemical Y & Phenol Red	
Bag 3 Chemical X Chemical Y & Phenol Red	

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PASS — Sample Assessment Items: Middle School

Sample Performance Task (continued)

☺ on your own

Part 2—On Your Own

Investigation 2

Chemical Reactions—Questions

Directions:

Use your own notes and observations to answer the following questions. Your answer will be graded on how well you show your understanding of science and how well you can explain it to others.

1. Using the data and observations that you recorded on the "Chemical Reactions Data Sheet," organize your observations in Data Table 1 below.

Data Table 1

	Bag 1 Chemical X and Phenol Red	**Bag 2** Chemical Y and Phenol Red	**Bag 3** Chemical X Chemical Y and Phenol Red
Temperature changes			
Color changes			
Other changes observed			

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☺ on your own

Part 2—On Your Own

Investigation 2

Chemical Reactions—Questions

2. If you weighed the sealed bag with its ingredients before and after the chemical reaction, would you expect the weight to change?

Yes_____ No_____

Using your understanding of matter, explain your answer.

_____

_____

_____

_____

_____

3. Some students decided to use a heat pack to treat a sore shoulder. When they mixed the contents of the heat pack, it gave off heat and stayed hot for awhile. Using your understanding of the chemical reactions in this investigation, explain how you would make your own heat pack and why it would work.

_____

_____

_____

_____

_____

_____

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PASS — Sample Assessment Items: Middle School

Sample Performance Task (continued)

on your own

Part 2—On Your Own

Investigation 2

Chemical Reactions—Questions

4. As part of their investigation, the students heated water to boiling. They poured equal amounts of the water into five containers, each made of a different material. After 15 minutes, they took the temperature of the water in each container and recorded it in Data Table 2 below.

Data Table 2

Materials	Temperature (°C) after 15 minutes
wood	90°
aluminum	72°
glass	80°
copper	70°
hard plastic	83°

From Data Table 2, select two materials you could use to make a heat pack that would keep your hands warm for the longest period of time. Explain your answer.

Material 1_____ Material 2_____

Explain why you would use these two materials.

_____

_____

_____

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on your own

Part 2—On Your Own

Investigation 2

Chemical Reactions—Questions

5. A. In Bag 3, something was produced that inflated the bag. What was produced?

_____

_____

B. How did it make the bag expand? Explain your answer.

_____

_____

_____

_____

_____

_____

Stop

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PASS — Sample Assessment Items: Middle School

Sample Scoring Rubric

Scoring Rubric For Task 2—Chemical Reactions—Grade 8

Page	Item #	Point Value	Scoring Rubric	Other Scoring Considerations
13	**1 * (Bag 1)**	0 - 1	1 pt. for a "Temperature Change" observation: "*bag got hot or warm*."	*** (See addendum for special scoring condition.)**
13	**1 * (Bag 1)**	0 - 1	1 pt. for a "Color Change" observation: "*transparent, or clear pink, or red*." Students may also state that the color "*stayed the same*" or "*remained the same,*" **or** that "*there was no change*"—these are acceptable observations since the color change in this bag was subtle.	*** (See addendum for special scoring condition.)**
13	**1* (Bag 1)**	0 - 1	1 pt. for "Other Changes Observed": "*solids dissolved*" or "*disappeared*."	*** (See addendum for special scoring condition.)**
13	**1 * (Bag 2)**	0 - 1	1 pt. for a "Temperature Change" observation: "*bag got cold*" or "*cool*."	*** (See addendum for special scoring condition.)**
13	**1 * (Bag 2)**	0 - 1	1 pt. for a "Color Change" observation: "*cloudy pink*," "*milky pink*," "*light pink*," **or** "*pink*"; instead of pink, students may also substitute colors like: "*red*," "*fuschia*," "*purple*," "*violet*," or "*magenta*."	*** (See addendum for special scoring condition.)**
13	**1 * (Bag 2)**	0 - 1	1 pt. for "Other Changes Observed": "*less dissolution or minimal dissolution of solids*" **or** "*solids settled to or stayed at the bottom of the bag*"; students may also state that the contents of the bag were "*cloudy*" or "*milky*" **or** that "*there was no change*" or they may write "*None*".	*** (See addendum for special scoring condition.)**
13	**1 * (Bag 3)**	0 - 1	1 pt. for a "Temperature Change" observation: "*the bag got warm*" **or** "*the bag got hot & cold*"; students may also state that the bag had a "*medium temperature*," "*normal temperature*," "*room temperature*," or that the temperature "*stayed the same*".	*** (See addendum for special scoring condition.)**
13	**1 * (Bag 3)**	0 - 1	1 pt. for a "Color Change" observation: "color changed from *pink/red to yellow*"; students may also describe color change as: "*white*," "*creamy*," **or** "*colorless*."	*** (See addendum for special scoring condition.)**
13	**1 * (Bag 3)**	0 - 1	1 pt. for "Other Changes Observed": "*a gas formed*" **and/or** "*a white precipitate formed*"; "*Bubbling*," "*boiling*," "*foamy*," "*bag got bigger*," "*bag expanded*," "*bag exploded*," or "*Swiss Cheese*" are acceptable to imply that a gas formed. "*Creamy mixture*" is acceptable for a white precipitate. Students may detect an "*odor*."	*** (See addendum for special scoring condition.)**

Scoring Rubric For Task 2—Chemical Reactions—Grade 8 (Page Two)

Page	Item #	Point Value	Scoring Rubric	Other Scoring Considerations
14	2a	0 - 1	1 pt. for the correct response of "No."	
14	2b	0 - 1	1 pt. for an answer that explains the "Law of Conservation of Matter" **and/or** the concept of a "Closed System." Acceptable responses include: "the amount of matter before the reaction and the amount of matter after the reaction did not change," **or** "nothing was added or taken away from the bag," **or** "the bag was sealed and no chemicals could get in or out of the bag."	
14	**3 a ***	0 - 1	1 pt. for the correct identification of "Chemical X and Phenol Red." Students may use "red liquid" or "water" as acceptable reactants for Phenol Red. "Calcium chloride" is acceptable for "Chemical X."	*** (See Addendum for special scoring condition.)** {"Draino and water" are not acceptable}
14	3b	0 - 1	1 pt. for an answer that explains that "heat can be liberated or produced in some chemical reactions." Students may state that "When you mix Chemical X and Phenol Red together, it produced heat."	
15	**4 a ***	0 - 1	1 pt. for the correct identification of "wood."	*** (See addendum regarding incorrectly printed prompt.)**
15	**4 b ***	0 - 1	1 pt. for the correct identification of "hard plastic."	*** (See addendum regarding incorrectly printed prompt.)**
15	4c	0 - 1	1 pt. for an answer that explains that "wood" and "hard plastic" are the best insulators. Acceptable responses include: "Water cooled the least in "wood" or "hard plastic" **or** "Less heat escaped from the containers made of "wood" and "hard plastic."	
16	5A	0 - 1	1 pt. for the correct identification that a "gas was produced"; "Air," "carbon dioxide," or "oxygen" are acceptable to imply that a gas was produced.	
16	5B	0 - 1	1 pt. for an answer that explains the nature of gases—"gas molecules are farther apart"; **or** "gases expand, exerting equal pressure in all directions;" **or** "gases take up more space than solids or liquids."	

PASS — Sample Assessment Items: Middle School

The following *Standards* and *Benchmarks* are associated with the sample Performance Task beginning on page 12.

National Science Education Standards

SI 1.3 – Use appropriate tools and techniques to gather, analyze, and interpret data. The use of tools and techniques, including mathematics, will be guided by the question asked and the investigations students design. The use of computers for the collection, summary, and display of evidence is part of this standard. Students should be able to access, gather, store, retrieve, and organize data, using hardware and software designed for these purposes.

SI 1.7 – Communicate scientific procedures and explanations. With practice, students should become competent at communicating experimental methods, following instructions, describing observations, summarizing results of other groups, and telling other students about investigations and explanations.

PS 1.2 – Substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties. In chemical reactions, the total mass is conserved. Substances often are placed in categories or groups if they react in similar ways (e.g., metals).

PS 3.2 – Heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature.

PS 3.5 – In most chemical and nuclear reactions, energy is transferred into or out of a system. Heat, light, mechanical motion, or electricity might all be involved in such transfers.

Benchmarks for Science Literacy

1B (6–8) 1 – Scientists differ greatly in what phenomena they study and how they go about their work. Although there is no fixed set of steps that all scientists follow, scientific investigations usually involve the collection of relevant evidence, the use of logical reasoning, and the application of imagination in devising hypotheses and explanations to make sense of the collected evidence.

4D (6–8) 3 – Atoms and molecules are perpetually in motion. Increased temperature means greater average energy of motion, so most substances expand when heated. In solids, the atoms are closely locked in position and can only vibrate. In liquids, the atoms or molecules have higher energy, are more loosely connected, and can slide past one another; some molecules may get enough energy to escape into a gas. In gases, the atoms or molecules have still more energy and are free of one another except during occasional collisions.

4D (6–8) 4 – The temperature and acidity of a solution influence reaction rates. Many substances dissolve in water, which may greatly facilitate reactions between them.

12D (6–8) 1 – Organize information in simple tables and graphs and identify relationships they reveal.

4E (6–8) 2 – Most of what goes on in the universe—from exploding stars and biological growth to the operation of machines and the motion of people—involves some form of energy being transformed into another. Energy in the form of heat is almost always one of the products of an energy transformation.

PASS — Sample Assessment Items: High School

Sample Enhanced Multiple-choice Question

2. A team of students wants to investigate whether air exerts pressure. They heat an empty soda can and then put a stopper in the opening at the top of the can. They then quickly invert the can in a large beaker of water and observe that the can is "crushed." The best explanation for this event is —

   A. the water pressure crushes the can.
   B. the density of the water is greater than the density of the metal can.
   C. heated air escapes from the can creating a pressure difference between the outside and inside air pressure.
   D. the can is easily crushed because it was poorly constructed.

National Science Education Standards

SI 2.5 – Scientific explanations must adhere to criteria such as: a proposed explanation must be logically consistent; it must abide by the rules of evidence; it must be open to questions and possible modification; and it must be based on historical and current scientific knowledge.

PS 2.5 – Solids, liquids, and gases differ in the distances and angles between molecules or atoms and therefore the energy that binds them together. In solids the structure is nearly rigid; in liquids molecules or atoms move around each other but do not move apart; and in gases molecules or atoms move almost independently of each other and are mostly far apart.

Benchmarks for Science Literacy

1B (9–12) 4 – There are different traditions in science about what is investigated and how, but they all have in common certain basic beliefs about the value of evidence, logic, and good arguments. And there is agreement that progress in all fields of science depends on intelligence, hard work, imagination, and even chance.

4E (9–12) 3 – Transformations of energy usually produce some energy in the form of heat, which spreads around by radiation or conduction into cooler places. Although just as much total energy remains, its being spread out more evenly means less can be done with it.

PASS — Sample Assessment Items: High School

Sample Constructed Response Investigation

Constructed Response Investigation

Yeast

Directions:

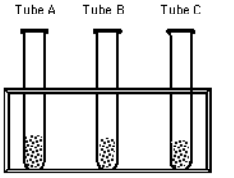
Read the following story and answer the questions related to the investigation that follows. Your answers will be graded on how well you communicate your understanding of science to others.

Karel and Keith decided to conduct an experiment to investigate the conditions that might affect cell reproduction in yeast.

In order to conduct their investigation, they:

- maintained 3 different populations of yeast, **Tube A, Tube B,** and **Tube C** under identical conditions;
- performed cell counts on each population in the same way; and
- recorded their observations and results on the chart below.

Set-up of investigation:



Test Tubes containing Yeast Populations

Results:

Yeast Population Counts

Number of Hours of Incubation	Tube A Number of Yeast Cells/dl	Tube B Number of Yeast Cells/dl	Tube C Number of Yeast Cells/dl
0	9	10	11
24	21	20	19
48	77	80	83
72	110	114	110
96	107	105	103
120	32	29	29

Go To The Next

-1-

1. Using Karel and Keith's results, calculate the average cell count for the 3 tubes of yeast for each hour of growth. Write your answers in the column on the chart below marked **Calculated Average.**

Yeast Population Counts

Number of Hours of Incubation	Tube A Number of Yeast Cells/dl	Tube B Number of Yeast Cells/dl	Tube C Number of Yeast Cells/dl	Calculated Average
0	9	10	11	
24	21	20	19	
48	77	80	83	
72	110	114	110	
96	107	105	103	
120	32	29	29	

2. Explain how you determined your calculations.

_____

_____

_____

3. Use the axis in the space below to graph these population changes over time. Be sure to label your graph.

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PASS — Sample Assessment Items: High School

Sample Constructed Response Investigation (continued)

4. Describe the changes in the average population of yeast over time. What factors may have been affecting the growth?

_____

_____

_____

_____

_____

5. In the space below, design an experiment that would test the effect of one of the factors listed in your answer to question # 3. Tell which factor your are using. Explain your design. Use the steps of the scientific method to design your experiment.

Stop

-3-

Sample Scoring Rubric

Page	Item	Range	Scoring Rubric
2	1	0-1	1 pt. for three or more correctly calculated averages. 0 pts. for less than three or more correctly calculated averages. 10, 20, 80, 11.3, 105, 30
2	2	0-1	1 pt. for valid explanation.
2	3a	0-4	1 pt. for an appropriate line graph of the average population. 1 pt. for correctly labeling the axis. 1 pt. for the correct data points 1 pt. for correct range **and** evenly spaced labeled step increases and tick marks.
3	4	0-3	1 pt for appropriate description(s) of changes in yeast over time. 1 pt for each factor listed affecting growth with a maximum of 2 points awarded. (pH, Temp, space, but not time)
3	5	0-5	1 pt for each of the following: up to 5 points 1. Identifying a valid factor affecting growth. 2. State a Hypothesis 3. Make a Prediction 4. Identify one variable to change 5. Identify control conditions 6. Identify testing conditions 7. Identify data collection method

PASS — Sample Assessment Items: High School

The following *Standards* and *Benchmarks* are associated with the sample Constructed Response Investigation beginning on page 18.

National Science Education Standards

LS 1.2 – Most cell functions involve chemical reactions. Food molecules taken into cells react to provide the chemical constituents needed to synthesize other molecules. Both breakdown and synthesis are made possible by a large set of protein catalysts, called enzymes. The breakdown of some of the food molecules enables the cell to store energy in specific chemicals that are used to carry out the many functions of the cell.

LS 1.4 – Cell functions are regulated. Regulation occurs both through changes in the activity of the functions performed by proteins and through the selective expression of individual genes. This regulation allows cells to respond to their environment and to control and coordinate cell growth and division.

LS 4.4 – Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite. This fundamental tension has profound effects on the interactions between organisms.

SI 1.2 – Design and conduct scientific investigations. Designing and conducting a scientific investigation requires introduction to the major concepts in the area being investigated, proper equipment, safety precautions, assistance with methodological problems, recommendations for use of technologies, clarification of ideas that guide the inquiry, and scientific knowledge obtained from sources other than the actual investigation. The investigation may also require student clarification of the question, method, controls, and variables; student organization and display of data; student revision of methods and explanations; and a public presentation of the results with a critical response from peers. Regardless of the scientific investigation performed, students must use evidence, apply logic, and construct an argument for their proposed solutions.

SI 1.6 – Communicate and defend a scientific argument. Students in school science programs should develop the abilities associated with accurate and effective communication. These include writing and following procedures, expressing concepts, reviewing information, summarizing data, using language appropriately, developing diagrams and charts, explaining statistical analysis, speaking clearly and logically, constructing a reasoned argument, and responding appropriately to critical comments.

SI 2.4 – Mathematics is essential in scientific inquiry. Mathematical tools and models guide and improve the posing of questions, gathering data, constructing explanations and communicating results.

SI 2.5 – Scientific explanations must adhere to criteria such as: a proposed explanation must be logically consistent; it must abide by the rules of evidence; it must be open to questions and possible modification; and it must be based on historical and current scientific knowledge.

PASS — Sample Assessment Items: High School

Benchmarks for Science Literacy

12D (6–8) 2 – Read simple tables and graphs produced by others and describe in words what they show.

4E (9–12) 3 – Transformations of energy usually produce some energy in the form of heat, which spreads around by radiation or conduction into cooler places. Although just as much total energy remains, its being spread out more evenly means less can be done with it.

9B (9–12) 4 – Tables, graphs, and symbols are alternative ways of representing data and relationships that can be translated from one to another.

5C (9–12) 2 – Within the cell are specialized parts for the transport of materials, energy capture and release, protein building, waste disposal, information feedback, and even movement. In addition to these basic cellular functions common to all cells, most cells in multicellular organisms perform some special functions that others do not.

5C (9–12) 5 – Complex interactions among the different kinds of molecules in the cell cause distinct cycles of activities, such as growth and division. Cell behavior can also be affected by molecules from other parts of the organism or even other organisms.

5C (9–12) 7 – Most cells function best within a narrow range of temperature and acidity. At very low temperatures, reaction rates are too slow. High temperatures and/or extremes of acidity can irreversibly change the structure of most protein molecules. Even small changes in acidity can alter the molecules and how they interact. Both single cells and multicellular organisms have molecules that help to keep the cell's acidity within a narrow range.

XVI. PASS — Sample Report

This section provides a sample of PASS reports at the elementary level. Reports for middle and high school assessments are similar in format and content.

PASS

Partnership for Assessment of Standards-based Science
Science Assessment 2004

District: School:
D–S Code: Grade: **5th** Number of Students: **59**

Results for Fifth Grade

Assessment Components

	2002	2003	2004
School Scale Score:	390	N/A	481
District Scale Score:			500
PASS Scale Score:	← 500 →		509

KEY
- N/A Not Applicable
- Not Available
- ←→ Based on anchor population combined for 1997 and 1998

Confidence Interval			School	DIST/SI	PASS
Enhanced Multiple-Choice					
School >20 Students Tested:	± 1.49%	Number of Students Tested:	59	526	7,568
School <21 Students Tested:	± 5.15%	Average Percent Correct:	50%	56%	61%
Earth Science Multiple-Choice					
School >20 Students Tested:	± 1.26%	Number of Students Tested:	59	526	7,568
School <21 Students Tested:	± 4.92%	Average Percent Correct:	50%	54%	57%
Life Science Multiple-Choice					
School >20 Students Tested:	± 1.71%	Number of Students Tested:	59	526	7,568
School <21 Students Tested:	± 5.54%	Average Percent Correct:	51%	61%	65%
Physical Science Multiple-Choice					
School >20 Students Tested:	± 1.71%	Number of Students Tested:	59	526	7,568
School <21 Students Tested:	± 5.76%	Average Percent Correct:	55%	57%	61%
Science Inquiry Multiple-Choice					
School >20 Students Tested:	± 1.44%	Number of Students Tested:	59	526	7,568
School <21 Students Tested:	± 4.85%	Average Percent Correct:	48%	53%	57%
Science and Technology Multiple-Choice					
School >20 Students Tested:	± 1.60%	Number of Students Tested:	59	526	7,568
School <21 Students Tested:	± 6.89%	Average Percent Correct:	48%	56%	61%
Open-Ended Question 1 — Snails & Magnets					
School >20 Students Tested:	± 1.93%	Number of Students Tested:	29	244	3,554
School <21 Students Tested:	± 5.98%	Average Percent Correct:	40%	48%	52%
Open-Ended Question 2 — Musical/Plants					
School >20 Students Tested:	± 1.24%	Number of Students Tested:	27	240	3,536
School <21 Students Tested:	± 3.66%	Average Percent Correct:	27%	31%	34%
Performance Task — Light and Shadows					
School >20 Students Tested:	± 1.88%	Number of Students Tested:	59	514	7,407
School <21 Students Tested:	± 3.37%	Average Percent Correct:	55%	57%	58%