

SCIENCE Assessment

Updates for 2013

Biology End-of-Course (EOC) Exam

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Introduction

Updates for 2013 contains pertinent information for Washington educators. This document includes a summary of changes and new information in science assessment, links to resources for teachers, and sample test items. *Updates for 2013* has been customized into grade levels: Grade 5, Grade 8, and the Biology End-of-Course Exam. The documents are available on <http://www.k12.wa.us/Science/EducatorResources.aspx>

End-of-Course Exam Development Information

Washington State K-12 Science Learning Standards

In 2009, the *K-12 Science Learning Standards* were formally adopted. Along with the new standards, the legislature provided direction for the redesign of the assessment system. The Measurements of Student Progress (MSP) replaced the Washington Assessment of Student Learning (WASL) and assessed the new science standards in grades 5 and 8 in the spring of 2011. A biology End-of-Course (EOC) exam replaced the High School Proficiency Exam (HSPE) in 2012.

View the Washington State K-12 Science Learning Standards at:
<http://www.k12.wa.us/Science/Standards.aspx>

Test and Item Specifications

The *Test and Item Specifications* provide guidelines for developing large-scale assessments based on the Washington State K-12 Science Learning Standards. The science assessment includes systems, inquiry, and application scenarios which reflect the cross-cutting concepts and abilities in the standards. Most items in science assessments are connected to a scenario. Some stand-alone items also appear. Stand-alone items are clearly marked for students on the assessment.

The test specifications provide a grade-level or course test map that delineates the type and number of items. The document also provides a list of science vocabulary words that are necessary for the purposes of the assessment.

The *Test and Item Specifications* are periodically updated. Included with each updated version of the *Test and Item Specifications* will be a summary of the changes made since the previous version. The *Test and Item Specifications* documents can be accessed through the following link:
<http://www.k12.wa.us/Science/TestItemSpec.aspx>.

Item Types

Item Types on the Biology End-of-Course (EOC) Exam

Item Type	Point Value	Items per operational test	Distinguishing Feature(s)
Multiple choice	1	31-34	<ul style="list-style-type: none">Each multiple choice item has four answer choices, the correct answer and three distractors.
Completion	1	1-4	<ul style="list-style-type: none">Each completion item requires the student to write a number, word or short phrase.
Short answer	2	5	<ul style="list-style-type: none">Each short answer item requires a response in the form of phrases or sentences.Short answer items may ask students to do things like write a conclusion or procedure, solve a technological design problem, or describe aspects of biological systems.

Five additional pilot items will be embedded in the EOC. These items are not included in student scores.

Performance Level Descriptors

Performance Level Descriptors (PLDs) give teachers, parents/guardians and students more information about the typical skills and knowledge a student demonstrates on state assessments in each performance level. Committees of Washington state teachers, parents and community members develop the Performance Level Descriptors during the standard setting process.

PLDs are broken down by the score levels students can earn:

- Basic (Level 2)
- Proficient (Level 3)
- Advanced (Level 4)

NOTE: There are no PLDs for Below Basic (Level 1).

PLD documents can be downloaded at

<http://www.k12.wa.us/assessment/StateTesting/PLD/default.aspx> .

Graduation Requirements

Beginning with the spring of 2012, all students taking a biology course participated in an end-of-course exam as directed by the 2010 [Engrossed Substitute Senate Bill 6444](#), section 513 (3). Students in the 10th grade who were not in a biology course were also required to take the biology EOC because of the No Child Left Behind requirement to assess science in high school.

[House Bill 1410](#) defines science assessment and graduation requirements as:

Students in the classes of 2013 and 2014 are not required to pass a state science exam for the purposes of graduation.

Beginning with the class of 2015, students are required to pass the biology EOC. The biology EOC was first available to those students in the spring of 2012.

Refer to <http://www.k12.wa.us/assessment/StateTesting/BiologyEnd-of-CourseExams.aspx> for further information.

2013 Biology EOC Testing Windows

The 2013 Winter Biology EOC will be available from January 2 through February 8, 2013. This assessment is for students in the 10th grade who took the biology EOC as 9th graders but did not pass and for students taking a biology course on a block/trimester schedule.

The 2013 Spring Biology EOC will be available May 6 to June 21, 2013. The schedule for the administration of the end-of-course exam is to be determined locally. Administration is to occur during the last three weeks of the course. This assessment is required for student taking a high school biology course on a yearlong schedule and is required for 10th grade students (in the class of 2015) who have not previously passed the biology EOC.

The exam may be administered in three 50 minute class settings, or in a single session of approximately 150 minutes.

Resources for Educators

Visit <http://www.k12.wa.us/Science/EducatorResources.aspx> for links to the documents listed in this section. Check regularly for new resources.

2012 Lessons Learned from Scoring Student Work

The Science Assessment Team shares observations about student responses to items piloted in 2012 for the Biology EOC in *Lessons Learned from Scoring Student Work*. The purpose of this document is to provide teachers with insight into common misconceptions and errors that may keep students from earning full credit on state assessment items.

2013 Lessons Learned from Scoring Student Work will be available in November and can be downloaded at: <http://www.k12.wa.us/Science/EducatorResources.aspx>.

Teacher Tool

The Teacher Tool provides information about items on the previous year's Biology EOC. A brief description of each item on the exam is provided as well as state-level performance data.

The Teacher Tool is located at <http://www.k12.wa.us/TeacherResourceTool2010-11/default.aspx>.

Sample Item Templates

Templates of questions and the scoring rubrics for common short-answer items used on the biology EOC are available in the form of Word documents. The templates can be edited for use in classroom practice by incorporating content from any science curriculum. If a grade level is marked "N/A" for an item type, this indicates that the item type is not assessed at that grade level.

The templates can be downloaded at: <http://www.k12.wa.us/Science/ItemTemplates.aspx>

Updates for 2012

The 2012 version of this *Updates* document also contains scenarios and items aligned to the *K-12 Science Learning Standards* and can be used for classroom practice. The document can be downloaded at: <http://www.k12.wa.us/Science/EducatorResources.aspx>

New Samples for 2013

The scenarios and items on pages 10 through 21 are samples that are aligned with the *K-12 Science Learning Standards*. These items have not gone through the comprehensive review process that test items must pass before placement on an actual state test. Teachers may still use these items as classroom exercises, or informal checks for understanding, as teachers have the ability and choice to clarify any questions about these items as students are working on them.

The Teacher Answer Pages (pages 23-42) provide the keys, rubrics, and sample student responses.

Printing tip: Print the student pages back-to-back, beginning with the cover sheet on page 10, to preserve pagination.

Student Sample Pages

Student Name: _____

Directions: Answer questions 1 through 5 on pages 11 and 12. They are not connected to a scenario.

- 1** How is cellular respiration by plants similar to the burning of fossil fuels?
- A. Both release oxygen for organisms that are consumers.
 - B. Both break down carbon-containing compounds.
 - C. Both produce ATP.
 - D. Both absorb light.
- 2** Which process increases genetic variation among whale offspring?
- A. Division of cells in mitosis
 - B. Fertilization of egg cells
 - C. Synthesis of proteins
 - D. Assembly of lipids
- 3** Adding habitat is a solution to the problem of decreased butterfly populations in prairie ecosystems. What could be an **unintended** consequence of adding habitat for butterflies?
- A. Beneficial nutrients could be removed from the ecosystem.
 - B. The air temperature could increase in the ecosystem.
 - C. Materials new to the ecosystem could be introduced.
 - D. The amount of light in the ecosystem could increase.

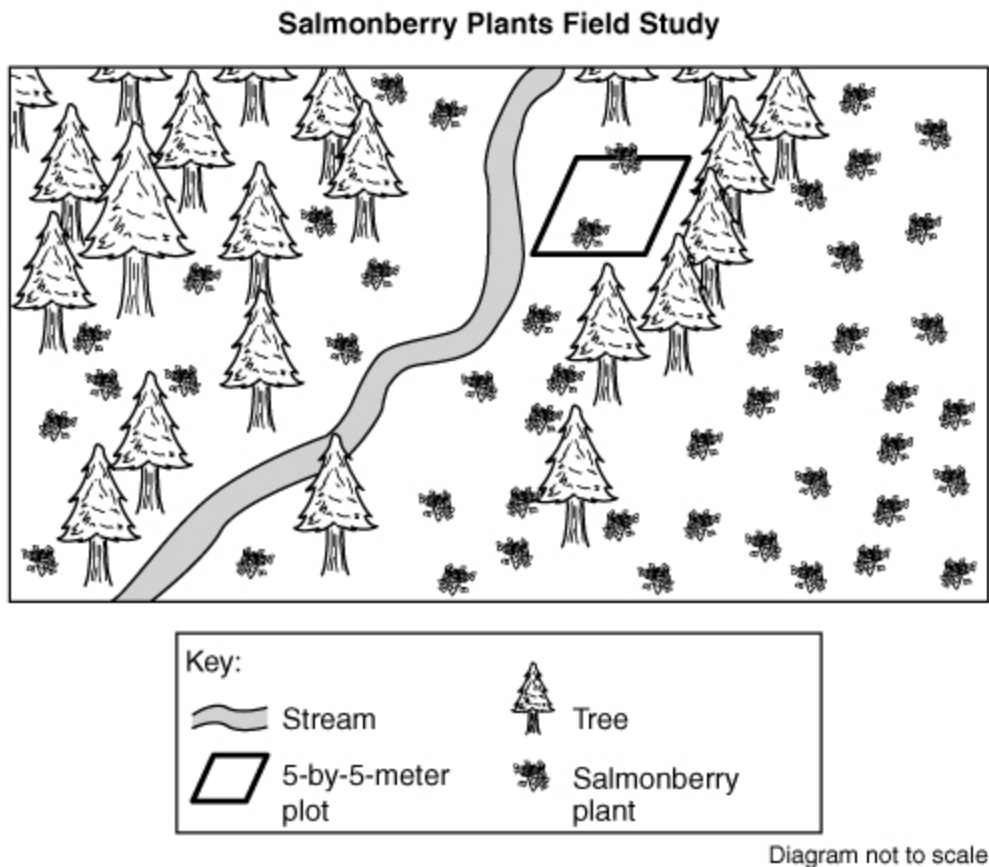
- 4 In mammals, the hormone *insulin* helps decrease the amount of glucose in blood. Which describes a negative feedback system between *insulin* and glucose?
- A. Small amounts of glucose in blood keep *insulin* from working properly.
 - B. *Insulin* is constantly released to prevent low glucose levels in blood.
 - C. *Insulin* causes the addition of large amounts of glucose to blood.
 - D. High levels of *insulin* decrease blood glucose levels.
- 5 Months after a forest fire, some nonnative plants began to grow in the area. Why were these plants able to grow?
- A. The plants were able to survive without water.
 - B. The plants were able to use the ash as chemical energy.
 - C. The plants were able to thrive in the newly formed niches.
 - D. The plants were able to mutate to adjust to the new surface materials.

Salmonberry Plants

Directions: Use the following information to answer questions 6 through 15 on pages 14 through 21.

Salmonberry plants can be found all along the Pacific coast. Salmonberry plants are a food source for many animals in Pacific coast ecosystems including hummingbirds, deer, and bear. Scientists conducted a field study to learn about salmonberry plant populations in different habitats in Washington.

Field Study Question: How does the salmonberry plant population vary by habitat?



Procedure:

1. Go to the salmonberry field study area. Record location, date, time, and temperature.
2. Choose a random location in the forest edge habitat.
3. Measure a 5-meter-by-5-meter plot and label as Plot 1.
4. Count the number of salmonberry plants in Plot 1. Record as Plot 1 for the forest edge habitat.
5. Repeat steps 2 through 4 for Plot 2 and Plot 3, choosing a new location in the forest edge habitat for each plot.
6. Repeat steps 1 through 5 for the stream bank and forest habitats.
7. Calculate and record the average number of salmonberry plants for each habitat.

Data Collected:

Location: Forest edge, stream bank, and forest habitats

Date and Time: May 1, from 11:00 A.M. to 2:00 P.M.

Temperature: 10° C to 15° C

Habitat vs. Number of Salmonberry Plants

Habitat	Number of Salmonberry Plants (in a 5-meter-by-5-meter plot)			
	Plot 1	Plot 2	Plot 3	Average
Forest edge	15	18	15	16
Stream bank	11	13	12	12
Forest	5	5	2	4

- 6** How could the validity of this field study be improved?
- A. Use a fourth habitat type in the field study.
 - B. Count the number of trees in the field study area.
 - C. Use three 1-meter-by-1-meter plots in each habitat.
 - D. Count the salmonberry plants in four plots at each habitat.
- 7** Which output from bears is used by salmonberry plants?
- A. Carbon dioxide from bears is used for photosynthesis in plants.
 - B. Oxygen from bears is used for photosynthesis in plants.
 - C. Glucose from bears is used for respiration in plants.
 - D. Water from bears is used for respiration in plants.

- 8 The results from the field study are shown in The Habitat vs. Number of Salmonberry Plants table. Describe a scientific reason for the results in the forest edge habitat and a scientific reason for results in the forest habitat.

In your description, be sure to:

- Describe a scientific reason for the results in the forest edge habitat.
- Describe a **different** scientific reason for the results in the forest habitat.
- Include data from the Habitat vs. Number of Salmonberry Plants table that supports **each** scientific reason.

Forest edge habitat results:
Forest habitat results:

9 Blackberry plants are found in forest edge habitats. How could blackberry plants limit the population of salmonberry plants?

- A.** Blackberry plants increase oxygen in the ecosystem.
- B.** Blackberry plants lack flowers that attract bees.
- C.** Blackberry plants produce dark purple berries.
- D.** Blackberry plants compete for resources.

10 Salmonberry leaf cells contain 14 chromosomes. How many chromosomes will a new leaf cell contain after mitosis?

Write your answer in the box.

_____ chromosomes

11 Some bears are getting into trash cans at campgrounds near the forest. The park rangers plan to trap and relocate these bears to solve the problem of these bears getting into the trash. Describe two constraints other than cost that park rangers could encounter while trapping and relocating these bears.

In your description, be sure to:

- Identify **two** constraints on trapping and relocating these bears other than cost.
- Describe how **each** constraint is a limitation.

One constraint:
Another constraint:

12 Which event might be evidence that the forest edge habitat is in equilibrium?

- A. A dead tree providing nutrients for a young tree
- B. A bird species leaving as temperatures increase
- C. A landslide damming the stream in the habitat
- D. A flood washing away topsoil from the ground

13 Salmonberry plant roots absorb minerals. What cellular process moves minerals across root cell membranes from an area of **low** mineral concentration to an area of **high** mineral concentration?

- A. Facilitated diffusion
- B. Passive transport
- C. Active transport
- D. Osmosis

- 14** Scientists wondered how the presence of the new type of grass could affect the population of salmonberry plants in a forest ecosystem. What kind of investigation would be most appropriate to answer this question?
- A.** A field study because factors that are hard to control could influence the results
 - B.** A research paper because information is available about many kinds of plants
 - C.** A controlled experiment because all the variables can be kept the same
 - D.** A simulation because computers are more reliable than natural systems

15 Plan a field study to answer the question in the box. You may use any materials and equipment in your procedure.

Be sure your procedure includes:

- logical steps to do the field study
- conditions to be compared
- data to be collected
- method for collecting data
- how often measurements should be taken and recorded
- environmental conditions to be recorded

Field Study Question: How does the total rainfall in different years affect
the mass of berries produced by a salmonberry plant?
Procedure:

Glossary of Non-Scientific Terms for Updates 2013 Document

EOC Biology – Published Fall 2012

Students are permitted to use this Glossary sheet as a reference.

ash	The powdery substance left after something has burned
damming	Stopping the flow of water
landslide	Slipping of rocks or dirt down a slope
park ranger	A person who keeps order and watches out for danger
prairie	Area of land with tall grasses and few trees
trap	Device that is used to catch animals
relocate	Move to a new place
potting soil	Dirt that is used for growing plants in pots
stream	A small river

Teacher Answer Pages

The following pages provide:

- A Scenario Map & Answer Key Table for each scenario with:
 - Item Specification text
 - Item Specification code
 - For example: LS2A(2) is the second item specification for content standard LS2A.
 - Correct answers for the multiple choice questions
 - Typical results for each item have been determined based on pilot results and operational results for similar items assessing the same item specification.
- Rubrics for completion and short-answer items (student words are in italics)
- Annotated (scored) student responses for each of the short-answer items (student words are in italics)

Stand Alone Items

Answer Key Table

Title: Stand Alone items		Grade: Biology EOC (New items written for this Updates document and did not go through the full development cycle.)									
Description: Items not attached to a scenario											
Item Description	Item Specification Code						Answers & Typical Results				
	Systems	Inquiry	Application	Domains of Science			A	B	C	D	
Item Specification Text					Structures & Function	Ecosystems	Biological Evolution				
**1	Compare cellular respiration to the burning of fossil fuels.				LS1B (2)			~60% correct			
**2	Describe that the process of fertilization allows for variation among offspring from a single set of parents.				LS1I (5)			~25% correct			
**3	Describe trade-offs and/or unintended consequences for one or more given solution(s) to a given technological design problem.			APPE (1)					~50% correct		
**4	Describe the regulatory inputs and/or outputs of a given negative feedback system.	SYSA (4)									~30% correct
**5	Explain how filling an available niche can allow a species to survive.						LS3C (2)			~40% correct	
Stand Alone Point Total = 5		1 20%	0 0%	1 20%	3 60%			MC = 5pts			
Actual Biology EOC = 45 points		15%	25%	15%	45%			MC/CP= 35pts, SA=10pts			
**These items were not part of the 2012 Operational Biology EOC.											

Salmonberry Habitats

Scenario Map & Answer Key, Page 1 of 2

Title: Salmonberry Habitats		Grade: Biology EOC (New scenario and items written for this Updates document and did not go through the full development cycle.)									
Description: Students do a field study to investigate how salmonberry plant populations vary by habitat.											
Item Description Item Specification Text		Item Specification Code Domains of Science						Answers & Typical Results			
		Systems	Inquiry	Application	Structures & Function	Ecosystems	Biological Evolution	A	B	C	D
**6	Describe how to improve the validity of an investigation.		INQF (4)					~45% correct			
**7	Describe the cycle of carbon through ecosystems./ <i>Systems</i> thinking can be especially useful in <i>analyzing</i> complex situations. To be useful, a <i>system</i> needs to be specified as clearly as possible.	SYSB *				LS2A (1)		~25% correct			
**8	Generate a logical conclusion that is supported by evidence from the investigation and/or provide a scientific reason to explain the trend in data given a description of and the results from a scientific investigation.		INQC (1)					SA Rubric			
**9	Describe factors that limit growth of plant and/or animal populations in an ecosystem.					LS2C (1)					~85% correct
**10	Describe the process of mitosis and/or the product of mitosis.				LS1H (3)			CP Rubric			
**11	Evaluate the solution(s) with respect to criteria on which to judge success and/or constraints on the solution(s) given one or more solution(s) to a problem that can be solved using a technological design process.			APPC (1)				SA Rubric			
**12	Identify whether a given system is changing or in equilibrium.	SYSB (1)						~75% correct			
**13	Describe the process(es) that allows substances to pass through the cell membrane.				LS1D (2)					~35% correct	

Crossed items are only counted once in a student's total raw score. They are reported in two different strands. The strand with the item specification is the strand used when constructing the MSP, the strand with the content standard and the asterisk () is the secondary reporting strand.

Salmonberry Habitats

Scenario Map & Answer Key, Page 2 of 2

Title: Salmonberry Habitats (continued)		Grade: Biology EOC (New scenario and items written for this Updates document and did not go through the full development cycle.)									
Description: Students do a field study to investigate how salmonberry plant populations vary by habitat?											
Item Description Item Specification Text		Item Specification Code					Answers & Typical Results				
		Systems	Inquiry	Application	Domains of Science			A	B	C	D
Structures & Function	Ecosystems				Biological Evolution						
**14	Describe an appropriate type of investigation for a given investigative question.		INQB (3)					~55% correct			
**15	Describe a plan to answer a given question for a field study.		INQB (2)					SA Rubric			
Scenario Point Total = 13		1 8%	6 46%	2 15%	4 31%			MC/CP= 7pts, SA=6pts			
Actual Biology EOC = 45 points		15%	25%	15%	45%			MC/CP= 35pts, SA=10pts			
**This scenario and all the associated items were not part of the 2012 Operational Biology EOC.											

Crossed items are only counted once in a student’s total raw score. They are reported in two different strands. The strand with the item specification is the strand used when constructing the MSP, the strand with the content standard and the asterisk () is the secondary reporting strand.

Scoring Rubric for Item 8: Salmonberry Plants Best Explanation

Performance Description	Typical results: Mean = -1.0 pts
<p>A 2-point response demonstrates the student understands the Content Standard INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. Item Specification 1: Generate a logical conclusion that is supported by evidence from the investigation and/or provide a scientific reason to explain the trend in data given a description of and the results from a scientific investigation.</p> <p>The response describes a scientific reason for the results in the forest edge habitat and a scientific reason for the results in forest habitat by: Describing a scientific reason for the results in the forest edge habitat AND Describing a different scientific reason for the results in the forest habitat AND Including data from the Habitat vs. Number of Salmonberry Plants table that supports each scientific reason.</p> <p>Examples: Reason for the results in the forest edge habitat:</p> <ul style="list-style-type: none"> • <i>The forest edge habitat grows more plants because the soil has more minerals. There are 12 more plants at the forest edge than in the forest.</i> • <i>The forest edge has more insects visiting the plants so the insects spread more seeds and the forest edge has the most plants.</i> • <i>The data shows more plants in the forest edge than on the stream bank or in the forest. The forest edge has an average of 16 plants and the forest has an average of 4 plants. One reason may be that the forest edge gets the most rainfall.</i> <p>Reason for the results in the forest habitat:</p> <ul style="list-style-type: none"> • <i>The forest habitat has the least plants because the forest is dark in there.</i> • <i>The forest has 4 plants and the forest edge has 12. This is because temperatures are colder in the forest.</i> • <i>The data shows fewer plants in the forest. There are more trees in the forest habitat. I think the trees will use a lot of nutrients in the soil, so the plants don't get as much. The forest has only a 4 plant average.</i> 	~40%
<p>A 1-point response demonstrates the student has partial understanding of the Content Standard. The response describes a scientific reason for the results in the forest edge habitat and includes data from the Habitat vs. Number of Salmonberry Plants table that supports that scientific reason OR describes a scientific reason for the results in the forest habitat and includes data from the Habitat vs. Number of Salmonberry Plants table that supports that scientific reason.</p>	~25%
<p>A 0-point response demonstrates the student has little or no understanding of the Content Standard.</p>	~30% Blank = ~5%

Annotated example of a 2-point response for item 8

8 The results from the field study are shown in The Habitat vs. Number of Salmonberry Plants table. Describe a scientific reason for the results in the forest edge habitat and a scientific reason for results in the forest habitat.

In your description, be sure to:

- Describe a scientific reason for the results in the forest edge habitat.
- Describe a **different** scientific reason for the results in the forest habitat.
- Include data from the Habitat vs. Number of Salmonberry Plants table that supports **each** scientific reason.

Forest edge habitat results:
<i>The forest edge habitat has more sun. The edge has 16 plants and the forest has 4.</i>
Forest habitat results:
<i>The forest habitat has the least plants. The forest is drier because the rain can't get through the trees.</i>

Annotations	Score Points
Forest edge habitat results: ... <i>has more sun.</i>	1
Supporting data: <i>The edge has 16 plants and the forest has 4.</i>	
Forest habitat results: <i>The forest is drier because the rain can't get through the trees.</i>	1
Supporting data: <i>The forest habitat has the least plants.</i>	
Total Points	2

Annotated example of a 1-point response for item 8

8 The results from the field study are shown in The Habitat vs. Number of Salmonberry Plants table. Describe a scientific reason for the results in the forest edge habitat and a scientific reason for results in the forest habitat.

In your description, be sure to:

- Describe a scientific reason for the results in the forest edge habitat.
- Describe a **different** scientific reason for the results in the forest habitat.
- Include data from the Habitat vs. Number of Salmonberry Plants table that supports **each** scientific reason.

Forest edge habitat results:
<i>The forest edge has more birds eating berries and has 12 more plants than the forest.</i>
Forest habitat results:
<i>This is because the forest is shady and it is hard for the plants to grow.</i>

Annotations	Score Points
Forest edge habitat results: ... <i>more birds eating berries</i>	1
Supporting data: ... <i>has 12 more plants than the forest.</i>	
Forest habitat results: <i>This is because the forest is shady...</i>	0
Supporting data: None	
Total Points	1

Annotated example of a 0-point response for item 8

8 The results from the field study are shown in The Habitat vs. Number of Salmonberry Plants table. Describe a scientific reason for the results in the forest edge habitat and a scientific reason for results in the forest habitat.

In your description, be sure to:

- Describe a scientific reason for the results in the forest edge habitat.
- Describe a **different** scientific reason for the results in the forest habitat.
- Include data from the Habitat vs. Number of Salmonberry Plants table that supports **each** scientific reason.

Forest edge habitat results:
<i>There is better soil in the forest edge.</i>
Forest habitat results:
<i>There is less water in the forest.</i>

Annotations	Score Points
Forest edge habitat results: <i>There is better soil...</i>	0
Supporting data: None	
Forest habitat results: <i>There is less water...</i>	0
Supporting data: None	
Total Points	0

Scoring Rubric for Item 10: Salmonberry Leaf Mitosis

Performance Description	Typical results: Mean = ~0.2 pts
<p>A 1-point response demonstrates the student understands the Content Standard LS1H: Genes are carried on chromosomes. Animal cells contain two copies of each chromosome with genetic information that regulate body structure and functions. Most cells divide by a process called mitosis, in which the genetic information is copied so that each new cell contains exact copies of the original chromosomes. Item Specification 3: Describe the process of mitosis (e.g., the genetic information is copied and each of two new cells receives exact copies of the original chromosomes) and/or the product of mitosis (e.g., two cells each with the same number of chromosomes as the original cell).</p> <p>The response describes how many chromosomes a new leaf will contain after mitosis by stating one of the following:</p> <ul style="list-style-type: none"> • 14 • fourteen 	~20%
<p>A 0-point response demonstrates the student has little or no understanding of the Content Standard.</p>	<p style="text-align: center;">~75%</p> <hr/> <p style="text-align: center;">Blank = ~5%</p>

Scoring Rubric for Item 11: Salmonberry Plants Criteria & Constraints

Performance Description		Typical results: Mean = ~0.6 pts										
<p>A 2-point response demonstrates the student understands the Content Standard APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. Item Specification 1: Evaluate the solution(s) with respect to criteria on which to judge success and/or constraints (i.e., limitations) on the solution(s) given one or more solution(s) to a problem that can be solved using a technological design process.</p> <p>The response describes two constraints other than cost that park rangers could encounter while trapping and relocating these bears by: Identifying two constraints on trapping and relocating these bears other than cost And Describing how each constraint is a limitation.</p> <table border="1"> <thead> <tr> <th>Identify constraint</th> <th>Describe how the constraint is a limitation</th> </tr> </thead> <tbody> <tr> <td><i>...other animals besides the bears might get trapped.</i></td> <td> <ul style="list-style-type: none"> <i>...the other animals are not a problem and might get hurt.</i> <i>...the traps will contain the other animal and the bears don't get trapped</i> </td> </tr> <tr> <td><i>...places for the problem bears might be far away</i></td> <td> <ul style="list-style-type: none"> <i>Lots of fuel/time/people will be needed to move the bears</i> </td> </tr> <tr> <td><i>...the bears may be violent</i></td> <td> <ul style="list-style-type: none"> <i>Ranger will need lots of protective gear/special training</i> </td> </tr> <tr> <td><i>...the traps might hurt the bears.</i></td> <td> <ul style="list-style-type: none"> <i>...people will protest the use of the traps/try to prevent the traps</i> </td> </tr> </tbody> </table>		Identify constraint	Describe how the constraint is a limitation	<i>...other animals besides the bears might get trapped.</i>	<ul style="list-style-type: none"> <i>...the other animals are not a problem and might get hurt.</i> <i>...the traps will contain the other animal and the bears don't get trapped</i> 	<i>...places for the problem bears might be far away</i>	<ul style="list-style-type: none"> <i>Lots of fuel/time/people will be needed to move the bears</i> 	<i>...the bears may be violent</i>	<ul style="list-style-type: none"> <i>Ranger will need lots of protective gear/special training</i> 	<i>...the traps might hurt the bears.</i>	<ul style="list-style-type: none"> <i>...people will protest the use of the traps/try to prevent the traps</i> 	~10%
Identify constraint	Describe how the constraint is a limitation											
<i>...other animals besides the bears might get trapped.</i>	<ul style="list-style-type: none"> <i>...the other animals are not a problem and might get hurt.</i> <i>...the traps will contain the other animal and the bears don't get trapped</i> 											
<i>...places for the problem bears might be far away</i>	<ul style="list-style-type: none"> <i>Lots of fuel/time/people will be needed to move the bears</i> 											
<i>...the bears may be violent</i>	<ul style="list-style-type: none"> <i>Ranger will need lots of protective gear/special training</i> 											
<i>...the traps might hurt the bears.</i>	<ul style="list-style-type: none"> <i>...people will protest the use of the traps/try to prevent the traps</i> 											
<p>A 1-point response demonstrates the student has partial understanding of the Content Standard. The response identifies one constraint and describes how the constraint is a limitation.</p>		~35%										
<p>A 0-point response demonstrates the student has little or no understanding of the Content Standard.</p>		~50%										
		Blank = ~5%										

Annotated example of a 2-point response for item 11

11 Some bears are getting into trash cans at campgrounds near the forest. The park rangers plan to trap and relocate these bears to solve the problem of these bears getting into the trash. Describe two constraints other than cost that park rangers could encounter while trapping and relocating these bears.

In your description, be sure to:

- Identify **two** constraints on trapping and relocating these bears other than cost.
- Describe how **each** constraint is a limitation.

One constraint:
<i>One constraint that rangers could encounter while trying to trap and relocate the bear population is that the bears might find their way back to the campground. This is a</i>
<i>limitation because they will have to be trapped again to remove them.</i>
Another constraint:
<i>The traps will have to be very large to contain the bears. Moving the traps will require</i>
<i>special equipment.</i>

Annotations	Score Points
One Constraint: ... <i>the bears might find their way back to the campground.</i>	1
Why this constraint is a limitation: ... <i>they will have to be trapped again to remove them.</i>	
Another Constraint: <i>The traps will have to be very large to contain the bears.</i>	1
Why this constraint is a limitation: <i>Moving the traps will require special equipment.</i>	
Total Points	2

Annotated example of a 1-point response for item 11

11 Some bears are getting into trash cans at campgrounds near the forest. The park rangers plan to trap and relocate these bears to solve the problem of these bears getting into the trash. Describe two constraints other than cost that park rangers could encounter while trapping and relocating these bears.

In your description, be sure to:

- Identify **two** constraints on trapping and relocating these bears other than cost.
- Describe how **each** constraint is a limitation.

One constraint:
<i>One problem is that bears will be hurt by the way they are trapped.</i>
Another constraint:
<i>The traps will get the attention of people. People could interfere with the traps or be caught in them.</i>

Annotations	Score Points
One Constraint: ... <i>that bears will be hurt by the way they are trapped.</i>	0
Why this constraint is a limitation: None	
Another Constraint: <i>The traps will get the attention of people.</i>	1
Why this constraint is a limitation: <i>People could interfere with the traps or be caught in them.</i>	
Total Points	1

Annotated example of a 0-point response for item 11

11 Some bears are getting into trash cans at campgrounds near the forest. The park rangers plan to trap and relocate these bears to solve the problem of these bears getting into the trash. Describe two constraints other than cost that park rangers could encounter while trapping and relocating these bears.

In your description, be sure to:

- Identify **two** constraints on trapping and relocating these bears other than cost.
- Describe how **each** constraint is a limitation.

One constraint:
<i>The rangers might get other animals in there traps.</i>
Another constraint:
<i>The bears might be too fast and get away from the rangers.</i>

Annotations	Score Points
One Constraint: <i>The rangers might get other animals in there traps.</i>	0
Why this constraint is a limitation: None	
Another Constraint: <i>The bears might be too fast and get away from the rangers.</i>	0
Why this constraint is a limitation: None	
Total Points	0

Scoring Rubric for Item 15: Salmonberry Plants New Field Study (page 1 of 3)

Performance Description	Attributes	Typical results: Mean = ~0.8 pts
A 2-point response demonstrates the student understands the Content Standard INQB: Scientific progress requires the use of various methods appropriate for answering different kinds of research question, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying data. Item Specification 2: Describe a plan to answer a given question for a field study.	6–7	~20%
A 1-point response demonstrates the student has partial understanding of the Content Standard.	3–5	~35%
A 0-point response demonstrates the student has little to no understanding of the Content Standard.	0–2	~35%
		Blank= ~10%

Rubric for Item 15: Salmonberry Plants New Field Study (page 2 of 3)

Attributes of a Procedure for a Field Study			
Attribute Name	Description	Attribute	Typical results:
Method for Collecting Data (Controlled Variable)	The procedure states or implies a consistent sampling strategy or technique (e.g., <i>keeps the sampling area the same, count at the same time every day</i>).	1	~30%
Conditions to be Compared (Independent/ manipulated Variable)	Only one independent variable (total rainfall) is identified or implied in the procedure or data table (if given). The independent variable must have at least three conditions to be credited.	1	~50%
Data to be Collected (Dependent/ responding Variable)	The data collected to answer the field study question (mass of berries) is identified or implied in the procedure or data table (if given).	1	~55%
Record Measurements	The procedure states or implies measurements are recorded periodically or gives a data table. Attribute Notes: 1. If artificial data for the responding variable is given, this attribute cannot be credited. 2. The phrase <i>take measurement</i> cannot be used to mean <i>record</i> .	1	~50%
Observations are Repeated	More than one observation for all conditions is planned, or implied in a data table, (e.g., <i>Go to the same plants every year, Repeat steps 4-5 for the same plants.</i>)	1	~40%
Record Environmental Conditions	Procedure identifies or implies recorded observations of at least one local environmental condition that might have an effect on the focus variables (e.g., <i>record air temperature, date</i>)	1	~20%
Logical Steps	The steps of the procedure are detailed enough to repeat the procedure effectively (examples of illogical steps: no ending time indicated, no limitation to the sampling area is given, recording vague data or results).	1	~30%
Total Possible Attributes		7	

Rubric for Item 15: Salmonberry Plants New Field Study (page 3 of 3)

General Notes:

1. **Inappropriate Procedures:** If the response does not plan an appropriate procedure for the given question, the response may not earn any of the possible attributes.
Examples:
 - a) Repeats the procedure from the scenario
 - b) Measures only one condition (therefore cannot establish the controlled or manipulated variables)
 - c) Purposefully changes more than one variable simultaneously.
 - d) Writes a procedure that is too vague to possibly be appropriate
 - e) Writes a prediction instead of a procedure
2. **Naming Attributes:** If the response names a bulleted attribute listed after “Be sure your procedure includes:” without including that attribute in the procedure, the attribute cannot be credited. When a bulleted attribute is named and implied in the response, both must be correct to be credited.
3. **Clarifying Vagueness in Procedures:**
 - a) Measuring a vague parameter (e.g., *observe the berries* instead of mass) may be credited as an independent/manipulated or dependent/responding variable. However, a vague parameter is difficult to repeatedly measure, so the logical steps attributes cannot be credited.
 - b) The term “repeat” at the end of a step refers to that step only.
 - c) The term “repeat” as a separate step (or in a new paragraph) refers to the whole procedure.
 - d) The term “repeat,” when qualified, cannot be credited for multiple trials (e.g., *repeat if necessary, repeat as desired*).
 - e) A vague action that calls for the independent/manipulated variable to be changed (e.g., *change habitat*) without indicating how many times, gives no end to the investigation so the logical steps attribute cannot be credited.
 - f) At high school, a vague action that calls for the independent/manipulated variable to be changed without indicating how many times cannot be credited for more than two conditions of the independent/manipulated variable

Annotated example of a 2-point response for item 15

15 Plan a field study to answer the question in the box. You may use any materials and equipment in your procedure.

Be sure your procedure includes:

- logical steps to do the field study
- conditions to be compared
- data to be collected
- method for collecting data
- how often measurements should be taken and recorded
- environmental conditions to be recorded

Field Study Question: How does the total rainfall in different years affect the mass of berries produced by a salmonberry plant?
Procedure: 1. Go to the forest edge habitat on 8/1/13 and record the location, date, time, air temp. 2. Choose a random location and use a frame to measure a 5 by 5 meter plot. 3. Choose 3 salmonberry plants that are within the frame. 4. Pick 50 berries off of each salmonberry plant. Use a scale to determine the mass. of the berries together and record the data. 5. Do research to determine the total rainfall for the location between 8/1/12 and 8/1/13. Record the rainfall data. 6. Return to the same location on the same date for the next five years and repeat steps 4 and 5 for the same plants.

Attribute Name	Credit	Annotations
Method for Collecting Data (Controlled Variable)	1	Step 3. Choose 3 salmonberry plants that are within the frame. Step 6. Return to the same location... same plants.
Conditions to be Compared (Manipulated Variable)	1	Step 5. ...determine the total rainfall... Step 6. ...for the next five years and repeat steps 4 and 5....
Data to be Collected (Responding Variable)	1	Step 4. ...determine the mass of the berries together...
Record Measurements	1	4. ...record the data. 5. Record the rainfall data.
Observations are Repeated	1	3. Choose 3 salmonberry plants that are within the frame. 6. Return to the same location... same plants.
Record Environmental Conditions	1	1. ...record the location, date, time, air temp.
Logical Steps	1	The steps of the procedure are detailed enough to repeat the procedure effectively.
Total Attributes	7	2 Score Points

Annotated example of a 1-point response for item 15

15 Plan a field study to answer the question in the box. You may use any materials and equipment in your procedure.

Be sure your procedure includes:

- logical steps to do the field study
- conditions to be compared
- data to be collected
- method for collecting data
- how often measurements should be taken and recorded
- environmental conditions to be recorded

Field Study Question: How does the total rainfall in different years affect the mass of berries produced by a salmonberry plant?
Procedure:
<i>Step 1. Go to a forest.</i>
<i>Step 2. Choose a salmonberry plant.</i>
<i>Step 4. Pick berries off of the plant and mass them.</i>
<i>Step 5. Record the mass and the rainfall for the year.</i>
<i>Step 6. Repeat every year.</i>

Attribute Name	Credit	Annotations
Method for Collecting Data (Controlled Variable)	0	None
Conditions to be Compared (Manipulated Variable)	1	<i>Step 5...the rainfall for the year.</i>
Data to be Collected (Responding Variable)	1	<i>Step 4. ...mass them (the berries).</i>
Record Measurements	1	<i>Step5. Record the mass...</i>
Observations are Repeated	1	<i>Step 6. Return every year.</i>
Record Environmental Conditions	0	None
Logical Steps	0	General note 3e: Give no ending time for the investigation (<i>Repeat every year.</i>)
Total Attributes	4	1 Score Points

Annotated example of a 0-point response for item 15

15 Plan a field study to answer the question in the box. You may use any materials and equipment in your procedure.

Be sure your procedure includes:

- logical steps to do the field study
- conditions to be compared
- data to be collected
- method for collecting data
- how often measurements should be taken and recorded
- environmental conditions to be recorded

Field Study Question: How does the total rainfall in different years affect the mass of berries produced by a salmonberry plant?
Procedure:
1. <i>Get all materials</i>
2. <i>Find a good spot</i>
3. <i>Find the mass of the berries</i>
4. <i>Repeat steps</i>
5. <i>Record</i>

Attribute Name	Credit	Annotations
General Note 1b. Measures only one condition		
Method for Collecting Data (Controlled Variable)	0	
Conditions to be Compared (Manipulated Variable)	0	
Data to be Collected (Responding Variable)	0	
Record Measurements	0	
Observations are Repeated	0	
Record Environmental Conditions	0	
Logical Steps	0	
Total Attributes	0	0 Score Points

Get involved and keep informed:

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Science educators in Washington are invited to participate on the Science Assessment Leadership Team to provide content and grade-level expertise throughout the process of developing state tests. To get more information and to join the team, please fill out the application located on our website:

<http://www.k12.wa.us/Science/ProfDevelopment.aspx>

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Resources/Contact Information

Science Assessment Webpage:

<http://www.k12.wa.us/science/>

OSPI Moodle Server:

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