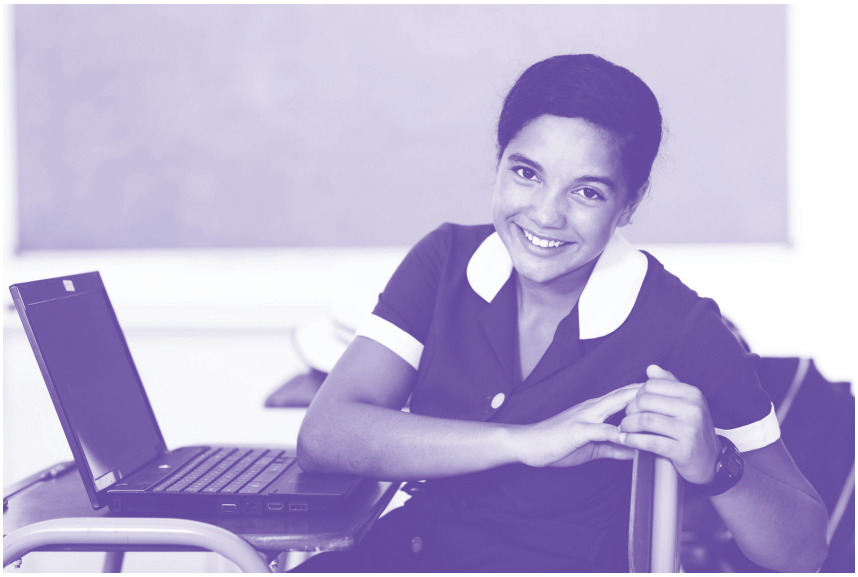


Exemplar Science Test Questions

Computer-Based Tests

ACT® Aspire™

discoveractaspire.org

We invite educators, administrators, and policymakers to learn about ACT Aspire™ by viewing the collection of sample computer-based test (CBT) questions online and in this booklet. The questions illustrate a variety of content from across grade bands and show different types of test questions and formats. This booklet also explains the concepts being measured and provides an answer key for the exemplar questions.

The exemplar ACT Aspire test questions should be accessed online with a desktop or laptop computer rather than a tablet or smartphone. Please note that the platform in which the questions are currently housed does not represent the final platform on which the ACT Aspire assessment will be delivered.

Login Information

To view the exemplar ACT Aspire CBT questions online, visit **tn.actaspire.org**. Usernames and passwords for the various subject areas can be found in the following table.

Subject	Username	Password
English	english	actaspire
Reading	reading	actaspire
Math	math	actaspire
Science	science	actaspire
Writing Grade 9	writing9	actaspire
Writing Grade 8	writing8	actaspire
Writing Grade 7	writing7	actaspire
Writing Grade 6	writing6	actaspire
Writing Grade 5	writing5	actaspire
Writing Grade 4	writing4	actaspire
Writing Grade 3	writing3	actaspire

Technical Support

For technical support related to this exemplar set of ACT Aspire CBT questions, please contact us by phone at 888.802.7502 or by email at **actaspire_implementation@actaspire.org**.

Additional Information

For more information about the ACT Aspire assessment system, visit **www.discoveractaspire.org**.

Contents

Introduction

The ACT Aspire™ Science tests focus on the assessment of science practices using real-world scientific scenarios. At the earlier grades, topics generally focus on everyday student discovery rather than formal science. The scenarios in the upper grade assessments include student investigations, formal scientific research, formal scientific data from references, and students or scientists providing competing explanations for real scientific phenomena.

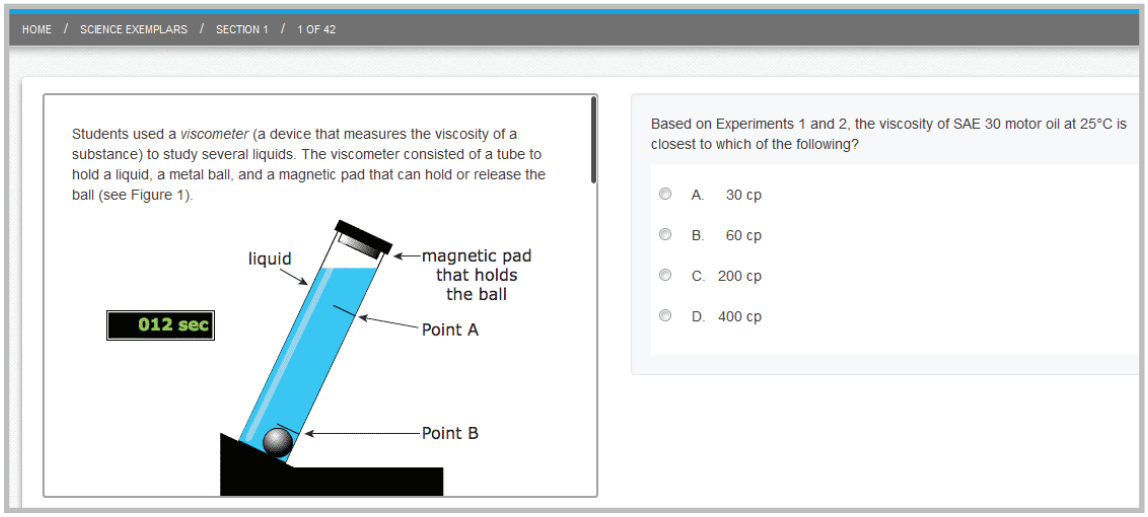
The content of the tests includes material from biology (life sciences at the earlier grades), chemistry and physics (physical science at the earlier grades), and Earth/space sciences (such as geology, astronomy, and meteorology). Advanced knowledge in these areas is not required, but background knowledge acquired in general, introductory science courses may be needed to answer some of the questions in the upper grade assessments. The tests do not, however, sample specific content knowledge with enough regularity to make inferences about a student's attainment of any broad area, or specific part, of the science content domain. The ACT Aspire tests stress science practices over recall of scientific content, complex mathematics skills, and reading ability. To that end, the ACT Aspire Science tests assess science practices in three domains: Interpretation of Data; Scientific Investigation; and Evaluation of Models, Inferences, and Experimental Results.

The ACT Aspire tests currently include selected-response questions, technology-enhanced items (computer-based delivery only), and constructed-response tasks. In the technology-enhanced items, students must carry out actions such as moving objects, typing in their answers, and manipulating bar and line graphs to provide their responses. The constructed-response tasks require students to produce, rather than select, a response. Constructed-response tasks assess complex reasoning or thinking skills by providing opportunities for students to explain, justify, critique, create, propose, produce, design, or otherwise demonstrate their knowledge and understanding in ways that are not typically assessed through selected-response items. Constructed-response tasks are scored according to scoring criteria unique to each item. The scoring criteria identify the specific information a student needs to include for a valid and complete response. Depending on the item, a holistic rubric may also be used to score the item. The holistic rubric is used to assess the overall proficiency of the response, allowing for differentiation among multiple skill levels. Some constructed-response tasks, called composite tasks, blend technology-enhanced or selected-response elements with open response.

Answer Key

The following pages show the grade,[1] item type, depth-of-knowledge level,[2] alignment to the ACT Aspire reporting categories, and the correct response for each question. The pages also include explanations of the questions and the correct responses.

Question 1



Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
1	EHS	Selected Response	2	Interpretation of Data	D

This item requires the examinee to combine data from Table 2 with data from Figure 2.

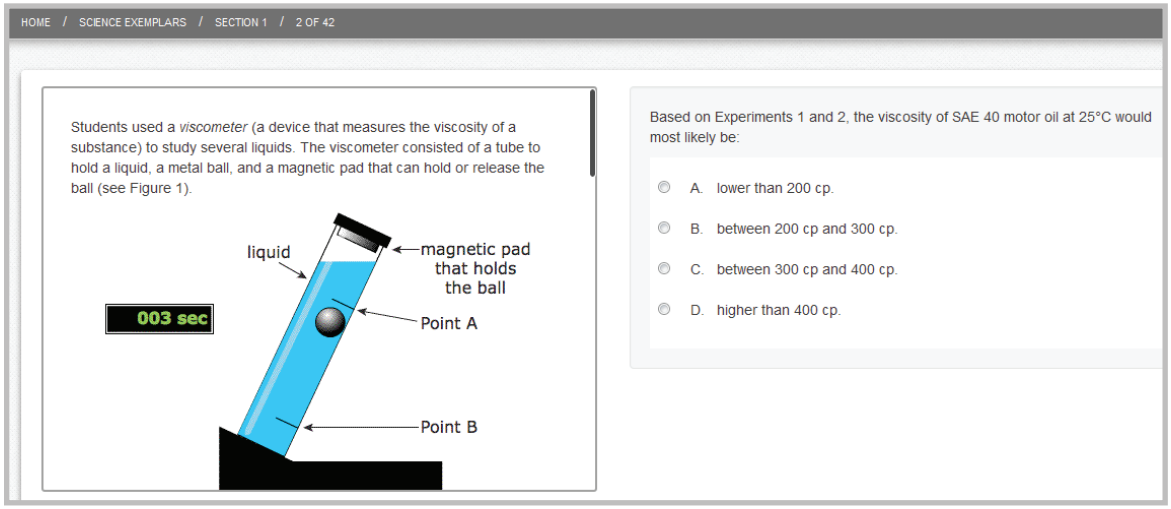
Explanation of Correct Response

The roll time listed in Table 2 for SAE 30 motor oil is 60 sec. In Figure 2, a roll time of 60 sec is expected for a liquid that has a viscosity of about 400 cp.

[1] Early High School is abbreviated EHS throughout this booklet.

[2] Norman L. Webb, "Depth-of-Knowledge Levels for Four Content Areas," last modified March 28, 2002, http://facstaff.wcer.wisc.edu/normw/All%20content%20areas%20%20DOK%20levels%2032802.doc.

Question 2



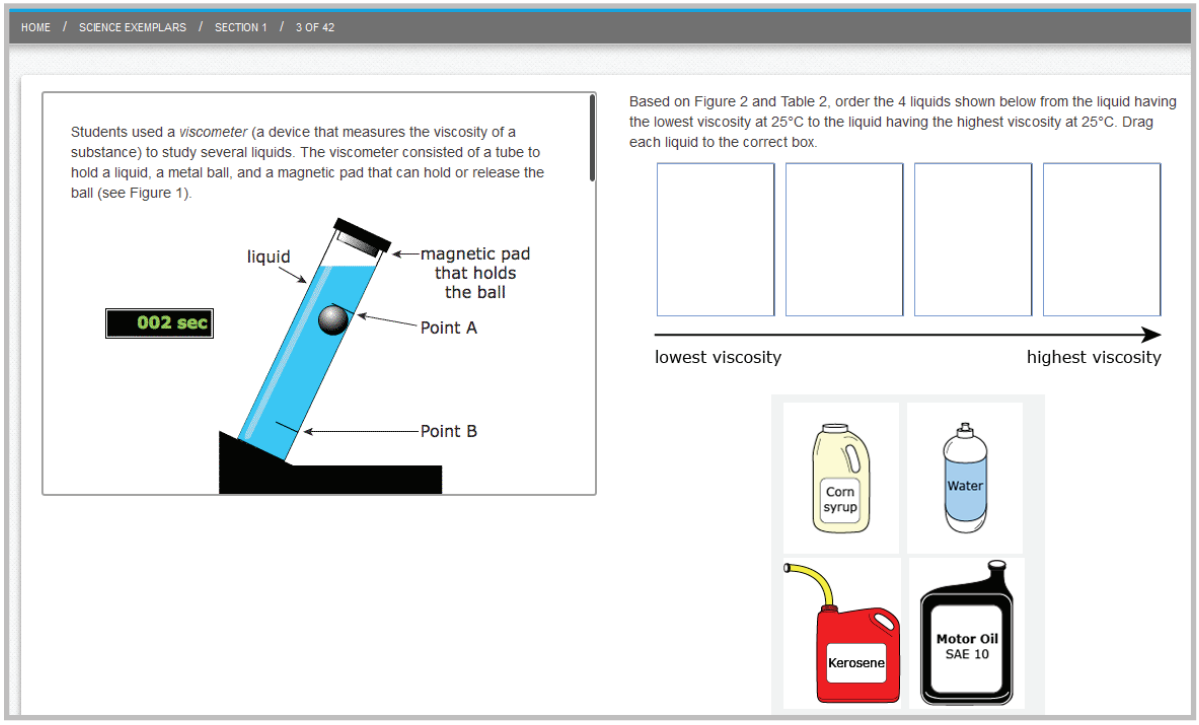
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
2	EHS	Selected Response	2	Interpretation of Data	D

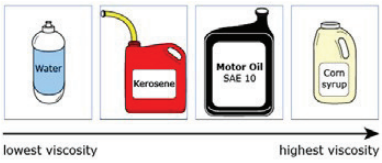
This item requires the examinee to interpolate from the data in Table 2 in order to determine a value and then compare that value with data in Figure 2.

Explanation of Correct Response

The roll time for SAE 40 motor oil would be between that listed in Table 2 for SAE 30 motor oil (60 sec) and SAE 50 motor oil (180 sec). In Figure 2, the viscosity of a liquid that has a roll time of 60 sec is approximately 400 cp, and the viscosity of a liquid that has a roll time of 180 sec would be greater than 1,000 cp, so the viscosity of SAE 40 motor oil must be greater than 400 cp.

Question 3



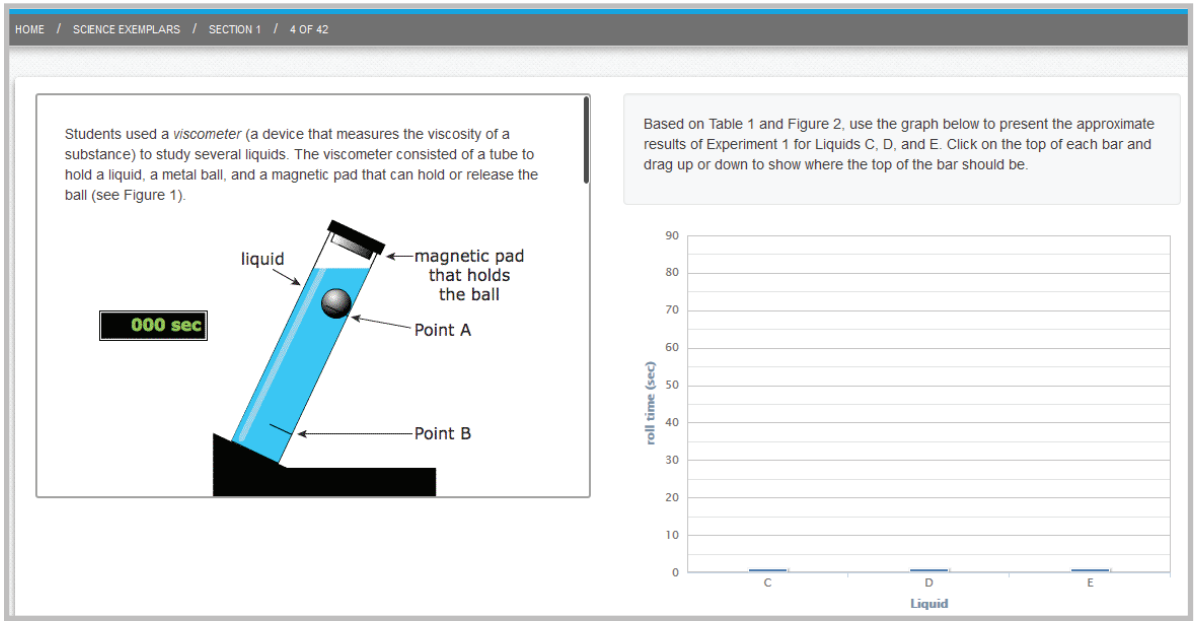
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
3	EHS	Technology Enhanced	2	Interpretation of Data	

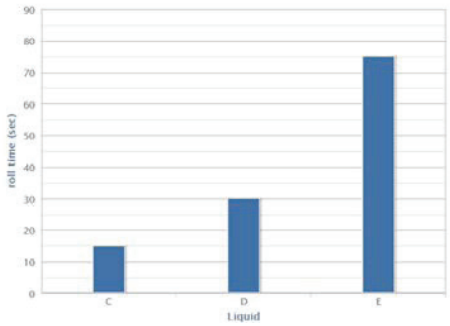
This item requires the examinee to combine and compare data from Table 2 with data from Figure 2.

Explanation of Correct Response

According to Figure 2, roll time increases as viscosity increases. Thus, the order of the liquids by increasing viscosity will be the same as the order of the liquids by increasing roll time.

Question 4



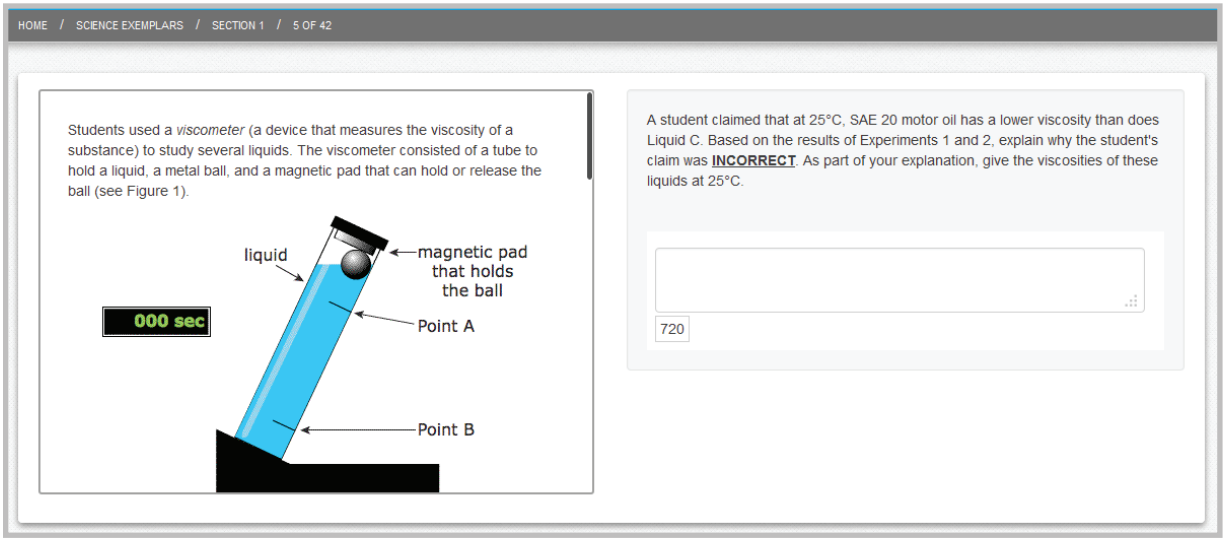
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
4	EHS	Technology Enhanced	2	Interpretation of Data	

This item requires the examinee to translate information from Figure 2 and Table 1 into a bar graph.

Explanation of Correct Response

In Table 1, Liquid C has a viscosity of 100 cp, which is shown in Figure 2 to have a roll time of about 15 sec; Liquid D has a viscosity of 200 cp, which has a roll time of about 30 sec; and Liquid E has a viscosity of 500 cp, which has a roll time of 70–75 sec.

Question 5



Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
5	EHS	Constructed Response	3	Evaluation of Models, Inferences, and Experimental Results	See scoring guide.

This item requires the examinee to determine which data and results from Table 1, Table 2, and Figure 2 are needed to explain why the student's claim was not correct.

Scoring Guide

2 points; analytic

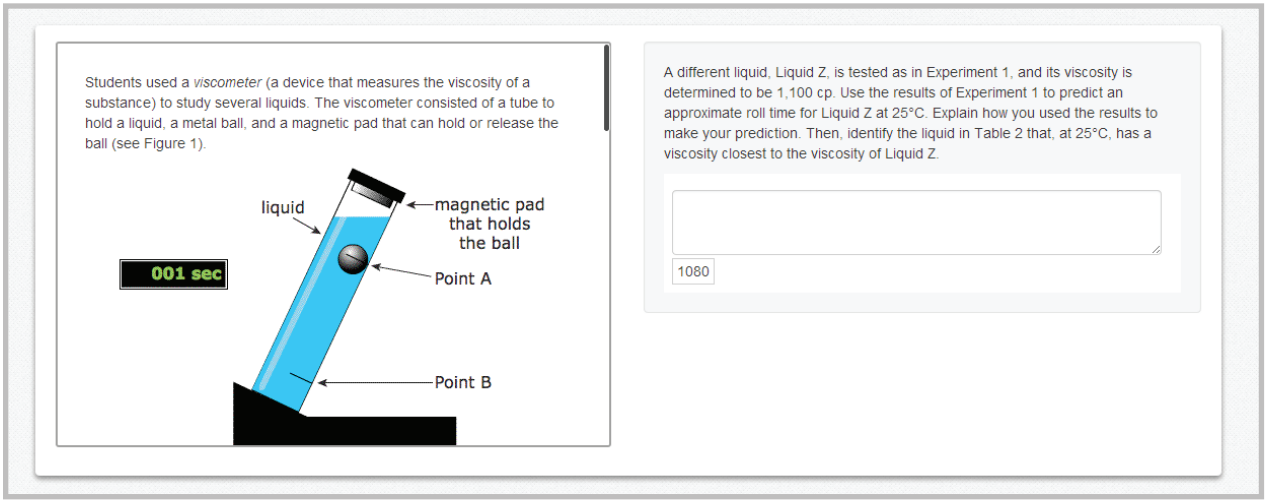
Rubric

Score	Description
2	The response explains why the student's claim was incorrect and includes the viscosities of Liquid C and SAE 20 motor oil at 25°C.
1	The response states that the viscosity of Liquid C is 100 cp **OR** states that the viscosity of SAE 20 motor oil is 200 cp.
0	The response demonstrates little understanding of data interpretation.

Sample Student Responses

Score	Response
2	Table 1 shows that the viscosity of Liquid C (at 25°C) is 100 cp. Using Figure 2 and Table 2, the viscosity of SAE 20 motor oil (at 25°C) is 200 cp, so the claim that SAE 20 motor oil has a lower viscosity than Liquid C is not correct.
1	Table 1 shows that the viscosity of Liquid C (at 25°C) is 100 cp, so the response is not correct.
0	Table 1 shows that the viscosity of Liquid C (at 25°C) is 50 cp.

Question 6



Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
6	EHS	Constructed Response	3	Scientific Investigation and Interpretation of Data	See scoring guide.

This item requires the examinee first to determine the experimental condition that would produce a given result by extrapolating from the experimental results in Figure 2 and then to compare that finding to the data in Table 2.

Scoring Guide

3 points; analytic

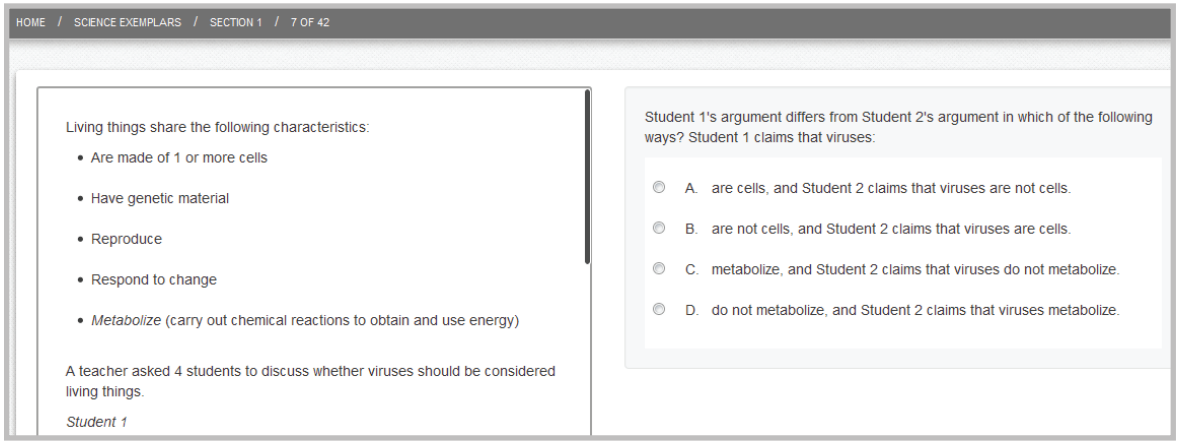
Rubric

Score	Description
3	The response includes a prediction of roll time for Liquid Z of between 160 sec and 170 sec, explains how the prediction was derived, and states that the roll time of Liquid Z is closest to SAE 50 motor oil. Any response that correctly describes the relationship between roll time and viscosity or correctly describes how to extrapolate the data should be given credit for an explanation.
2	The response includes 2 of the 3 components of a 3-point response such as a prediction of roll time for Liquid Z and an explanation of how the data were used to predict the roll time of Liquid Z.
1	The response includes a predicted roll time for Liquid Z without an explanation of how the prediction was derived **OR** only includes an explanation of how the predicted roll time was determined without expressly stating what the predicted roll time is **OR** only identifies the correct liquid in Table 2.
0	The response demonstrates little understanding of data interpretation.

Sample Student Responses

Score	Response
3	If the viscosity of Liquid Z is 1,100 cp, then according to Figure 2 the predicted roll time would be approximately 160 sec. *(Any number between 160* sec *and 170 sec would be scored as correct.)* As roll time increases, viscosity increases. A viscosity of 1,000 cp has a roll time of approximately 150 sec; therefore, a viscosity of 1,100 cp would have a roll time greater than 150 sec. According to Table 2, SAE 50 motor oil has a roll time of 180 sec, so SAE 50 motor oil has a viscosity closest to that of Liquid Z. *(Any response that correctly describes the relationship between roll time and viscosity or correctly describes how to extrapolate the data should be given credit for an explanation.)*
2	I predict that the roll time of Liquid Z would be 167 sec and that, at 25°C, SAE 50 motor oil has the closest viscosity.
1	The predicted roll time of Liquid Z is 160 sec.
0	The predicted roll time of Liquid Z is 150 sec.

Question 7



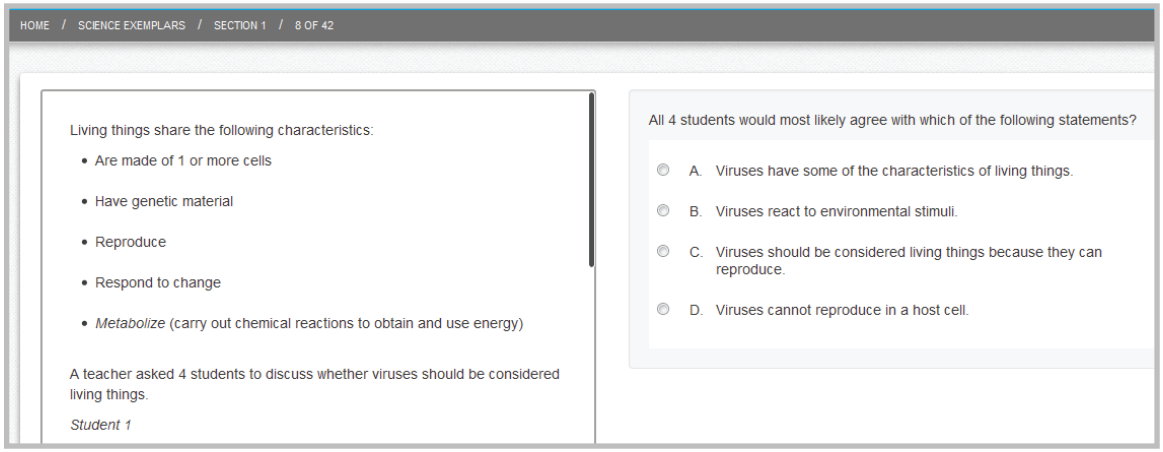
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
7	8	Selected Response	2	Evaluation of Models, Inferences, and Experimental Results	D

This item requires the examinee to identify a difference between the arguments of Student 1 and Student 2.

Explanation of Correct Response

Student 1 and Student 2 differ on whether viruses metabolize.

Question 8



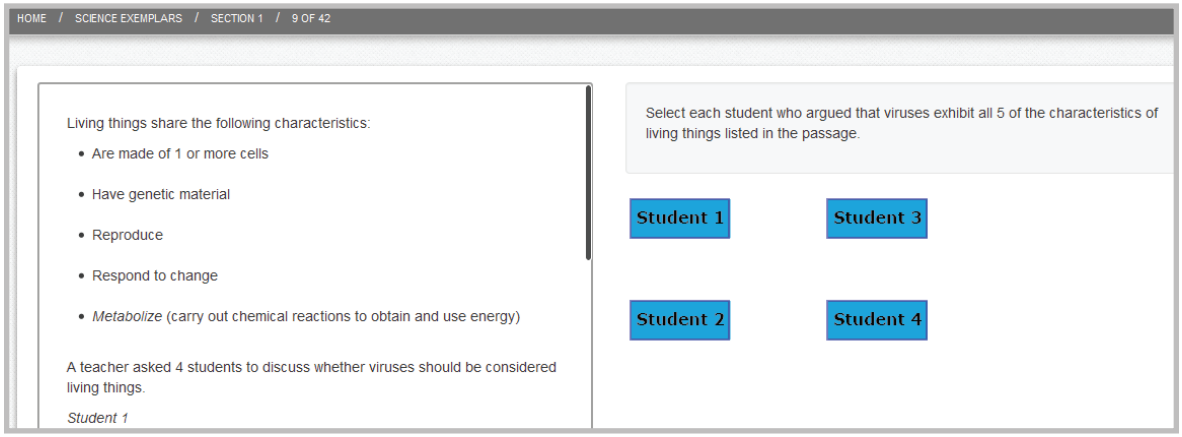
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
8	8	Selected Response	2	Evaluation of Models, Inferences, and Experimental Results	A

This item requires the examinee to identify a statement with which all four students would most likely agree.

Explanation of Correct Response

Based on their arguments, all four students would most likely agree that viruses have some of the characteristics of living things.

Question 9



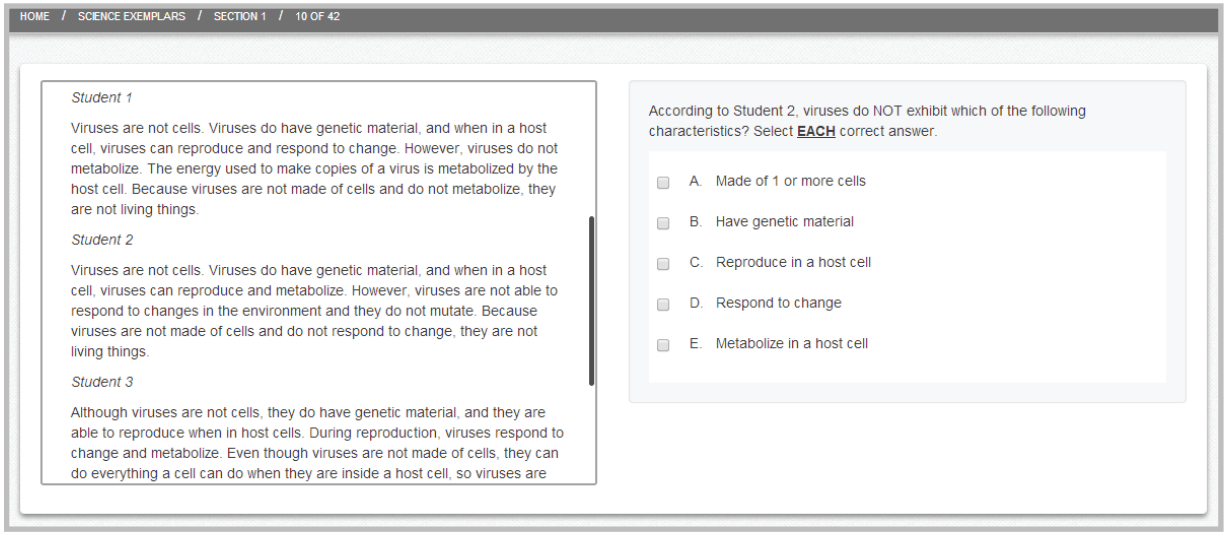
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
9	8	Technology Enhanced	2	Evaluation of Models, Inferences, and Experimental Results	Student 1, Student 3, Student 2, Student 4

This item requires the examinee to determine which student(s) argued that viruses exhibit all five of the characteristics of living things that were listed in the passage.

Explanation of Correct Response

Student 4 is the only student who argued that viruses exhibit all five of the characteristics of living things listed in the passage.

Question 10



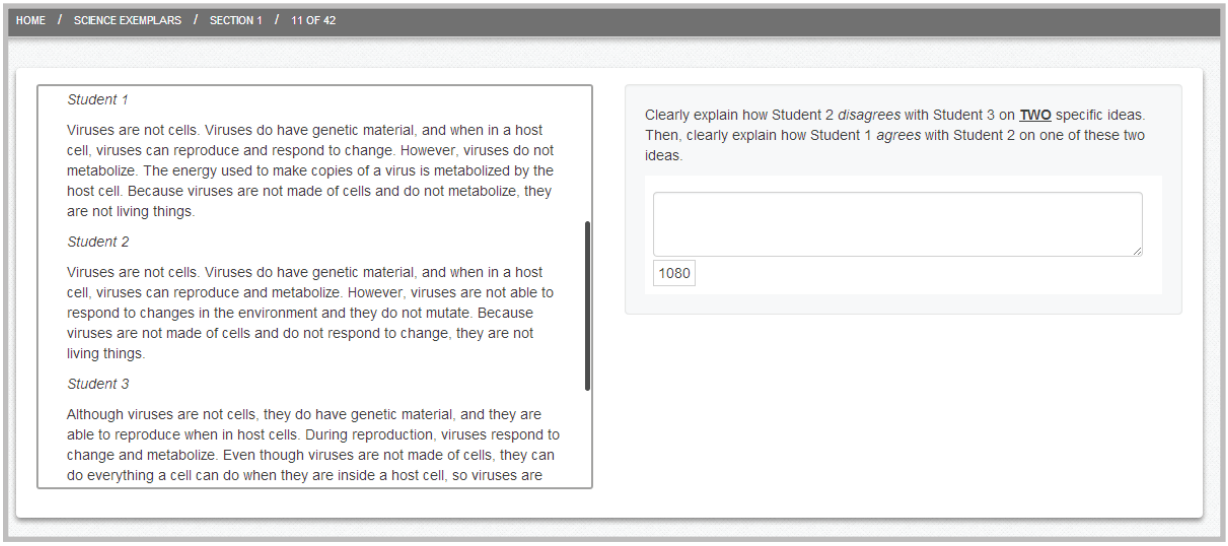
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
10	8	Selected Response	1	Evaluation of Models, Inferences, and Experimental Results	A & D

This item requires the examinee to find basic information in Student 2's argument.

Explanation of Correct Response

According to Student 2, viruses do not exhibit the characteristic of being made of one or more cells, and viruses also do not respond to change.

Question 11



Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
11	8	Constructed Response	3	Evaluation of Models, Inferences, and Experimental Results	See scoring guide.

This item requires the examinee to explain how Student 2 disagrees with Student 3 on two specific ideas and how Student 1 agrees with Student 2 on one of these two ideas.

Scoring Guide

3 points; analytic

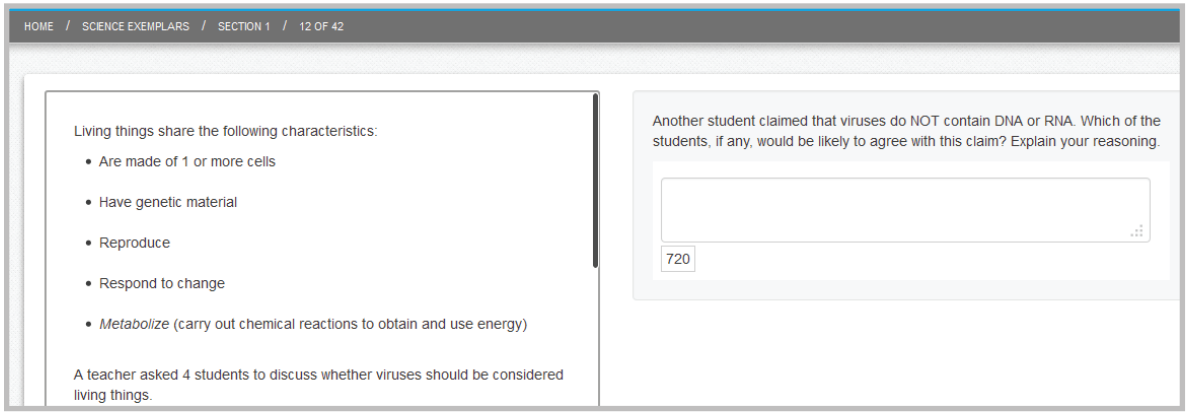
Rubric

Score	Description
3	The response correctly identifies *two* specific ways in which Student 2 and Student 3 disagree and correctly identifies *one* way in which Student 1 and Student 2 agree.
2	The response only includes *two* ways in which Student 2 and Student 3 disagree, both of which are correct, **OR** correctly identifies *one* way that Student 2 and Student 3 disagree and *one* way that Student 1 and Student 2 agree.
1	The response only includes *one* correct way in which Student 2 and Student 3 disagree **OR** *one* correct way in which Students 1 and 2 agree.
0	The response demonstrates little understanding of how to compare the explanations of Students 1, 2, and 3.

Sample Student Responses

Score	Response
3	Student 2 states that viruses do not respond to change; Student 3 states that viruses do respond to change. In addition, Student 2 states viruses are not living things; Student 3 states that viruses are living things. Both Student 1 and Student 2 state that viruses are not living things.
2	Student 2 states that viruses do not respond to change; Student 3 states that viruses do respond to change. In addition, Student 2 states viruses are not living things; Student 3 states that viruses are living things.
1	Student 2 says that viruses respond to change; Student 3 says that viruses do not respond to change. In addition, Student 2 says viruses are cells while Student 3 says viruses are not cells. Students 1 and 2 agree that viruses are not living things.
0	Student 2 says that viruses are cells while Student 3 says that viruses are not cells. Student 2 says viruses have genetic material while Student 3 says viruses do not have genetic material. Students 1 and 2 agree that viruses are living things.

Question 12



Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
12	8	Constructed Response	2	Evaluation of Models, Inferences, and Experimental Results	See scoring guide.

This item requires the examinee to identify which of the four students, if any, would be most likely to agree with a new claim made by another student. Students must have basic knowledge of the biological roles of DNA and RNA.

Scoring Guide

2 points; analytic

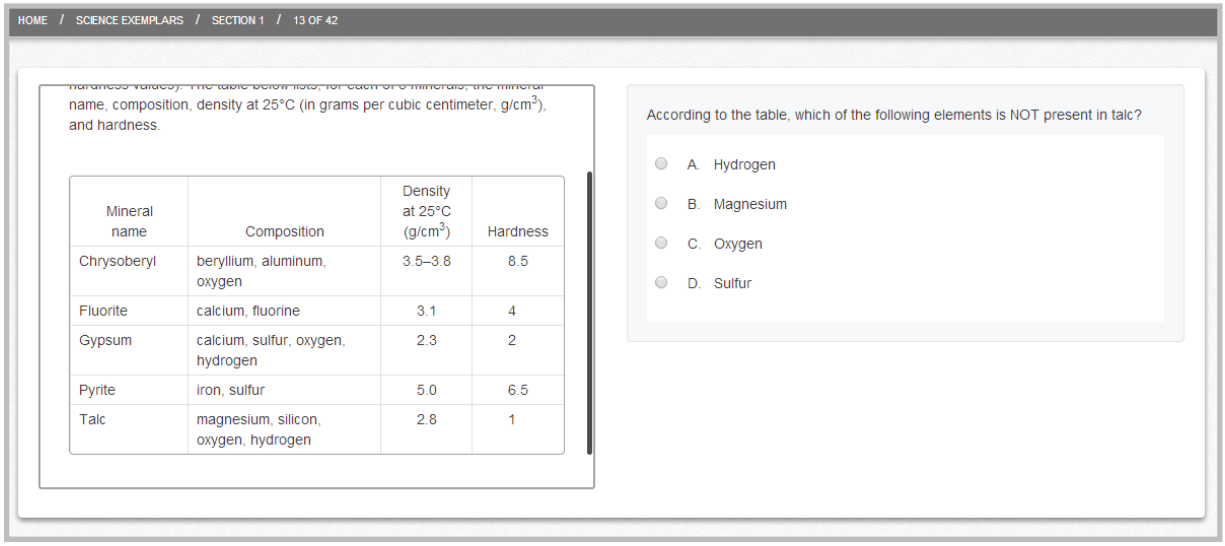
Rubric

Score	Description
2	The response correctly states that none of the four students would agree with the claim that viruses do not contain DNA or RNA and uses the passage to support this statement.
1	The response correctly states that none of the four students would agree with the claim that viruses do not contain DNA or RNA but does not explain the answer based on the information in the passage.
0	The response demonstrates little understanding of how to evaluate the statement in the question against the statements of Students 1–4 or of what relationship exists between DNA, RNA, and genetic material.

Sample Student Responses

Score	Response
2	None of the students would agree with the statement that viruses do not contain DNA or RNA. All 4 students clearly say that viruses have genetic material.
1	None of the students would agree with the statement.
0	Students 1, 2, 3, and 4 would agree with the statement since DNA and RNA are not mentioned by any of the students.

Question 13



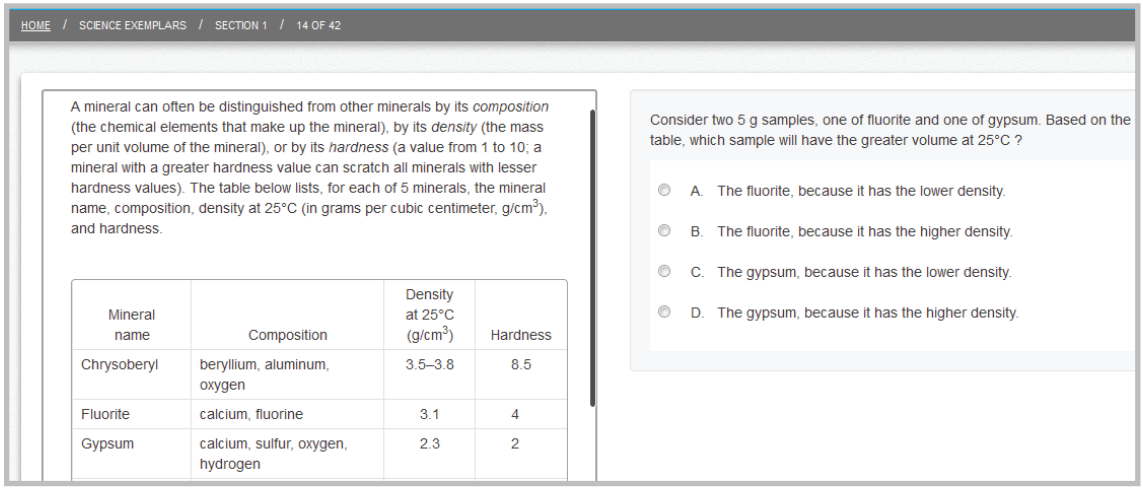
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
13	8	Selected Response	1	Interpretation of Data	D

This item requires the examinee to select one piece of data from the table.

Explanation of Correct Response

According to the table, the elements present in talc are magnesium, silicon, oxygen, and hydrogen. Sulfur is not one of the elements present in talc.

Question 14



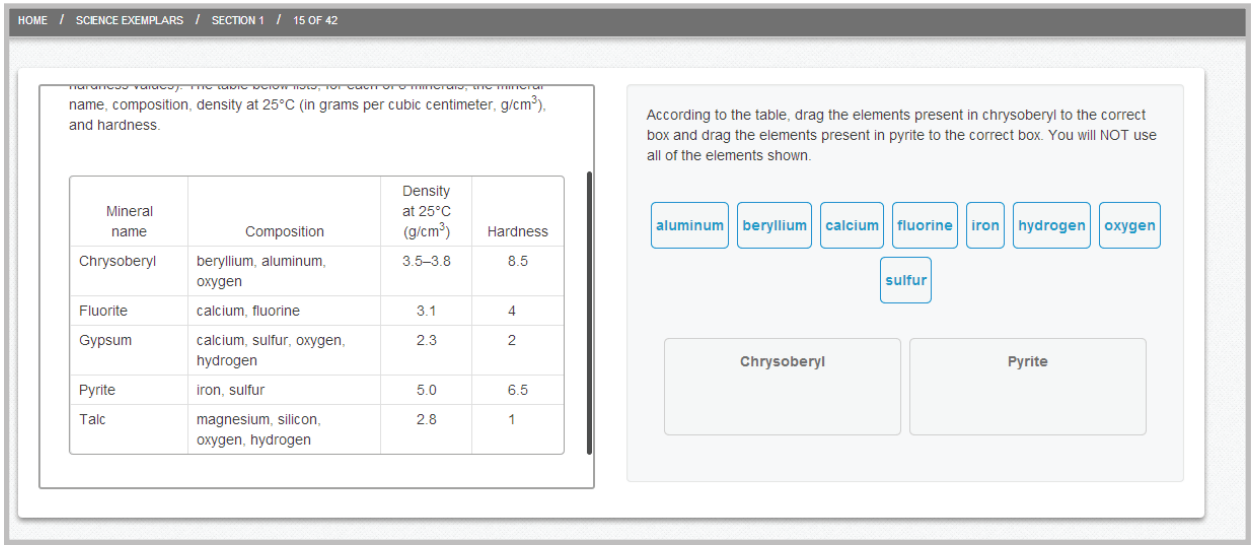
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
14	8	Selected Response	2	Evaluation of Models, Inferences, and Experimental Results	C

This item requires the examinee to apply the relationship between mass, volume, and density provided in the passage to data from the table in order to formulate a conclusion.

Explanation of Correct Response

Based on the density information in the table and the fact that density = mass/volume, a 5 g sample of gypsum will have a greater volume than a 5 g sample of fluorite because the density of gypsum (2.3 g/cm^3) is lower than the density of fluorite (3.1 g/cm^3).

Question 15



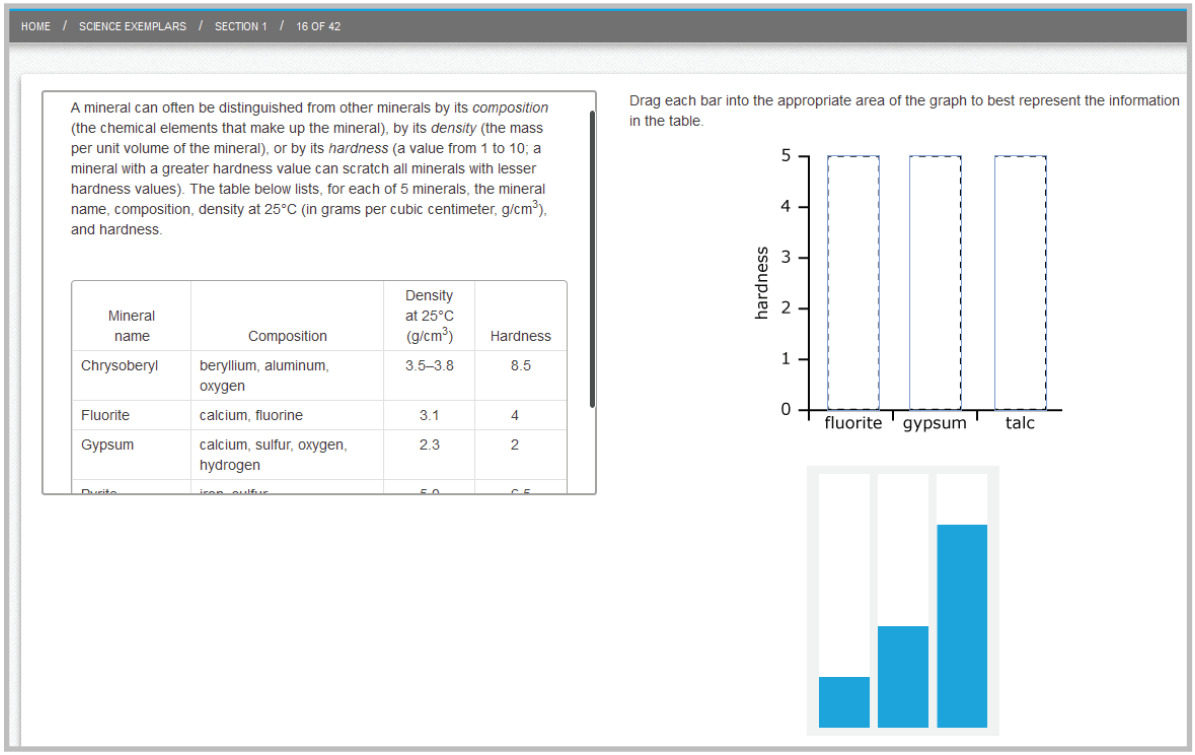
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
15	8	Technology Enhanced	2	Interpretation of Data	

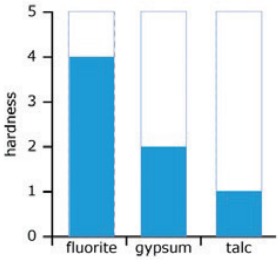
This item requires the examinee to select two or more pieces of data from a simple data presentation.

Explanation of Correct Response

According to the table, the only elements present in chrysoberyl are beryllium, aluminum, and oxygen, and the only elements present in pyrite are iron and sulfur.

Question 16



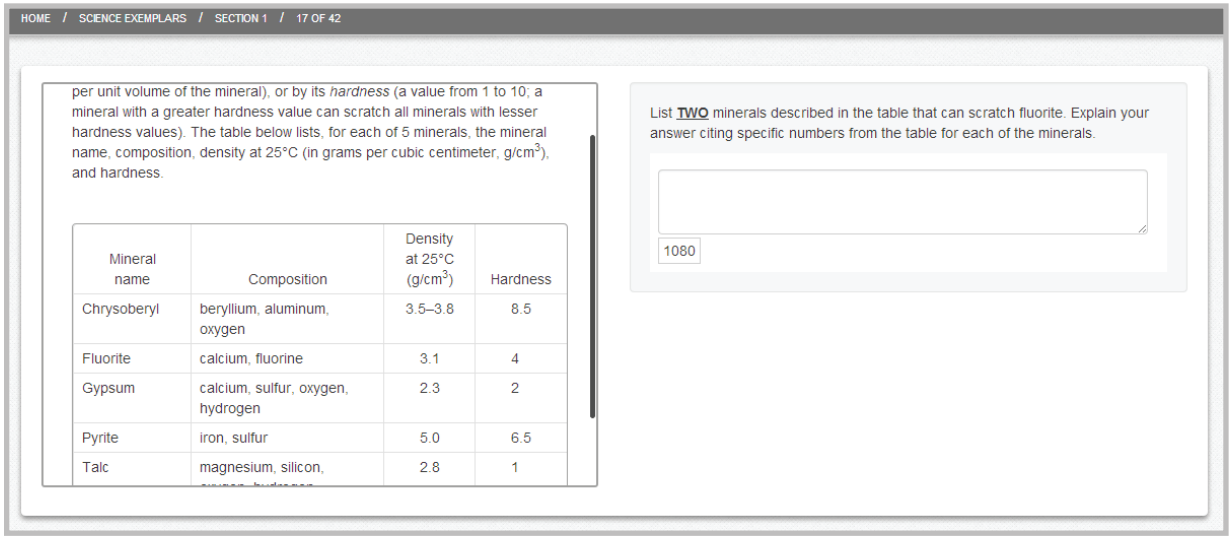
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
16	8	Technology Enhanced	2	Interpretation of Data	

This item requires the examinee to translate information from the table into a bar graph.

Explanation of Correct Response

According to the table, the hardness of fluorite is 4, the hardness of gypsum is 2, and the hardness of talc is 1.

Question 17



Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
17	8	Constructed Response	2	Evaluation of Models, Inferences, and Experimental Results	See scoring guide.

This item requires the examinee to compare data from the table in order to formulate a conclusion.

Scoring Guide

3 points; analytic

Rubric

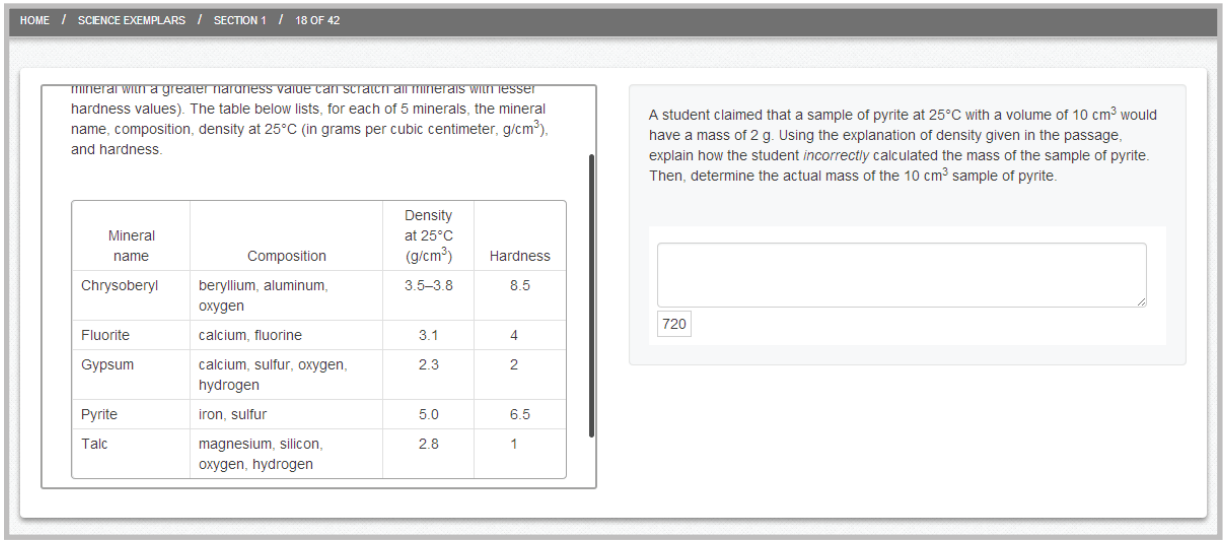
Score	Description
3	The response correctly identifies the two minerals in the table that can scratch fluorite, and the explanation cites the hardness values of each of these two minerals and compares those values to the hardness of fluorite.
2	The response correctly identifies one of the minerals that can scratch fluorite and explains using the data in the table **OR** identifies both minerals in the table that can scratch fluorite but does not use the information in the table to support the answer.
1	The response correctly identifies one of the minerals in the table that can scratch fluorite **OR** states that minerals with a hardness higher than fluorite can scratch fluorite but does not identify the two minerals from the table.
0	The response demonstrates little understanding of either hardness or data interpretation.

Note: Nonstandard responses that reverse the concept of hardness and list gypsum and talc as the minerals from the table that can scratch fluorite, or that address what minerals fluorite can scratch, can score 1 to 2 points depending on the consistency and completeness of such responses.

Sample Student Responses

Score	Response
3	Both chrysoberyl and pyrite can scratch fluorite. A mineral with a greater hardness value can scratch a mineral with a lower hardness value. The hardness value of fluorite is 4, the hardness value chrysoberyl is 8.5, and the hardness value of pyrite is 6.5, so both chrysoberyl and pyrite can scratch fluorite.
2	Both chrysoberyl and pyrite can scratch fluorite. A mineral with a greater hardness value can scratch a mineral with a lower hardness value.
1	A mineral with a greater hardness value can scratch a mineral with a lower hardness value.
0	Gypsum and fluorite can scratch pyrite.

Question 18



Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
18	8	Constructed Response	3	Evaluation of Models, Inferences, and Experimental Results	See scoring guide.

This item requires the examinee to determine how density information from the table was incorrectly applied and to properly use the relationships between density and volume to calculate a mass.

Scoring Guide

2 points; analytic

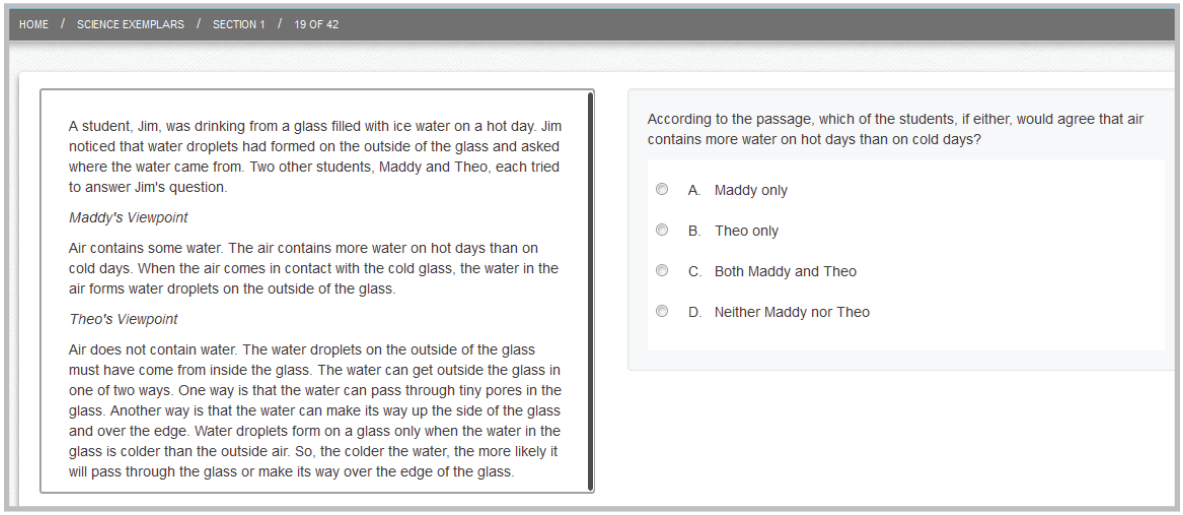
Rubric

Score	Description
2	The response explains how the student incorrectly calculated the mass of a 10 cm^3 sample of pyrite, and then the response indicates that the sample's correctly calculated mass is 50 g.
1	The response explains how the student incorrectly calculated the mass of a 10 cm^3 sample of pyrite **OR** indicates that the sample's correctly calculated mass is 50 g.
0	The response demonstrates little understanding of the concept of density and how to manipulate the equation to determine the mass of a sample.

Sample Student Responses

Score	Response
2	The student may have divided the volume by the density of pyrite $\left(\frac{10\ cm^3}{5\ g/cm^3}\right)$ to determine the mass of the sample. The actual mass of the sample would be 50 g.
1	The actual mass of the sample would be 50 g.
0	The actual mass of the sample would be 5 g.

Question 19



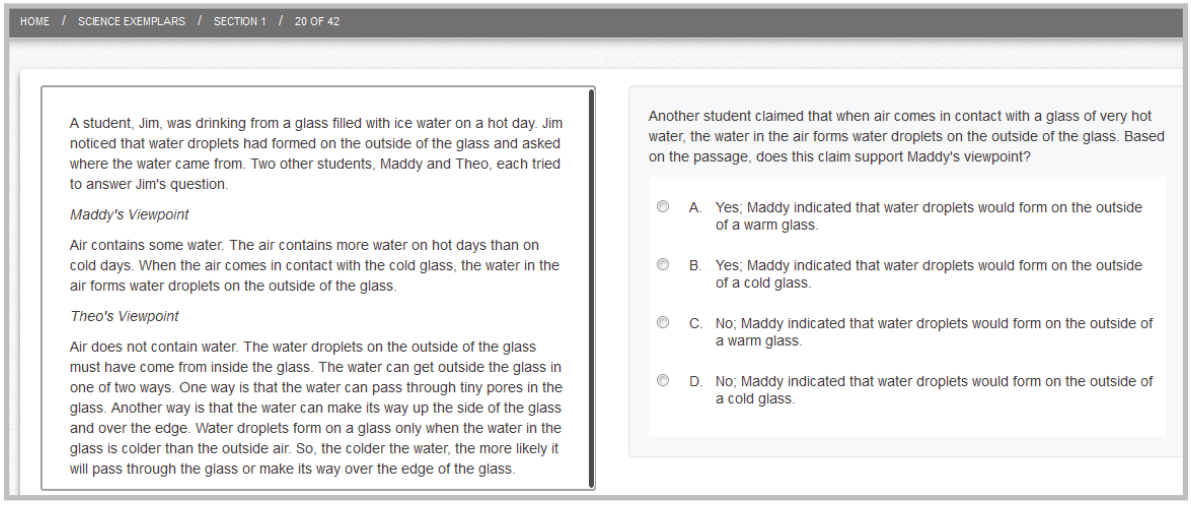
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
19	7	Selected Response	2	Evaluation of Models, Inferences, and Experimental Results	A

This item requires the examinee to compare the two viewpoints in order to determine which of the students would agree with a claim.

Explanation of Correct Response

Maddy's viewpoint indicates that air contains more water on hot days than on cold days. Theo's viewpoint indicates that air does not contain water.

Question 20



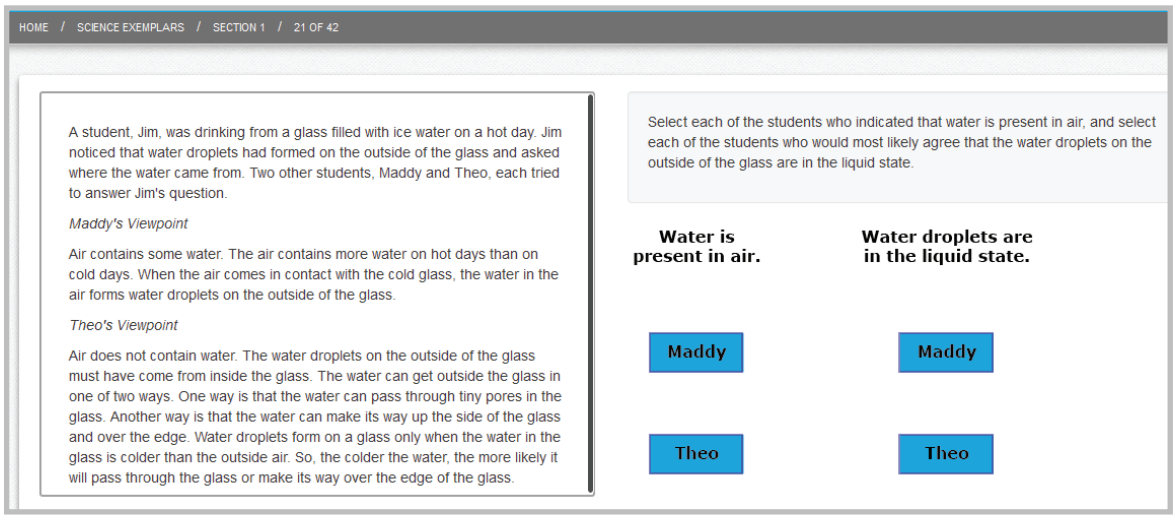
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
20	7	Selected Response	2	Evaluation of Models, Inferences, and Experimental Results	D

This item requires the examinee to decide if a new claim supports a viewpoint.

Explanation of Correct Response

Maddy's viewpoint indicates that water droplets will form on the outside of a cold glass, but she does not claim that water droplets would form on a warm or hot glass.

Question 21



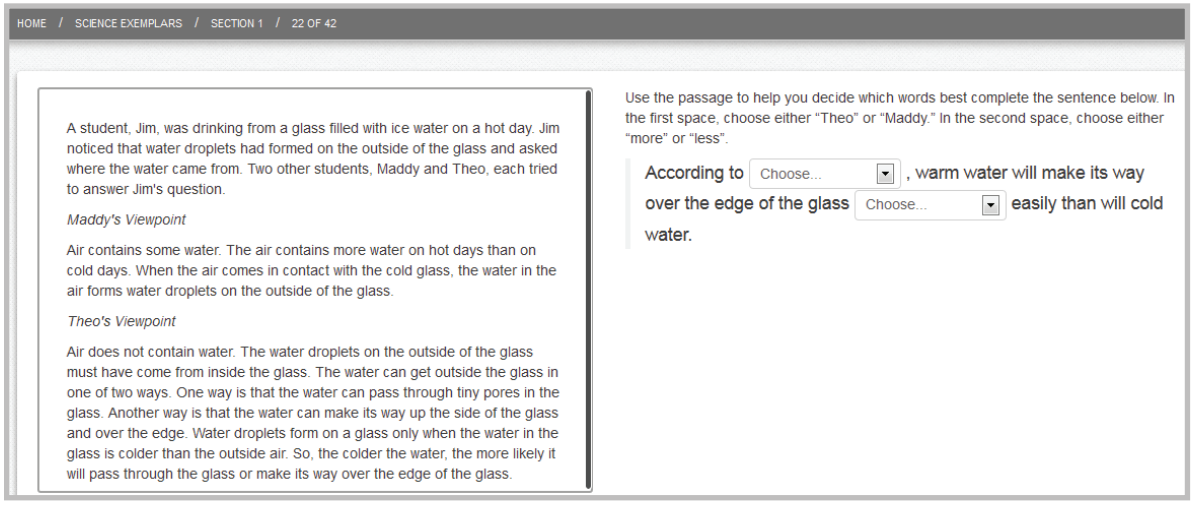
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response	
					Water is present in air.	Water droplets are in the liquid state.
21	7	Technology Enhanced	2	Evaluation of Models, Inferences, and Experimental Results	Maddy	Maddy
					Theo	Theo

This item requires the examinee to decide if the students would most likely agree with each of two statements. This involves identifying the assumptions in each student's viewpoint.

Explanation of Correct Response

Maddy states air contains some water, and Theo states that air does not contain water. The examinee needs to identify the assumption, made by both students, that water droplets are liquid.

Question 22



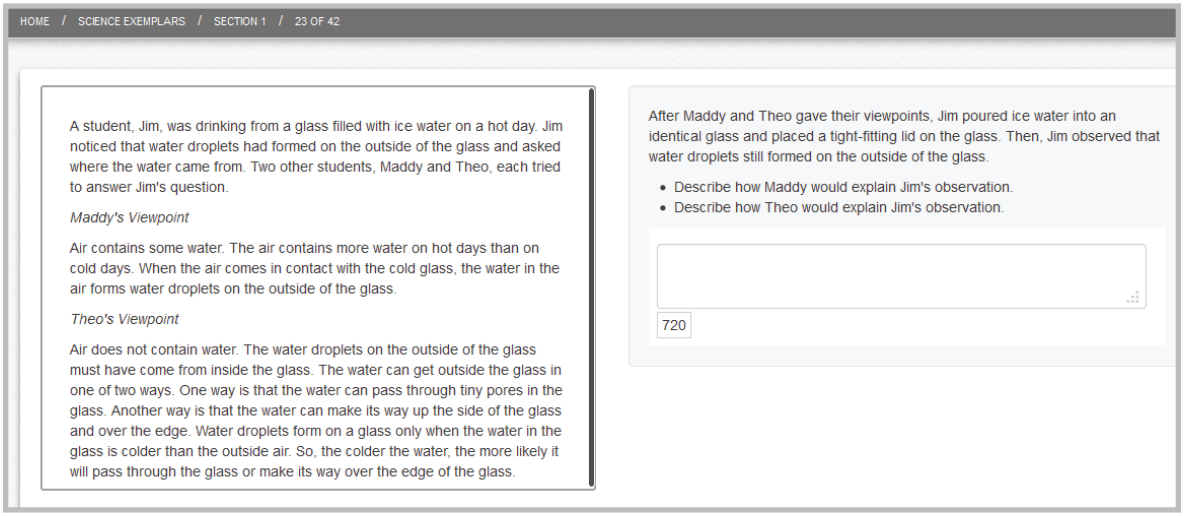
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
22	7	Technology Enhanced	2	Evaluation of Models, Inferences, and Experimental Results	According to Theo , warm water will make its way over the edge of the glass less easily than will cold water.

This item requires the examinee to identify key implications in each student's viewpoint in order to complete a sentence.

Explanation of Correct Response

Theo's viewpoint is the only viewpoint that discusses water making its way over the edge of the glass. Theo also states that the colder the water is, the more likely it is to make its way over the edge. Thus, Theo implies that warm water will make its way over the edge of the glass less easily than will cold water.

Question 23



Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
23	7	Constructed Response	3	Evaluation of Models, Inferences, and Experimental Results	See scoring guide.

This item requires the examinee to describe how each student would explain new information.

Scoring Guide

2 points; analytic

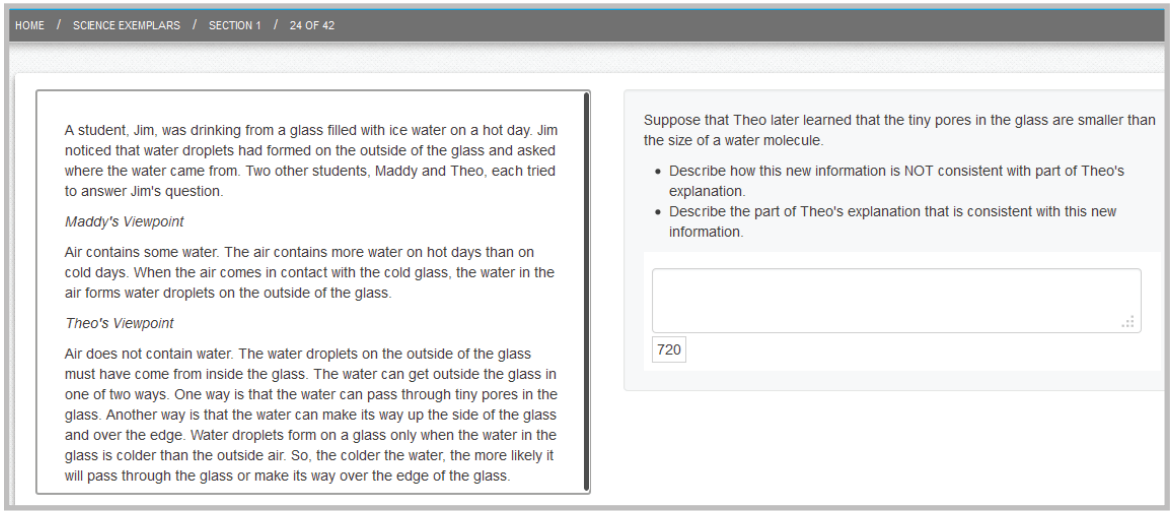
Rubric

Score	Description
2	The response correctly describes how Maddy **AND** Theo would explain Jim's observation.
1	The response correctly describes how Maddy or Theo would explain Jim's observation. **OR** The response describes either Maddy's or Theo's explanation correctly and describes the other explanation incorrectly.
0	The response demonstrates little understanding of why water droplets form on the outside of the glass.

Sample Student Responses

Score	Response
2	Maddy: When water contained in the air contacts the (cold) surface of the glass, water droplets form. Theo: Water would pass through (pores in) the glass (if the water could not pass through the seal made by the tight-fitting lid).
1	Maddy: When water contained in the air contacts the (cold) surface of the glass, water droplets form. **OR** Theo: Water would pass through (pores in) the glass (if the water could not pass through the seal made by the tight-fitting lid).
0	Water was escaping while the lid was being put on.

Question 24



Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
24	7	Constructed Response	2	Evaluation of Models, Inferences, and Experimental Results	See scoring guide.

This item requires the examinee to describe how new information is not consistent with part of one viewpoint and to describe which part of the viewpoint is consistent with the new information.

Scoring Guide

2 points; analytic

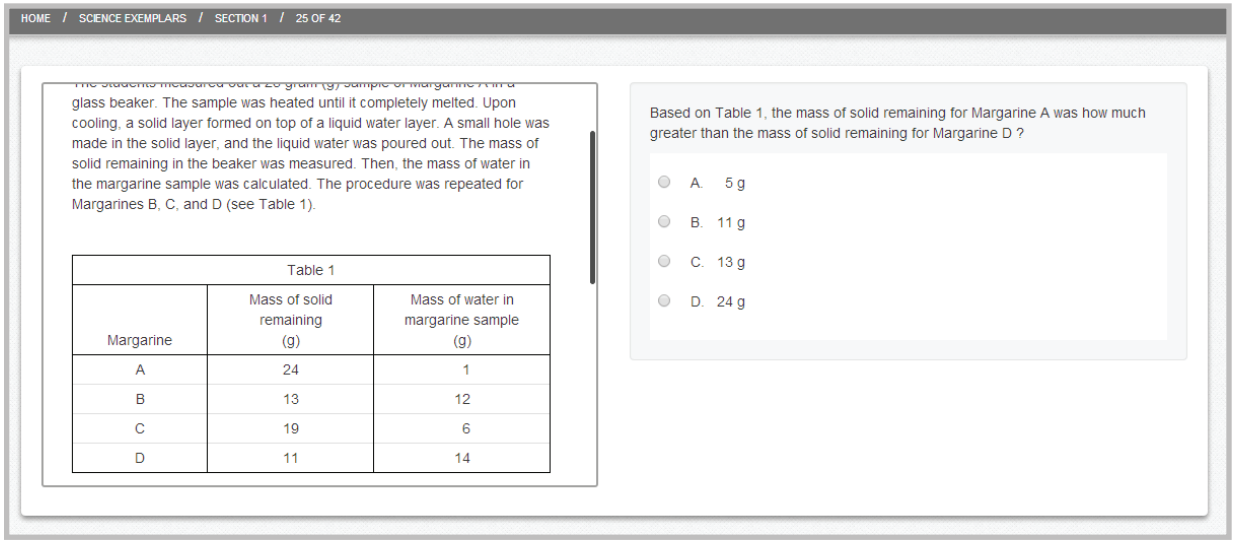
Rubric

Score	Description
2	The response correctly describes how the new information is both NOT consistent with part of Theo's explanation **AND** is consistent with another part of Theo's explanation.
1	The response correctly describes how the new information is NOT consistent with part of Theo's explanation. **OR** The response correctly describes how the new information is consistent with part of Theo's explanation.
0	The response demonstrates little understanding of why water droplets form on the outside of the glass.

Sample Student Responses

Score	Response
2	The new information is inconsistent with Theo's claim that water can pass through tiny pores in the glass. The new information is consistent with Theo's claim that there are tiny pores in the glass.
1	The new information is inconsistent with Theo's claim that water can pass through tiny pores in the glass. **OR** The new information is consistent with Theo's claim that there are tiny pores in the glass.
0	Air does not contain water.

Question 25



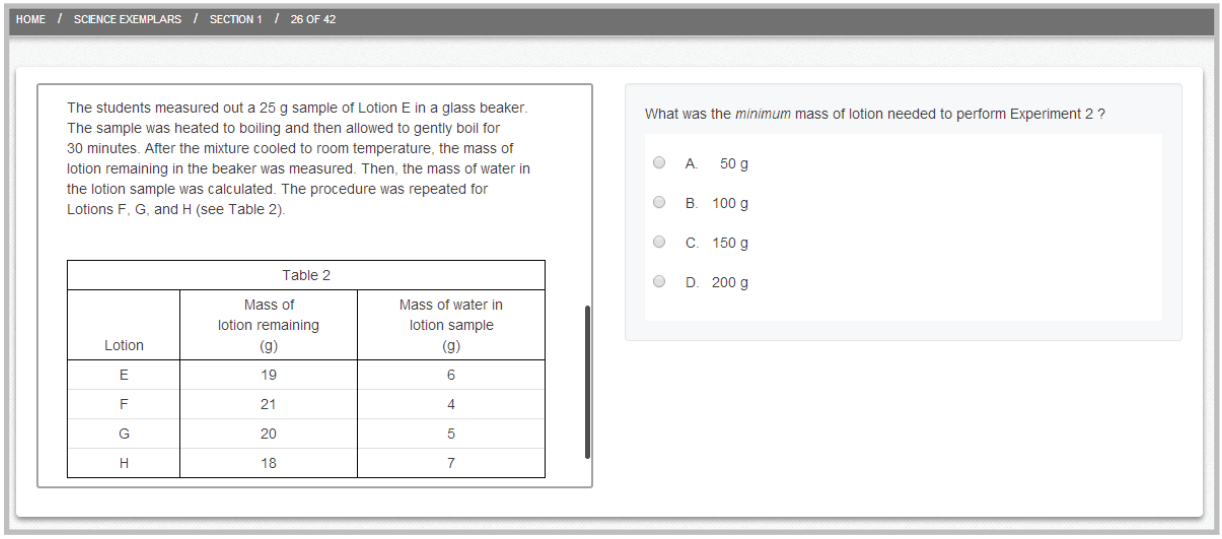
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
25	6	Selected Response	2	Interpretation of Data	C

This item requires the examinee to find two pieces of data in a table and to compare those data using a simple calculation.

Explanation of Correct Response

The mass of solid remaining for Margarine A was 24 g, and the mass of solid remaining for Margarine D was 11 g, so the mass remaining for Margarine A is 13 g greater than the mass remaining for Margarine D.

Question 26



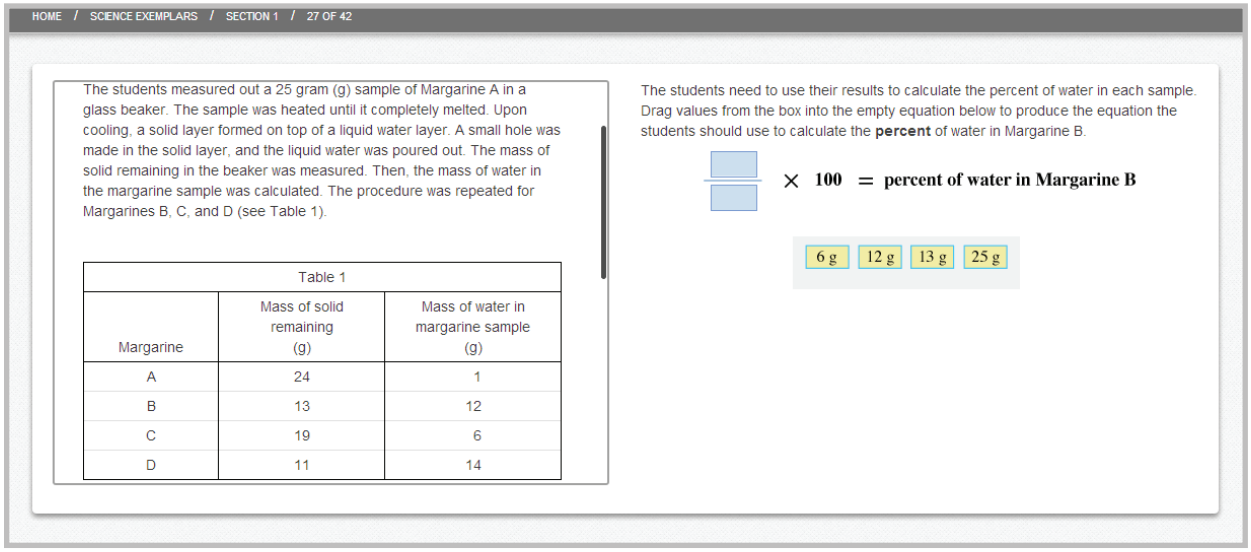
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
26	6	Selected Response	2	Scientific Investigation	B

This item requires the examinee to understand the design of the experiment.

Explanation of Correct Response

The students needed four 25 g samples of lotion, so the minimum mass of lotion is 100 g.

Question 27



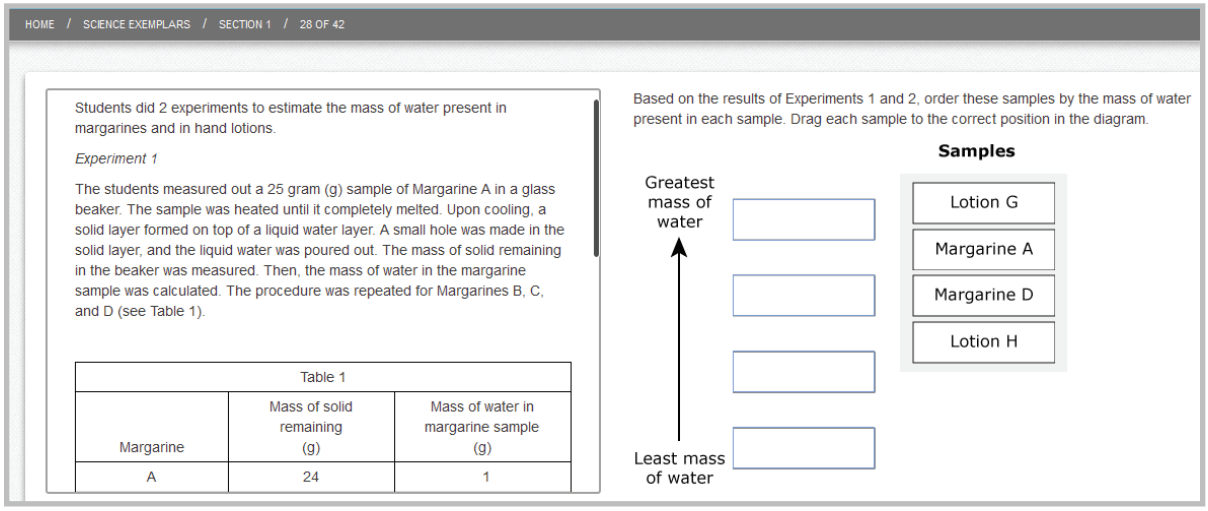
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
27	6	Technology Enhanced	2	Interpretation of Data	$\frac{12\text{ g}}{25\text{ g}} \times 100 =$ percent of water in Margarine B 6 g 13 g

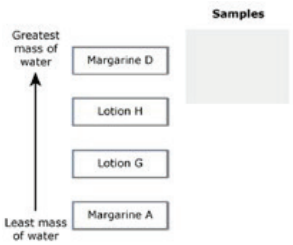
This item requires the examinee to use a simple mathematical relationship between data in Table 1.

Explanation of Correct Response

The mass of the water in the sample of Margarine B (listed in Table 1) was 12 g, and (according to the description of Experiment 1) the mass of the sample of Margarine B was 25 g.

Question 28



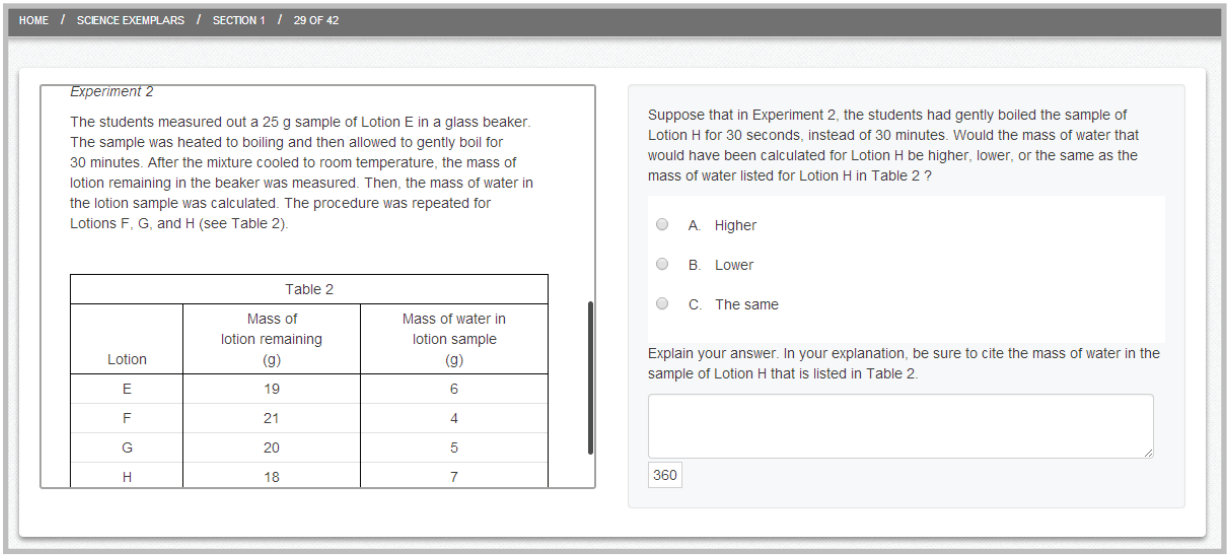
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
28	6	Technology Enhanced	2	Interpretation of Data	

This item requires the examinee to compare data from two tables to create an ordered list.

Explanation of Correct Response

In Table 1, the mass of water calculated for Margarine A was 1 g, and the mass of water calculated for Margarine D was 14 g. In Table 2, the mass of water calculated for Lotion G was 5 g, and the mass of water calculated for Lotion H was 7 g.

Question 29



Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
29	6	Composite	3	Scientific Investigation	See scoring guide.

This item requires the examinee to predict the effects of modifying the design of an experiment and to explain his or her prediction.

Scoring Guide

3 points; composite

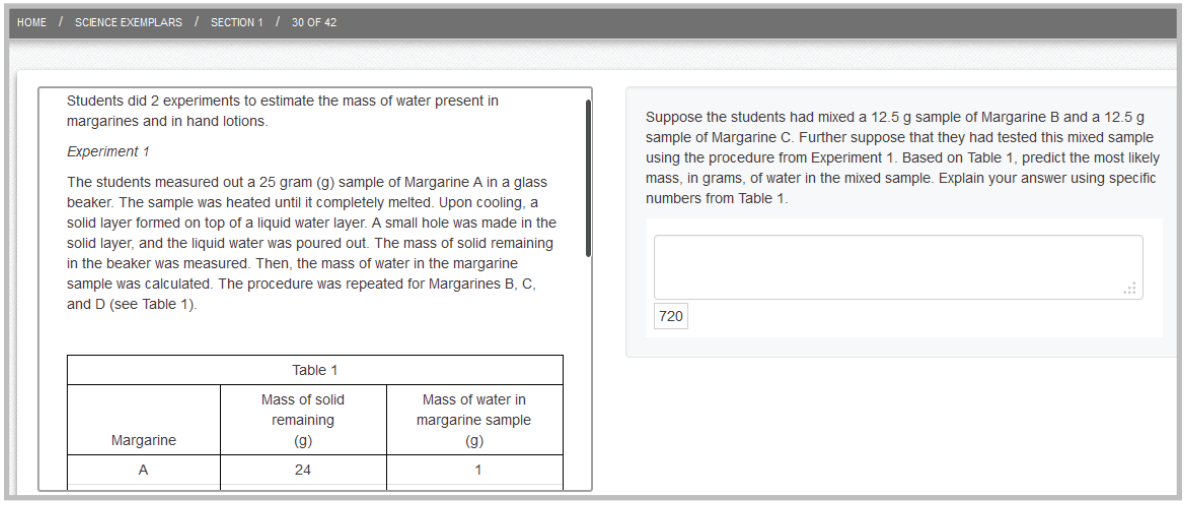
Rubric

Score	Description
3	The examinee performs 3 of the following tasks correctly: • selects the correct response • provides an explanation • cites the mass of water in the sample of Lotion H listed in Table 2
2	The examinee performs 2 of the following tasks correctly: • selects the correct response • provides an explanation • cites the mass of water in the sample of Lotion H listed in Table 2
1	The examinee performs 1 of the following tasks correctly: • selects the correct response • provides an explanation • cites the mass of water in the sample of Lotion H listed in Table 2
0	The examinee demonstrates little to no understanding of the concept.

Sample Student Responses

Score	Response
3	Lower (correct response). If the sample had only been boiled for 30 sec, less water would have evaporated, resulting in less than 7 g of water calculated for Lotion H.
2	Lower (correct response). If the sample had only been boiled for 30 sec, less water would have evaporated. **OR** If the sample had only been boiled for 30 sec, less water would have evaporated, resulting in less than 7 g of water calculated for Lotion H.
1	Boiling the sample for a shorter time means less time for evaporation.
0	Greater.

Question 30



Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
30	6	Constructed Response	3	Scientific Investigation	See scoring guide.

This item requires the examinee to predict the results of an additional trial (testing a margarine sample that is a mix of Margarine B and Margarine C) and to explain their prediction.

Scoring Guide

2 points; analytic

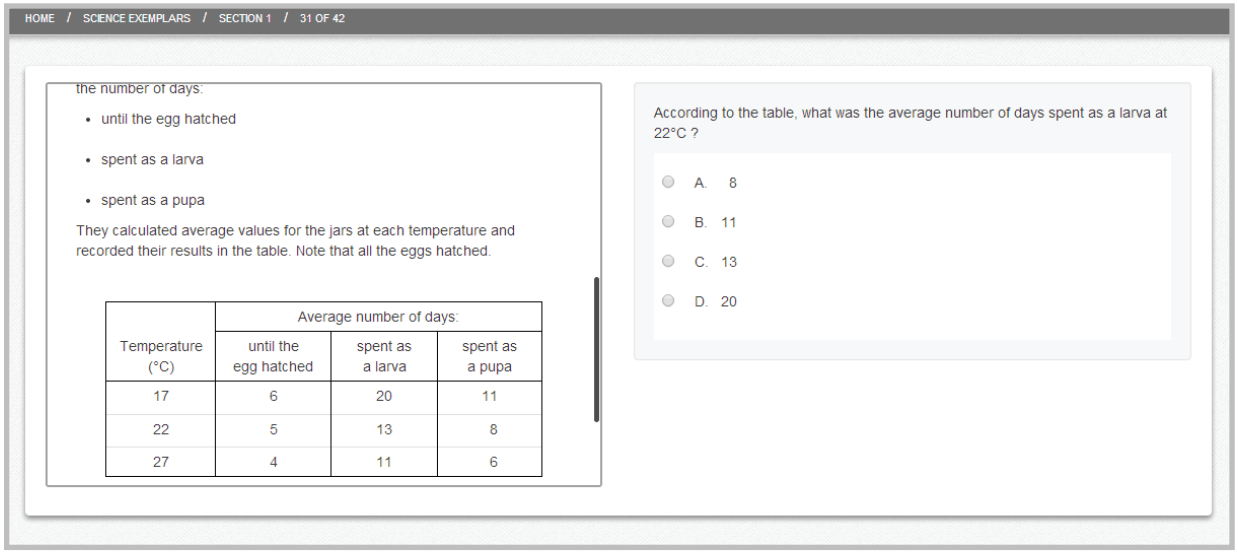
Rubric

Score	Description
2	The response provides the correct value or range of values for the mass of water in the mixed sample **AND** explains the examinee's reasoning using specific numbers from Table 1.
1	The response provides the correct value or range of values for the mass of water in the mixed sample **OR** explains the examinee's reasoning but does not provide a correct value.
0	The response demonstrates little to no understanding of how to use the data from the experiment.

Sample Student Responses

Score	Response
2	9 g, because if you take half of 12 g and half of 6 g and add them together, you get 9. **OR** 12 g + 6 g = 18 g 18 g / 2 = 9 g **OR** The result for Margarine B was 12 g, and for Margarine C it was 6 g. If you mix equal amounts of each together, the mixture should have a water content between 12 g and 6 g.
1	9 g **OR** You need to find the average of 12 g and 6 g.
0	18 g

Question 31



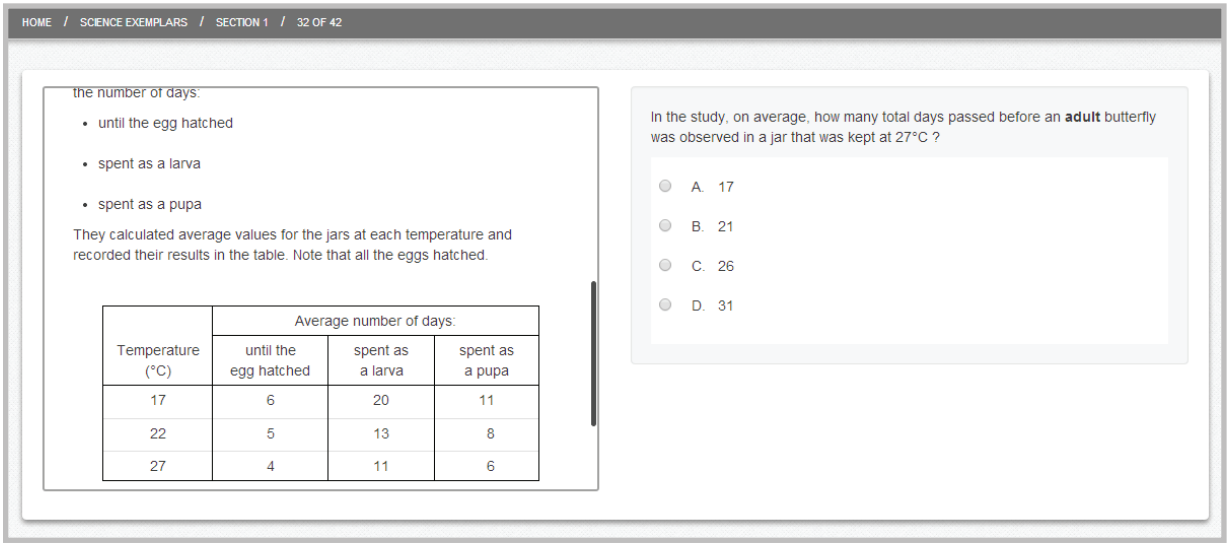
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
31	4	Selected Response	1	Interpretation of Data	C

This item requires the examinee to select a single piece of data in the table based on a given condition.

Explanation of Correct Response

According to the table, the average number of days spent as a larva at 22°C was 13 days.

Question 32



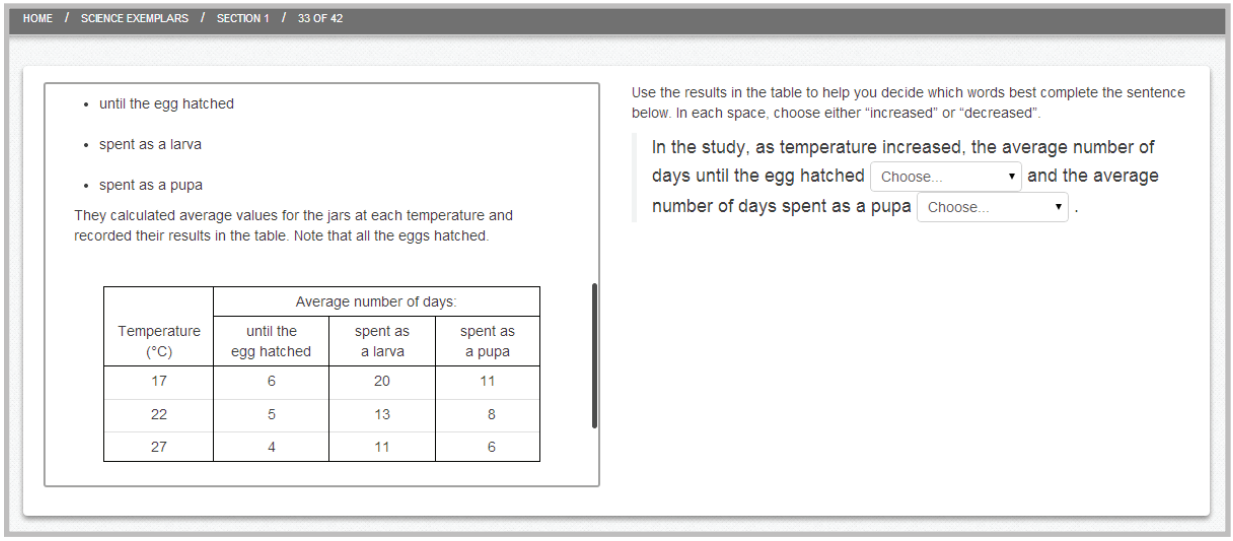
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
32	4	Selected Response	2	Scientific Investigation	B

This item requires the examinee to understand an aspect of the design of the study in order to select and combine data from the table.

Explanation of Correct Response

The students observed the jars from the time when they added the eggs until an adult butterfly was observed in a jar, so the total number of days for the jars kept at 27°C would be the sum of the average number of days until the egg hatched (4 days), the average number of days spent as a larva (11 days), and the average number of days spent as a pupa (6 days). So, on average, 21 days passed before an adult butterfly was observed in a jar.

Question 33



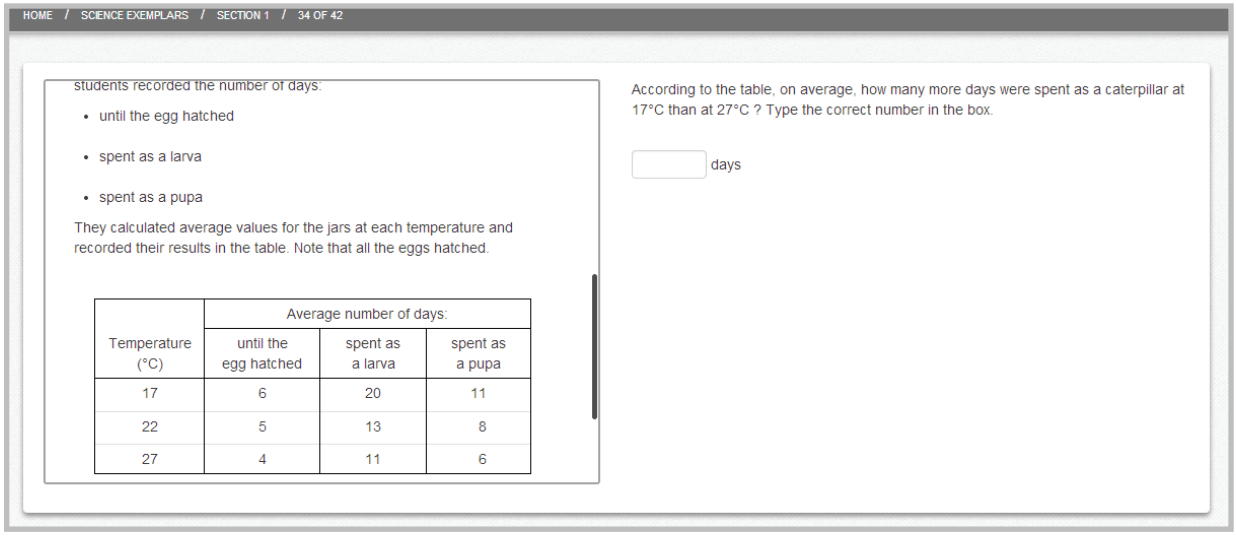
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
33	4	Technology Enhanced	2	Interpretation of Data	In the study, as temperature increased, the average number of days until the egg hatched decreased and the average number of days spent as a pupa decreased .

This item requires the examinee to evaluate 2 trends in the data listed in the table. The examinee selects each answer from a pull-down menu.

Explanation of Correct Response

According to the table, as the temperature increased from 17°C to 27°C, the average number of days until the egg hatched decreased from 6 days to 4 days. According to the table, as the temperature increased from 17°C to 27°C, the average number of days spent as a pupa decreased from 11 days to 6 days.

Question 34



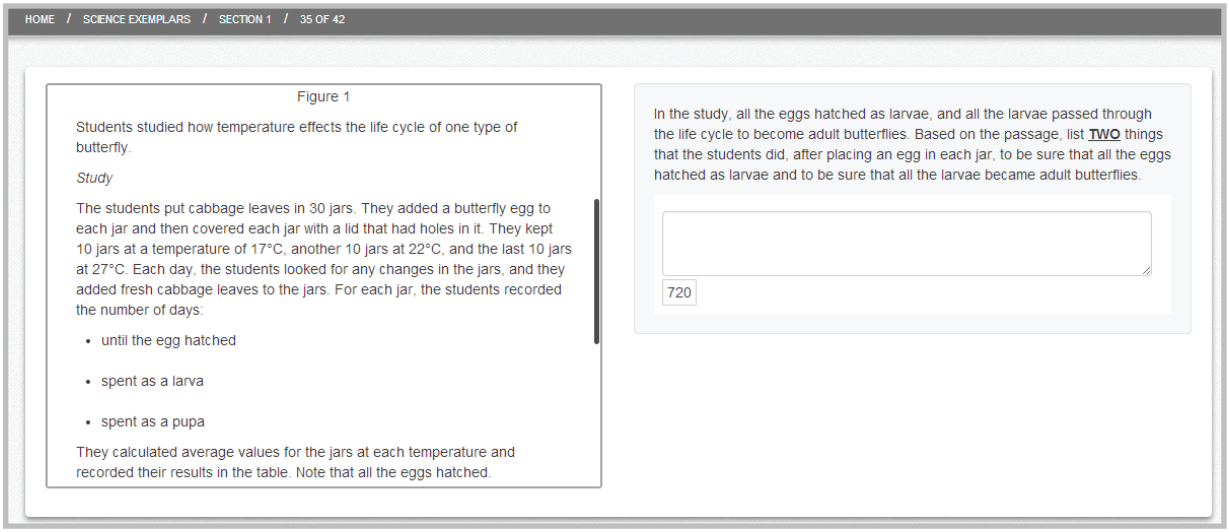
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
34	4	Technology Enhanced	2	Interpretation of Data	9 days

This item requires the examinee to compare two values in the table. The examinee enters the calculated value into a text field.

Explanation of Correct Response

The examinee must recall that the passage defined a larva as a caterpillar. According to the table, the average number of days spent as a larva (caterpillar) at 17°C was 20 days, and the average number of days spent as a larva (caterpillar) at 27°C was 11 days. So, the difference was 9 days.

Question 35



Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
35	4	Constructed Response	3	Scientific Investigation	See scoring guide.

This item requires the examinee to understand the methods that were employed during the study to ensure that all the eggs hatched and survived long enough to become adult butterflies.

Scoring Guide

2 points; analytic

Rubric

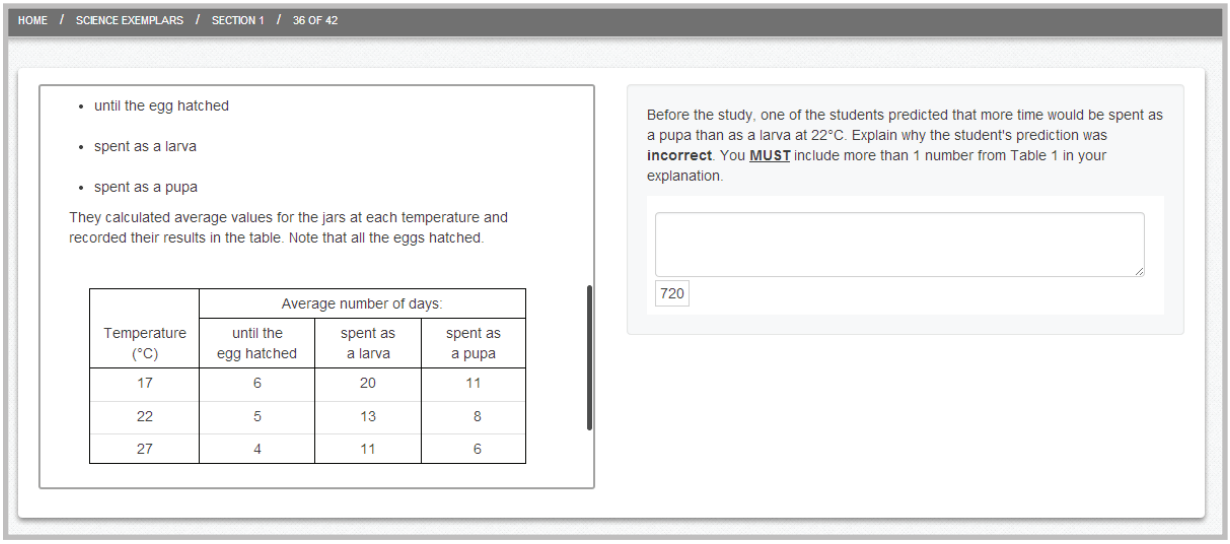
Score	Description
2	The response identifies **ANY** two things that the students did to ensure that all the eggs hatched as larva and became adult butterflies.
1	The response identifies **ANY** one thing that the students did to ensure that all the eggs hatched as larva and became adult butterflies.
0	The response demonstrates little to no understanding of the concept.

Note: Temperature was an unknown variable being tested that may or may not have ensured survival and should not receive a point.

Sample Student Responses

Score	Response
2	The students added fresh food **OR** cabbage leaves (daily) and covered the jars with lids that provided fresh air **OR** had holes.
1	The students added fresh cabbage leaves daily. **OR** The students added fresh food. **OR** The students covered the jars with lids that allowed fresh air into the jar. **OR** The students covered the jars with lids that had holes.
0	The students used a different temperature for each group.

Question 36



Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
36	4	Constructed Response	2	Evaluation of Models, Inferences, and Experimental Results	See scoring guide.

This item requires the examinee to explain why a prediction was incorrect. The examinee must determine which experimental results support their explanation and cite these results in the explanation.

Scoring Guide

2 points; analytic

Rubric

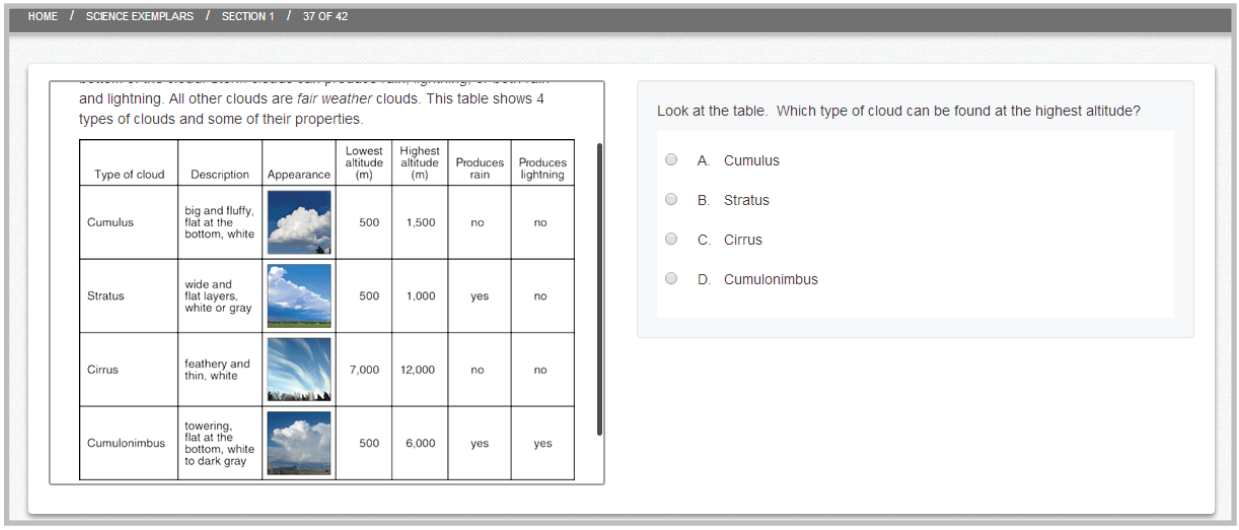
Score	Description
2	The response explains why the student's prediction was incorrect **AND** includes more than one number from Table 1 in the explanation.
1	The response explains why the student's prediction was incorrect, but does not use more than one number from Table 1 in the explanation.
0	The response demonstrates little to no understanding of the concept.

Note: A correct statement of the general trend, such as "All spent more time as larvae," should receive a point.

Sample Student Responses

Score	Response
2	More time was spent as a larva than as a pupa (at 22°C). Time spent as a pupa was 8 days, and time spent as a larva was 13 days. **OR** The time spent as a larva was 13 days, which was 5 days more than that spent as a pupa.
1	The prediction is incorrect because (at 22°C) more time was spent as a larva than as a pupa.
0	13 days

Question 37



Type of cloud	Description	Appearance	Lowest altitude (m)	Highest altitude (m)	Produces rain	Produces lightning
Cumulus	big and fluffy, flat at the bottom, white		500	1,500	no	no
Stratus	wide and flat layers, white or gray		500	1,000	yes	no
Cirrus	feathery and thin, white		7,000	12,000	no	no
Cumulonimbus	towering, flat at the bottom, white to dark gray		500	6,000	yes	yes

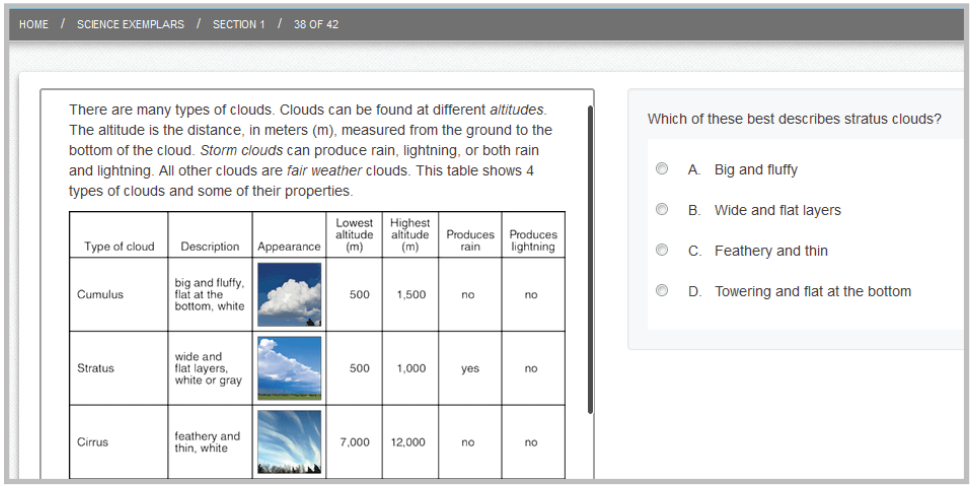
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
37	3	Selected Response	2	Interpretation of Data	C

This item requires the examinee to compare values for the highest altitude listed in the table.

Explanation of Correct Response

According to the table, a cirrus cloud can be found at a greater altitude (12,000 m) than any of the other types of clouds.

Question 38



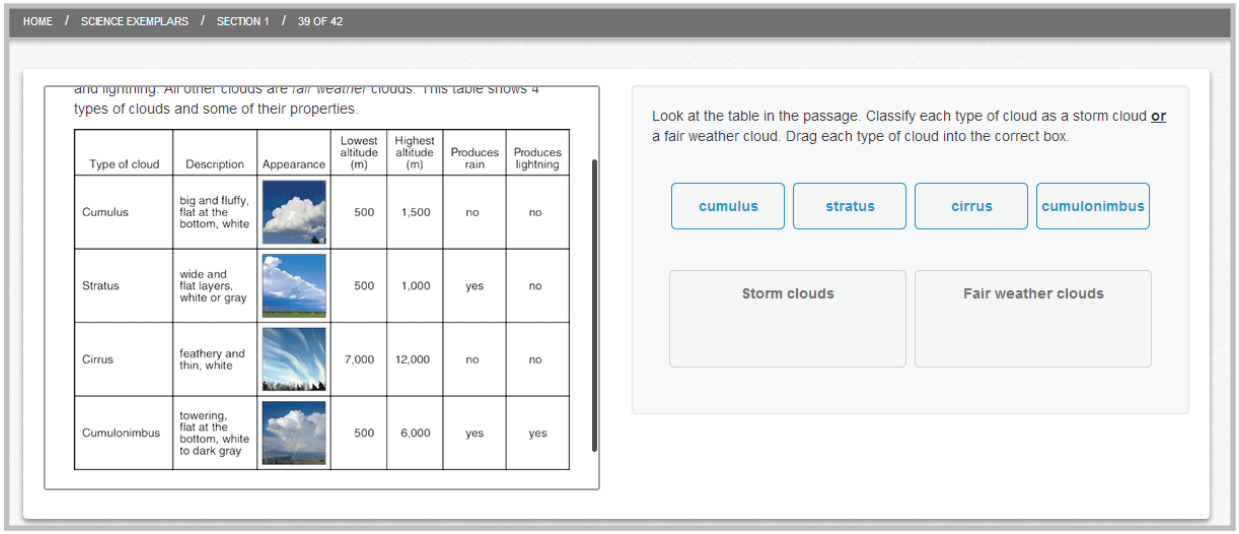
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
38	3	Selected Response	1	Interpretation of Data	B

This item requires the examinee to find basic information in a table.

Explanation of Correct Response

In the table, “Wide and flat layers” appears only in the description of stratus clouds.

Question 39



Type of cloud	Description	Appearance	Lowest altitude (m)	Highest altitude (m)	Produces rain	Produces lightning
Cumulus	big and fluffy, flat at the bottom, white		500	1,500	no	no
Stratus	wide and flat layers, white or gray		500	1,000	yes	no
Cirrus	feathery and thin, white		7,000	12,000	no	no
Cumulonimbus	towering, flat at the bottom, white to dark gray		500	6,000	yes	yes

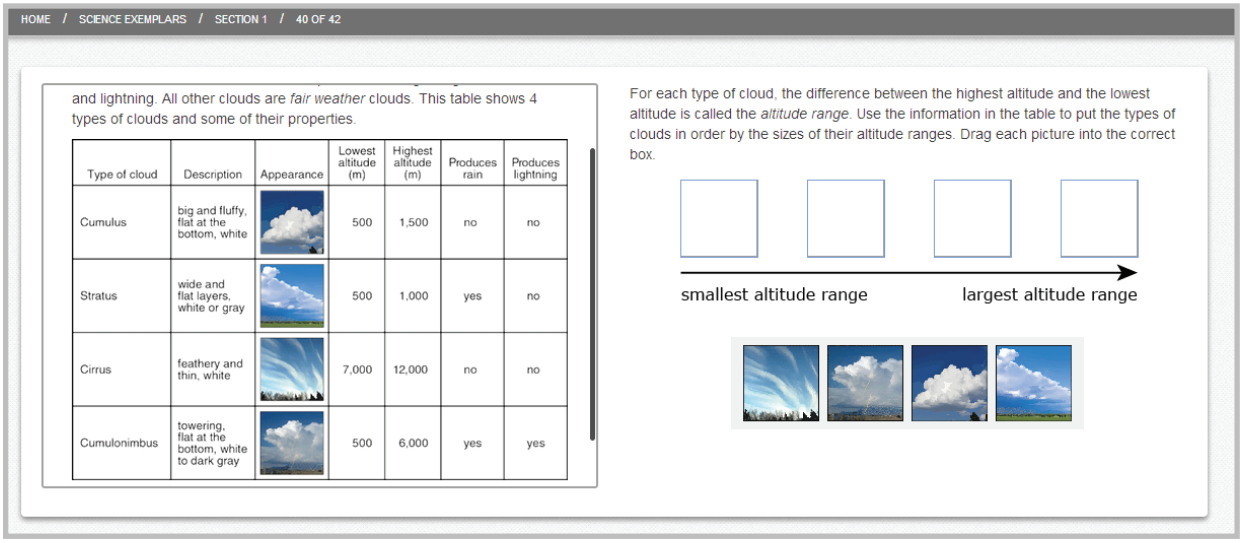
Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
39	3	Technology Enhanced	2	Interpretation of Data	Storm clouds: stratus, cumulonimbus; Fair weather clouds: cumulus, cirrus

This item requires the examinee to compare cloud types and sort them according to criteria introduced in the passage.

Explanation of Correct Response

The passage specifies that "storm clouds" produce rain, lightning, or both rain and lightning. According to the table, stratus clouds produce rain, and cumulonimbus clouds produce rain and lightning, so stratus clouds and cumulonimbus clouds are storm clouds. Neither cumulus nor cirrus clouds produce rain or lightning, so they are fair weather clouds.

Question 40



Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
40	3	Technology Enhanced	3	Interpretation of Data	

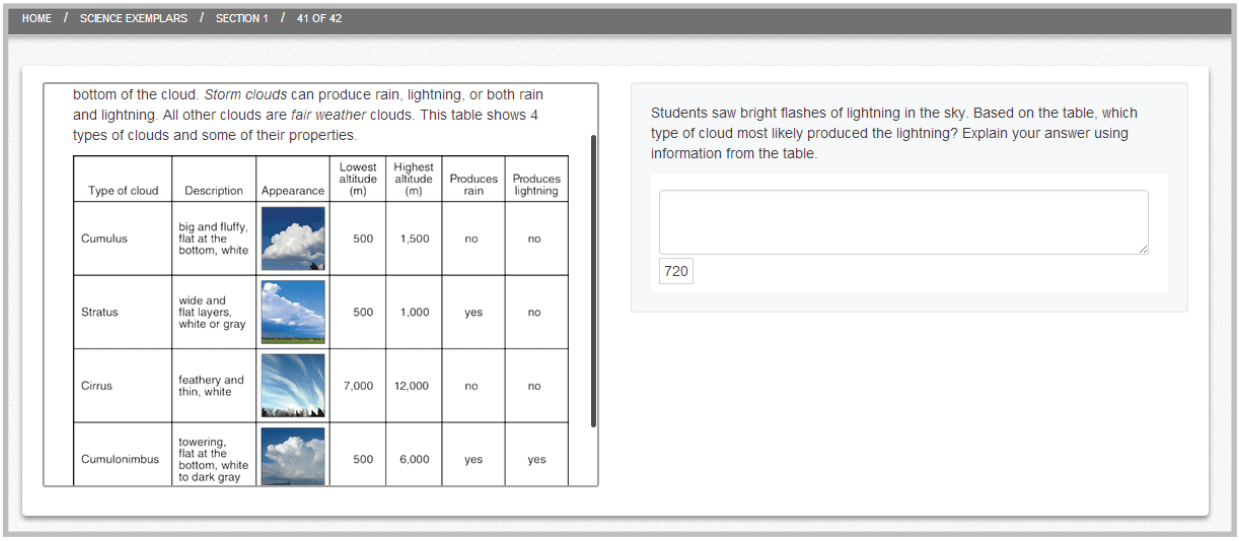
This item requires the examinee to estimate or calculate a new piece of data for each of the types of clouds and then compare these new data to produce an ordered list.

Explanation of Correct Response

Based on the table, the altitude ranges for each type of cloud are as follows:

- Cumulus (1,500 m – 500 m = 1,000 m)
- Stratus (1,000 m – 500 m = 500 m)
- Cirrus (12,000 m – 7,000 m = 5,000 m)
- Cumulonimbus (6,000 m – 500 m = 5,500 m)

Question 41



Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
41	3	Constructed Response	2	Evaluation of Models, Inferences, and Experimental Results	See scoring guide.

This item requires the examinee to make a conclusion based on information about cloud types provided in the table and to defend that conclusion using data from the table.

Scoring Guide

2 points; analytic

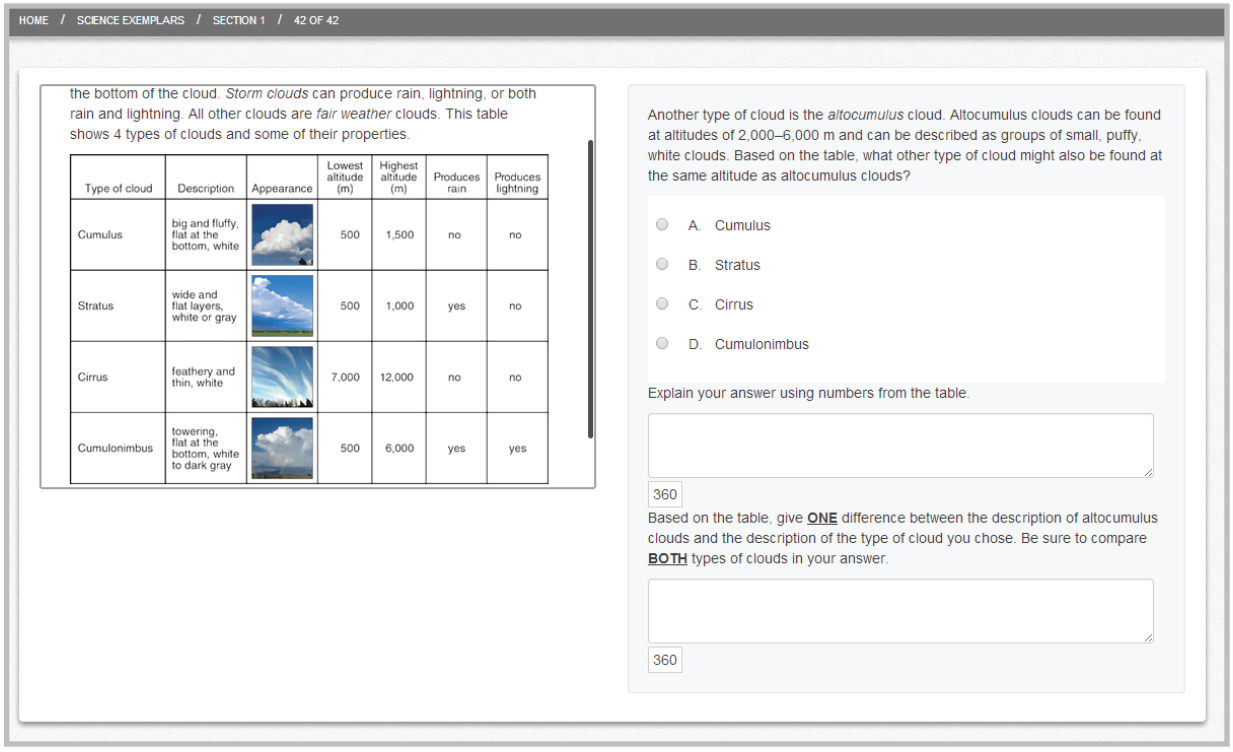
Rubric

Score	Description
2	The examinee identifies the type of cloud that produced lightning **AND** explains his or her answer using information from the table.
1	The examinee identifies the type of cloud that produced the lightning but either does not explain the answer **OR** explains the answer without using information from the table.
0	The response demonstrates little to no understanding of the concept.

Sample Student Responses

Score	Response
2	Cumulonimbus, because it is the only cloud listed in the table that produces lightning.
1	Cumulonimbus, because it is a storm cloud.
0	Stratus; it produces rain, and there is lightning when it rains.

Question 42



Sequence	Grade	Item type	DOK level	ACT Aspire reporting category	Correct response
42	3	Composite	3	Evaluation of Models, Inferences, and Experimental Results	See scoring guide.

This item first requires the examinee to apply information about an additional cloud type (altocumulus) to information in the table in order to conclude which cloud type meets the provided criteria and to explain how the data in the table were used to arrive at the conclusion. The examinee must then compare the description of altocumulus clouds to the description of the type of cloud they had selected from the table.

Scoring Guide

3 points; composite

Rubric

Score	Description
3	The examinee performs 3 of the following tasks correctly: • selects the correct response • explains using numbers from the table • gives one difference between the description of altocumulus clouds and the description of the type of cloud chosen by the examinee
2	The examinee performs 2 of the following tasks correctly: • selects the correct response • explains using numbers from the table • gives one difference between the description of altocumulus clouds and the description of the type of cloud chosen by the examinee (whether the type of cloud selected by the examinee was correct or not)
1	The examinee performs 1 of the following tasks correctly: • selects the correct response • explains using numbers from the table • gives one difference between the description of altocumulus clouds and the description of the type of cloud chosen by the examinee (whether the type of cloud selected by the examinee was correct or not)
0	The examinee demonstrates little to no understanding of the concept.

Note: An examinee who selects the incorrect selected-response task but provides explanations that are clearly supporting cumulonimbus clouds can earn up to 2 points for the response.

Sample Student Responses

Score	Response
3	Cumulonimbus (correct response). Cumulonimbus clouds form between 500 m and 6,000 m. Altocumulus clouds are small, puffy clouds, and cumulonimbus clouds are towering with flat bottoms.
2	Cumulonimbus (correct response). The altitude range is 500 m to 6,000 m. **OR** The altitude range is 500 m to 6,000 m. Altocumulus are white, and cumulonimbus clouds can be gray. **OR** Cumulonimbus (correct response). Altocumulus clouds are puffy, and cumulonimbus clouds are towering with flat bottoms.
1	Cumulonimbus (correct response). **OR** Altocumulus clouds and cumulonimbus clouds are both found at 6,000 m. **OR** Altocumulus clouds are white, but cumulonimbus clouds can be gray.
0	Cumulus; they are both flat at the bottom.