Activity 5
Reviewing Constructed-Response Science Items Grades 3, 4 and 5

Grade: 5

Standard: Earth and Space Sciences

Benchmark: Summarize the processes that shape Earth's surface and describe evidence of those processes.

Indicator: Describe evidence of changes on Earth's surface in terms of slow processes (e.g., erosion, weathering, mountain building and deposition) and rapid processes (e.g. volcanic eruptions, earthquakes and landslides).

Earth's land surface can be changed by erosion from slow or rapid natural processes.

In the **Answer Document**:

Describe how erosion can slowly change the surface of the land.

Describe how erosion can quickly change the surface of the land.

(2 points)

Scoring Guidelines

Exemplar Response: Erosion can slowly change the surface of the land when water freezes in the cracks of rocks and breaks them. Erosion can quickly change the surface of the land when hurricanes remove sand from beaches and the sand dunes.
Other Correct Response(s): Other correct responses for erosion by slow processes may include: ▪ Ice carving and carrying away rock and soil (glacier) ▪ Cracking of rocks by freezing water ▪ Wind and flowing water wearing down rocks ▪ Acid rain on limestone Other correct responses for erosion by rapid processes may include: ▪ Flowing flood waters cutting away at the bank of a river or stream

▪ Beach erosion during hurricanes ▪ Rock slides caused by heavy rains	
Points	**Student Response**
2 point text	The response correctly describes a slow process of erosion AND describes a rapid process of erosion.
1 point text	The response correctly describes a slow process of erosion OR describes a rapid process of erosion.
	1 point sample answer: Erosion can slowly change the surface of the land when acid rain eats away limestone.
0 point text	Response is incorrect.
	0 point sample answer: Erosion happens when the land is removed from where it was before.

Flaws:

Grade: 5

Standard: Scientific Processes: Inquiry, Technology, and Ways of Knowing

Benchmark: Use appropriate instruments safely to observe, measure and collect data when conducting a scientific investigation.

Indicator: Select and safely use the appropriate tools to collect data when conducting investigations and communicating findings to others (e.g., thermometers, timers, balances, spring scales, magnifiers, microscopes and other appropriate tools).

Your class is studying cloud formation. Each afternoon for a week, the students go outside and sketch the shapes of the clouds they see that day.

To understand what causes the different types of cloud formation, the class needs to collect other information about weather conditions.

In the **Answer Document**, name two pieces of information that the students need to collect. What instruments will they use to collect that information? (2 points)

Scoring Guidelines

Exemplar Response:

The students need to know the air pressure and they should use a barometer to measure this. They also need to know how humid it is. They can use a humidity gauge to measure the humidity.

Other Correct Response(s):

Other correct responses may include:

- Temperature – they will use a thermometer
- Wind speed – they will use an anemometer
- Direction of cloud movement – they will use a weather vane

Points	Student Response
2 point text	The response provides two pieces of information that students need to collect and states what instrument is needed to collect the information.
1 point text	The response provides two pieces of information and none or one instrument OR One piece of information and none to two instruments

	OR One or two instruments.
	1 point sample answer: The student needs to know the wind speed and the air pressure.
0 point text	Response is incorrect.
	0 point sample answer: The student can't do this investigation if there are no clouds in the sky.

Flaws:

Grade: 5

Standard: ES (Earth and Space Sciences)
Benchmark: D (Analyze weather and changes that occur over a period of time.)
Indicator: 7 (Describe the weather which accompanies cumulus, cumulonimbus, cirrus and stratus clouds.)

The table below shows temperature and cloud conditions for four different cities on a particular day.

Weather Data

City	Temperature	Type of Cloud Observed
1	27°F	Cumulonimbus
2	35°F	Cirrus
3	42°F	Stratus
4	37°F	Cumulonimbus

Select two cities.

In your **Answer Document,** describe and explain the type of weather each city will experience on this day. (4 points)

Scoring Guidelines

Exemplar Response:
City 1 will have snow because cumulonimbus clouds bring precipitation, but since it is really cold, it will be snow instead of rain. City 3 will be overcast and dark because stratus clouds are thick, so they block out the sun and they do not bring any kind of precipitation.

Other Correct Response(s):
Correct responses may include:
- City 1 will experience snow because cumulonimbus clouds bring precipitation and the temperature is below freezing.
- City 2 will experience sunny skies because cirrus clouds do not produce precipitation and do not cover the entire sky (are wispy or thin).
- City 3 will experience overcast (dark) skies with no precipitation because stratus clouds are low in the sky and block light from the sun.

• City 4 will experience rain because cumulonimbus clouds bring precipitation and the temperature is above freezing.	
Points	**Student Response**
4 point text	The response provides evidence of a complete understanding of the weather that accompanies different types of clouds and temperatures. The response provides a correct weather description and explanation of that weather for two cities.
3 point text	The response provides evidence of an understanding of the weather that accompanies different types of clouds and temperatures. The response provides a correct weather description for two cities but a correct explanation for only one of the city's weather conditions.
	3 point sample answer: City 2 will be sunny because cirrus clouds are wispy and don't block the sun. City 3 will be overcast and dark.
2 point text	The response provides evidence of a partial understanding of the weather that accompanies different types of clouds and temperatures. The response provides: • A correct weather description and correct explanation of that weather for one city; OR • A correct weather description for two cities, with no correct explanation for either city's weather.
	2 point sample answer: City 1 will be snowy and city 4 will be rainy.
1 point text	The response provides evidence of an incomplete understanding of the weather that accompanies different types of clouds and temperatures. The response provides a correct weather description for only one city with no explanation of the city's weather.
	1 point sample answer: City 2 will be sunny.
0 point text	The response fails to demonstrate any understanding of the weather that accompanies different types of clouds and temperatures. The response does not meet the criteria required to earn one point. The response indicates inadequate or no understanding of the task and/or the idea or concept needed to answer the item. It may only repeat information given in the test item. The response may provide an incorrect solution/response and the provided supportive information may be irrelevant to the

	item, or possibly, no other information is shown. The student may have written on a different topic or written, “I don’t know.”
	0 point sample answer: City 1 will have rain because the clouds are the right type. City 2 will be cloudy because the cirrus clouds cover the whole sky.

Flaws:

Activity 5
Reviewing Constructed-Response Science Items Grades 6, 7 and 8

Grade: 8

Standard: Physical Sciences

Benchmark: Relate uses, properties and chemical processes to the behavior and/or arrangement of the small particles that compose matter.

Indicator: Investigate how matter can change forms but the total amount of matter remains constant.

Ice changes into a liquid and then into a gas as it is heated.

Are these physical or chemical changes?

What happens to the mass of the water as it melts and then vaporizes?

(2 points)

Scoring Guidelines

Exemplar Response: It is a physical change. The mass stays the same.	
Other Correct Response(s): Other correct responses may include: ▪ The change is a physical change. ▪ The mass of the water does not change during either change.	
Points	**Student Response**
2 point text	The response correctly identifies the change AND identifies what happens to the mass of the water.
1 point text	The response correctly identifies the change OR identifies what happens to the mass of the water.
	1 point sample answer: The mass stays the same.
0 point text	The response indicates no understanding of the task or the underlying skills, concepts, tasks, or processes.
	0 point sample answer: It is a chemical change.

Flaws:

Grade: 8

Standard: Earth and Space Sciences

Benchmark: Describe interactions of matter and energy throughout the lithosphere, hydrosphere and atmosphere (e.g., water cycle, weather and pollution).

Indicator: Describe how temperature and precipitation determine climatic zones (biomes) (e.g., desert, grasslands, forests, tundra and alpine).

The chart below shows the characteristics of four biomes found on Earth.

Biome	Characteristics		
	Temperatures	Precipitation	Common Vegetation
Hot Desert	Hot days, cold nights yearly	Very dry yearly	Cacti, shrubs
Temperate Forest	Cold winters; warm summers	Moderate amounts yearly	Trees, shrubs,ferns, moss
Tropical Rain Forest	Warm yearly	Heavy rainfalls yearly	Trees, ferns, moss
Tundra	Cold winters; cool summers	Minimal amounts yearly	Grass, moss, shrubs

Choose one biome from the table and compare it to the desert.

In your **Answer Document**, describe how the desert can be distinguished from the biome you chose. Use two pieces of data from the chart to support your answer. (2 points)

Scoring Guidelines

Exemplar Response:

Deserts differ from temperate forests because deserts have dry conditions all year, and temperate forests get moderate precipitation year round. Deserts also have cacti that are not found in the temperate forests, and temperate forests have moss that deserts don't have.

Other Correct Response(s):

Other correct responses may include:

- Temperate forests have more precipitation, different seasons (winter, summer), and different vegetation (trees, ferns, moss).

▪ Tropical rain forests have more precipitation, warm temperatures year round, and different vegetation (trees, ferns). ▪ Tundra gets a little more rain, has colder temperatures year round, and has different vegetation (grass, moss). (Note to Scorers: Only two of the characteristics listed are required to distinguish the desert from other biomes)

Points	Student Response
2 point text	The response correctly describes two pieces of evidence that can be used to distinguish the desert from another biome.
1 point text	The response correctly describes one piece of evidence that can be used to distinguish the desert from another biome.
	1 point sample answer: The tropical rain forests get more rain than the desert gets.
0 point text	The response fails to indicate any understanding of how the desert can be distinguished from another biome. The response does not meet the criteria required for one point. The response indicates inadequate or no understanding of the task and/or the idea or concept needed to answer the item. It may only repeat information given in the test item. The response may provide an incorrect solution/response and the provided supportive information may be very irrelevant to the item, or possibly no other information is shown. The student may have written on a different topic or written, "I don't know."
	0 point sample answer: The desert is hot and dry.

Flaws:

Grade: 8

Standard: Scientific Processes: Inquiry, Technology, and Ways of Knowing

Benchmark: Explain that there are differing sets of procedures for guiding scientific investigations and procedures are determined by the nature of the investigation, safety considerations and appropriate tools.

Indicator: Choose the appropriate tools or instruments and use relevant safety procedures to complete scientific investigations.

Scientists want to know if a volcano may be ready to erupt in the near future.

Choose two instruments scientists could use to help determine this.

What would they measure with these instruments? (2 points)

Scoring Guidelines

Exemplar Response:

Scientists could use a thermometer to measure any increase in temperature. This might mean the volcano is getting ready to erupt. They could also use a seismometer to see if earthquakes are occurring.

Other Correct Response(s):

Other correct responses may include:

- Thermometer to measure increase in temperature
- Seismometer to measure earthquake activity
- An instrument to measure the emission of gases into the atmosphere

Points	Student Response
2 point text	The student provides two correct instruments and explains their use.
1 point text	The student provides only one correct instrument and explains its use.
	1 point sample answer: Scientists could use a thermometer to see if the temperature is rising.
0 point text	Response is incorrect.
	0 point sample answer: The scientists can use a telescope.

Flaws:

Activity 5
Reviewing Constructed-Response Science Items High School

Standard: Life Sciences

Benchmark: (Explain that cells are the basic unit of structure and function of living organisms, that all cells come from pre-existing cells and that there are a variety of cell types.

Indicator: Explain that living cells: a. are composed of a small number of key chemical elements (carbon, hydrogen, oxygen, nitrogen, phosphorus and sulfur); b. are the basic unit of structure and function of all living things; c. come from pre-existing cells, and; d. are different from viruses.

Viruses cannot reproduce independently. Certain resources of the host cell are required to replicate a virus.

In your **Answer Document**, describe how two different parts of the host cell are used to replicate a virus. Consider molecules, organelles, and processes of the host cell. (2 points)

Scoring Guidelines

Exemplar Response: The host cell's amino acids are used to form a virus's protein cap. The host cell's enzymes are used to produce copies of a virus's DNA.
Other Correct Response(s): Other responses that describe parts of the host cell that are required to replicate a virus include: Molecules ▪ ATP for protein synthesis ▪ Nucleotides to synthesize virus's DNA/RNA ▪ polypeptide=protein ▪ Enzymes for most processes Organelles ▪ Ribosomes for protein synthesis ▪ Golgi apparatus to process protein capsid ▪ Mitochondria Processes

▪ Replication of nucleic acids ▪ Transcription ▪ Protein synthesis ▪ Metabolism (production of ATP)

Points	Student Response
2 point text	The response correctly describes how two different parts of the host cell are required to replicate a virus.
1 point text	The response correctly describes how one part of the host cell is required to replicate a virus.
	1 point sample answer: The host cell's ribosomes are used to synthesize a virus's protein capsid.
0 point text	The response fails to give one reason why viruses should be classified as living OR give one reason why viruses should be classified as nonliving. The response does not meet the criteria required to earn one point. The response indicates inadequate or no understanding of the task and/or the idea or concept needed to answer the item. It may only repeat information given in the test item. The response may provide an incorrect solution/response and the provided supportive information may be irrelevant to the item; or, possibly, no other information is shown. The student may have written on a different topic or written, "I don't know."
	0 point sample answer: Viruses cause many diseases.

Flaws:

Standard Physical Sciences

Benchmark: Describe that matter is made of minute particles called atoms and atoms are comprised of even smaller components. Explain the structure and properties of atoms.

Indicator: Recognize that all atoms of the same element contain the same number of protons, and elements with the same number of protons may or may not have the same mass. Those with different masses (different numbers of neutrons) are called isotopes.

Atoms in the Periodic Table differ in their atomic number and atomic mass and volume of the atom.

In the **Answer Document:**

1. Explain where most of the mass of an atom is found.
2. Explain where most of the volume of an atom is found.

(2 points)

Scoring Guidelines

Exemplar Response:

1. Most of the mass of an atom is found in the nucleus because protons and neutrons are much heavier than electrons.
2. Most of the volume of an atom is found in the electrons because the electrons are in large-diameter orbits around the small nuclei.

Other Correct Response(s):

Other correct responses may include:

1. Nuclei have more mass than electrons.
2. Nuclei are much smaller than the atomic orbits of electrons.

Points	Student Response
2 point text	The response shows a complete understanding of the structure of atoms.
1 point text	The response shows a partial understanding of the structure of atoms.
	1 point sample answer: Nuclei are heavier than electrons.
0 point text	Response is incorrect.
	0 point sample answer: The volume and mass are all over the atoms.

Flaws:

Standard: Scientific Ways of Knowing

Benchmark: Recognize that scientific literacy is part of being a knowledgeable citizen.

Indicator: Investigate how the knowledge, skills and interests learned in science classes apply to the careers students plan to pursue.

A medical researcher is screening individuals for participation in a new drug trial for an experimental arthritis medication. All potential participants must answer a series of questions in order to determine whether they are eligible to participate. Below are four of the questions that appear on the questionnaire.

1. Are you currently taking any other medications?

2. If applicable, are any of the medications you are currently taking arthritis medications?

3. Do you have or have you had an ulcer (stomach problems) in the past year?

4. If applicable, are you currently pregnant or nursing?

Choose two of these questions and explain why it is important for the researcher to have accurate answers before selecting participants. Make sure to indicate the question number for each explanation. Respond in the space provided in your **Answer Document**. (2 points)

Scoring Guidelines

Exemplar Response: 1. Medications may react with each other. This may cause dangerous side effects. 4. If a woman is pregnant, the drug could affect the fetus since the fetus is connected to the mother by the placenta.
Other Correct Response(s): Other correct responses for each question may include: 1. Potential drug interactions could produce negative side effects or render certain drugs more or less effective. 2. Some drugs build up in your system over time, and it would be difficult for the researcher to ascertain whether the participant's "progress" during the study is a factor of the experimental drug or is affected by the previous arthritis medication taken.

3. Many drugs may cause stomach discomfort/distress. 4. Some drugs could cause birth defects and may also get into breast milk, causing problems for a nursing infant.	
Points	**Student Response**
2 point text	The response demonstrates a complete understanding of the task by explaining why it is important for the researcher to have accurate answers to two of the given questions before selecting participants.
1 point text	The response demonstrates a partial understanding of the task by explaining why it is important for the researcher to have an accurate answer to one of the given questions before selecting participants.
	1 point sample answer: 3. If they are given orally, some drugs can cause stomachaches.
0 point text	The response demonstrates no understanding of the task. The response may provide incorrect information or be irrelevant to the task. The response may only repeat information from the passage or prompt without any supporting information responsive to the task. The student may have written "I don't know."
	0 point sample answer: Drugs are always dangerous when they are new and you don't know what they will do to you.

Flaws:

Activity 6
Revising constructed Response Science Items to Correct the Flaws

Prompt:

Scoring Guidelines

Exemplar Response:	
Other Correct Response(s):	
Points	**Student Response**
4 point text	
3 point text	
2 point text	
1 point text	
0 point text	

Prompt:

Scoring Guidelines

Exemplar Response:	
Other Correct Response(s):	
Points	**Student Response**
4 point text	
3 point text	
2 point text	
1 point text	
0 point text	

Prompt:

Scoring Guidelines

Exemplar Response:	
Other Correct Response(s):	
Points	**Student Response**
4 point text	
3 point text	
2 point text	
1 point text	
0 point text	

Activity 7
Writing Effective Constructed-Response Science Items

Grade 5

Standard: Life Science

Benchmark: Differentiate between the life cycles of different plants and animals.

Indicator: Compare the life cycles of different plants including germination, maturity, reproduction, and death.

Grade 8

Standard: Physical Science

Benchmark: Trace how electrical energy flows through a simple electrical circuit and describe how the electrical energy can produce thermal energy, light, sound, and magnetic forces.

Indicator: Trace how electrical current travels by creating a simple electric circuit that will light a bulb.

High School

Standard: Science and Technology

Benchmark: Explain that science and technology are interdependent: each drives the other.

Indicator: Describe examples of scientific advances and emerging technologies and how they may impact society.

Prompt:

Scoring Guidelines

Exemplar Response:	
Other Correct Response(s):	
Points	**Student Response**
4 point text	
3 point text	
2 point text	
1 point text	
0 point text	