

MEA 2011–2012

Science Grade 8

The table below shows the entire eighth-grade science test design. Scores are based on common items only, half of which are released and can be found in this document.

Test Design

CONTENT AREA	COMMON		FIELD TEST ITEMS		TOTAL ITEMS PER STUDENT		BASE TESTING TIME	POINTS
	MC	CR	MC	CR	MC	CR		
SCIENCE	40	4	8	1	48	5	105 MIN.	56

Each item on the MEA measures a content standard of Maine's 2007 *Learning Results*.

Science Content Standards Assessed on the MEA

D. The Physical Setting

1. Universe and Solar System
2. Earth
3. Matter and Energy
4. Force and Motion

E. The Living Environment

1. Biodiversity
2. Ecosystems
3. Cells
4. Heredity and Reproduction
5. Evolution

Item Information Chart

Please refer to the item information chart on the next page for in-depth information on each science released item. The released item numbers in the chart correspond to item numbers in the practice test and on the MEA Item Analysis Report.

Constructed-Response Scoring Guides

A constructed-response scoring guide includes score point descriptions used to determine the score. Training notes that follow the scoring guide provide in-depth descriptions or particular information also used to determine the score.

Student Work

At least one sample student response is provided for each score point with annotations that explain the reasoning behind the assigned score.

Grade 8 Science Released Item Information																						
Released Item Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Practice Test Page Number	1	1	1	1	2	2	2	2	3	3	3	4	4	4	4	5	5	5	5	6	7	7
Content Strand (Maine 2007 Learning Results)	D4	E4	D2	E1	D2	D4	D3	D1	D3	D2	E3	E3	E5	D2	D1	E1	E2	D4	D3	D1	D3	E2
Depth of Knowledge Code	1	2	2	2	2	1	2	1	2	1	2	2	2	3	2	2	3	2	2	3	2	2
Item Type	MC	CR	CR																			
Possible Points	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4
Answer Key	C	D	D	B	C	C	C	A	B	A	A	B	A	D	D	B	D	D	D	C		
% Who Chose A or Earned 1 Point	5	1	10	6	4	3	8	82	28	79	67	26	62	21	13	34	17	3	6	25	8	15
% Who Chose B or Earned 2 Points	4	1	3	58	12	3	13	5	47	19	10	58	10	15	7	29	27	9	9	8	51	56
% Who Chose C or Earned 3 Points	86	2	17	8	60	39	65	9	11	1	5	9	14	21	5	20	12	3	19	52	27	17
% Who Chose D or Earned 4 Points	5	96	70	28	24	55	14	4	13	1	17	6	13	43	75	16	43	85	65	14	7	4
Statewide Average Student Score																					2.19	1.92

Content Strands: See "MDOE Regulation 132--Learning Results: Parameters for Essential Instruction" at <http://www.maine.gov/education/lres/pei/index.html>.

Item Type: MC = multiple choice, CR = constructed-response

Answer Key: the letter of the correct answer choice

MEA Science Grade 8 Released Items – Student Work

Constructed-Response Item 21

21 Changes that are observed in everyday living are listed below.

- Rusting iron
- Cooking an egg
- Melting ice
- Cutting paper
- Charging a battery
- Mowing grass
- Burning wood
- Making lemonade
- Eating food

- a. Choose **six** changes from the list and identify each change as a physical or a chemical change.
- b. Explain your reasoning for each of your identifications.

Scoring Guide for Constructed-Response Item 21

Score	Description
4	The response demonstrates a thorough understanding of the difference between physical and chemical changes. The response correctly classifies physical and chemical changes of six changes in the table and supports the identifications with a valid argument. The response has no errors or omissions.
3	The response demonstrates a general understanding of the difference between physical and chemical changes. The response has one to two errors or omissions.
2	The response demonstrates a limited understanding of the difference between physical and chemical changes. The response has three to four errors or omissions.
1	The response demonstrates a minimal understanding of the difference between physical and chemical changes. The response has one piece of correct information.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes for Constructed-Response Item 21

Parts a. and b.:

- Rusting iron is a chemical change because a new substance (oxide of iron) is formed.
- Cooking an egg is a chemical change because it gives rise to a new substance by destroying proteins present in the egg. A response that states “cooking an egg is a physical change” is unacceptable. The egg is not changing state; the egg is changing into another substance, which happens to be solid at room temperature. This type of response demonstrates an understanding below the eighth-grade level.
- Melting ice is a physical change. A new substance is not formed; ice is melted and the state of matter is changed.
- Cutting paper is a physical change. A new substance is not formed when paper is cut. There is only a change in size of the object.
- A chemical reaction takes place in a battery by forming compounds or new substances as it is charged or discharged. Thus, charging a battery is a chemical change.
- Mowing grass is a physical change. A new substance is not formed when grass is mowed.
- Burning wood is a chemical change. New substances are formed (ash, CO₂, and H₂O). A response that states “burning wood is a chemical change *because the wood changes chemically*” is unacceptable. A response that states “burning wood is a chemical change *because it undergoes a chemical reaction*” is acceptable.
- Making lemonade is a physical change. A new substance is not formed when lemonade is made.
- Eating food is a chemical change. By mixing with saliva present in the mouth, food is broken into new substances. (This can also be a physical change—teeth breaking food into smaller pieces.)

Note 1: Any example not listed in the prompt was not credited, regardless of a valid answer. The response could be seen as responding by rote memory rather than demonstrating knowledge.

Note 2: If a response correctly identified all six selected changes and then gave a general explanation or definition of physical and chemical changes, the response received a score of 3 points.

Part a. is worth 3 points and part b. is worth 3 points. (Half points are assigned to these scores.)

1/2 point = 1-

1 1/2 points = 1+

3 1/2 points = 2+

5 1/2 points = 3+ and use the score conversion scale below.

Score Conversion:

6 points = 4

4-5 points = 3

2-3 points = 2

1 point = 1

a. Rusting iron and burning wood are chemical changes. Cutting paper, making lemonade, melting ice, and mowing grass are all physical changes.

b. Rusting iron is a chemical change because iron and oxygen are making a whole new substance: rust. Burning wood is a chemical change because oxygen is reacting to the heat on the wood. Cutting paper and mowing grass are physical changes because only the mass of the grass and the paper are changing. Making lemonade is a physical change because it's not a new substance, it is just a mixture. Lastly, melting ice is a physical change because it is only a phase change.

Summary annotation statement:

The response includes six changes from the list and correctly identifies each change as a physical or chemical change. Each explanation of the change includes appropriate reasoning. The response expresses a thorough understanding and receives a score of 4.

A) Mowing grass - physical change melting ice - physical change
Burning wood - chemical change rusting iron - chemical change
Cutting paper - physical change eating food - physical change.

B) Well all the physical changes are because they only change their appearance not the actual material itself. The chemical changes actually changes the substances, like burning wood changes to ash.

Summary annotation statement:

The six changes are identified correctly as physical or chemical changes. Part b. includes a general explanation regarding physical changes: “[T]hey only change their appearance, not the actual material.” Chemical changes are also explained as “actually chang[ing] the substances, like burning wood changes to ash.” The response is considered general and receives a score of 3.

Ⓐ cutting paper-physical, charging a battery-
chemical, melting ice-chemical, mowing grass-
physical, rusting iron-chemical, eating food-
physical.

Ⓑ The physical changes were caused
by humans like eating food or cutting
paper. Chemical changes happen because
of nature.

Summary annotation statement:

Five changes from the list are correctly identified as a chemical or physical change. "Melting ice" is not a chemical change. The reasoning in part b. is incorrect. For these reasons, the response is considered limited and receives a score of 2.

Sample 1-Point Response with Annotations for Constructed-Response Item 21

a. melting ice - chemical change.
Mowing grass - physical change
Eating food - physical change
making lemonade - chemical change
b. depending on ~~the~~ what 1.

Summary annotation statement:

"Mowing grass" and "eating food" are correctly identified as physical changes. This is considered a minimal response and receives a score of 1.

Sample 0-Point Response with Annotations for Constructed-Response Item 21

A.
Burning Wood - When you put a flame to wood it will burn. Making lemonade - put the sugar in it and it disappears. Mowing grass - you cut the grass. Melting ice - turns into water. Charging a battery - when you charge it you can play with the toy again.

Summary annotation statement:

The response contains no information that correctly responds to the question. No credit is earned.

Constructed-Response Item 22

- 22 The honey badger is a mammal that eats a variety of foods, including honey. However, the badger cannot easily find beehives on its own. A bird called a honeyguide bird is good at finding beehives. When the bird finds a beehive, it sings loudly, attracting the badger. The badger comes and pulls apart the beehive, leaving some beeswax, larvae, and honey for the bird.
- Identify the type of relationship that exists between the badger and the bird.
 - Describe the type of relationship identified in part a. Include how these two animals interact.
 - Describe **one** positive consequence and **one** negative consequence that result from the interaction between the badger and the bird.

Scoring Guide for Constructed-Response Item 22

Score	Description
4	The student demonstrates a thorough understanding of an interaction between two animals and its consequences. The response identifies and describes the relationship and how the two animals interact. The response includes a positive and a negative consequence of the interactions between the animals. The response has no errors or omissions.
3	The student demonstrates a general understanding of an interaction between two animals and its consequences. The response has one error or omission.
2	The student demonstrates a limited understanding of an interaction between two animals and its consequences. The response has two errors or omissions.
1	The student demonstrates a minimal understanding of an interaction between two animals and its consequences. The response has one correct piece of information.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes for Constructed-Response Item 22

- a. The relationship is mutualism or symbiotic.

Note 1: The only answers given credit in part a. were “mutualism,” “symbiotic,” and “symbiosis.” “Mutual” or “mutual relationship” were not credited, because, in general discourse, all relationships can be considered mutual in the context that they are shared. Some degree of technical terminology was required.

- b. Both organisms benefit from the relationship. One animal finds a food source and the other makes the food available to both of them.

Note 1: Part b. was scored by assigning 1 point each to the description of a symbiotic relationship and to the interaction of the badger and honeyguide.

Note 2: In part b., discussions of symbiosis were accepted when phrased as, “they help each other survive.” It touches on the same issue, as survival is the most important benefit to any organism.

- c. Positive and Negative Consequences:

- The badger gets a positive benefit by being led to the food’s location.
- The bird gets a positive benefit by being given access to the food.
- A negative consequence is that the badger destroys the beehive.
- A negative consequence is that the bird is unable to get food unless the badger is nearby. The badger is unable to get honey without the bird.

Note 1: For part c., the response “there might not be enough food for both” was accepted as a negative consequence. Splitting a single food source can create a scarcity.

Note 2: For part c., no credit was given for “both organisms dying” as a negative consequence.

Part a. is worth 1 point, part b. is worth 2 points, and part c. is worth 2 points.

Score Conversion:

5 points = 4

4 points = 3

2–3 points = 2

1 point = 1

A. The relationship is a symbiotic relationship.

B. A symbiotic relationship is when 2 animals help each other and get benefits from it. In this case, the honeyguide bird finds a beehive. It then sings so the honey badger can find the hive. The badger tears up the hive, eats, and leaves some food for the honeyguide bird. The bird finds seeds, the badger tears it apart, and they both eat.

C. One thing that's positive is that they both can eat. Neither will go hungry. One negative thing is that the bee population will go down. It will go down because if they keep destroying hives, there won't be many left.

Summary annotation statement:

The response correctly identifies the relationship as "symbiotic." The response describes the relationship as helping each other, and the two animals "get benefits from it." The response also includes the interaction of the honey badger and the honeyguide bird. In addition, the positive consequence is explained: "[T]hey both can eat. Neither will go hungry." The negative consequence is also explained: "[T]hey keep destroying [the bee]hive." The response expresses a thorough understanding and receives a score of 4.

① The badger and the Bird have a simbeotic relationship.

② They have a simbeotic relationship because they work together. The bird finds the food and the badger gets the food from the beehive.

③ One positive consequence for them is the bird does not have to open the beehive and the badger does not have to find the food. One negative problem is the bird can't eat if there is no badger around to break the beehive apart. The badger can't eat also. If there is a bird around to alert it to a beehive.

Summary annotation statement:

The response correctly identifies the relationship as “simbeotic” [symbiotic]. The interaction of the badger and honeyguide bird is included, but in the description of a symbiotic relationship, it is unclear that both benefit from the relationship. The positive and negative consequences are included, although the positive is weakly stated. The response is considered general and receives a score of 3.

a. The badger and the bird are like hunting partners.

b. One goes out to find the prey while the sits and waits for its call. When alarmed The badgers attacks, leaving just enough for the bird.

c. One good thing is that neither the badger nor the bird will starve, One bad thing is they are destroying the bees habitat.

Summary annotation statement:

The response does not identify the type of relationship in part a. The description provided in part b. does not make it clear that the badger and the bird help each other to survive. Therefore no points are given for the description of the type of the relationship. The description of the interaction, “[o]ne goes out to find the prey...[w]hen alarmed [t]he [badger] attacks, leaving just enough for the bird,” is enough for partial credit (1 point) in part b. The positive consequence, “neither the badger nor the bird will starve,” and the negative consequence, “destroying the bees [bees’] habitat,” are both valid. For these reasons, the response is considered limited and receives a score of 2.

(3 points = 2 score)

A) a food relationship

B) the bird finds the food
the badger eats what it wants and
leaves the rest for the bird

C) ^{positive} The badger interacts with
other animals

^{negative} if all the birds
die out so will the badgers

Summary annotation statement:

The response incorrectly identifies the type of relationship. In part b., the response includes a correct description of the interaction: “[T]he bird finds the food...the badger eats what it wants and leaves the rest.” Part c. receives no credit. This is considered a minimal response and receives a score of 1.

a.) Kinda of like a hunter and retriever

b.) The bird finds a beehive and sings

c.) ? I Don't know!

Summary annotation statement:

The response contains no correct elements and receives a score of 0.