

MEA 2018–2019

Science Grade 8

The table below shows the entire eighth grade science test design. Scores are based on common items only, 12 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
Practice Test Page Number	2	2	3	3	3	4	4	5	5	5	6	7
Content Strand (Maine 2007 Learning Results)	D.2.a	D.4.c	D.1.b	E.3.d	E.3.c	E.4.c	E.5.c	D.4.d	D.2.b	D.4.e	E.2.c	D.3.c
Depth of Knowledge Code	2	2	2	2	3	2	2	1	2	2	2	2
Item Type	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	CR	CR
Possible Points	1	1	1	1	1	1	1	1	1	1	4	4
Answer Key	D	A	B	D	C	A	C	A	A	C		
% Who Chose A or Earned 1 Point	2	56	2	9	8	65	9	77	51	28	11	18
% Who Chose B or Earned 2 Points	4	11	81	9	5	12	14	15	21	9	61	37
% Who Chose C or Earned 3 Points	21	26	4	10	58	18	71	3	16	54	8	15
% Who Chose D or Earned 4 Points	72	7	12	72	29	5	5	3	12	8	6	13
Statewide Average Student Score											1.82	1.88

Content Strands: See “MDOE Regulation 132–*Learning Results: Parameters for Essential Instruction*” at <https://www.maine.gov/doe/learning/content/scienceandtech/standards>.

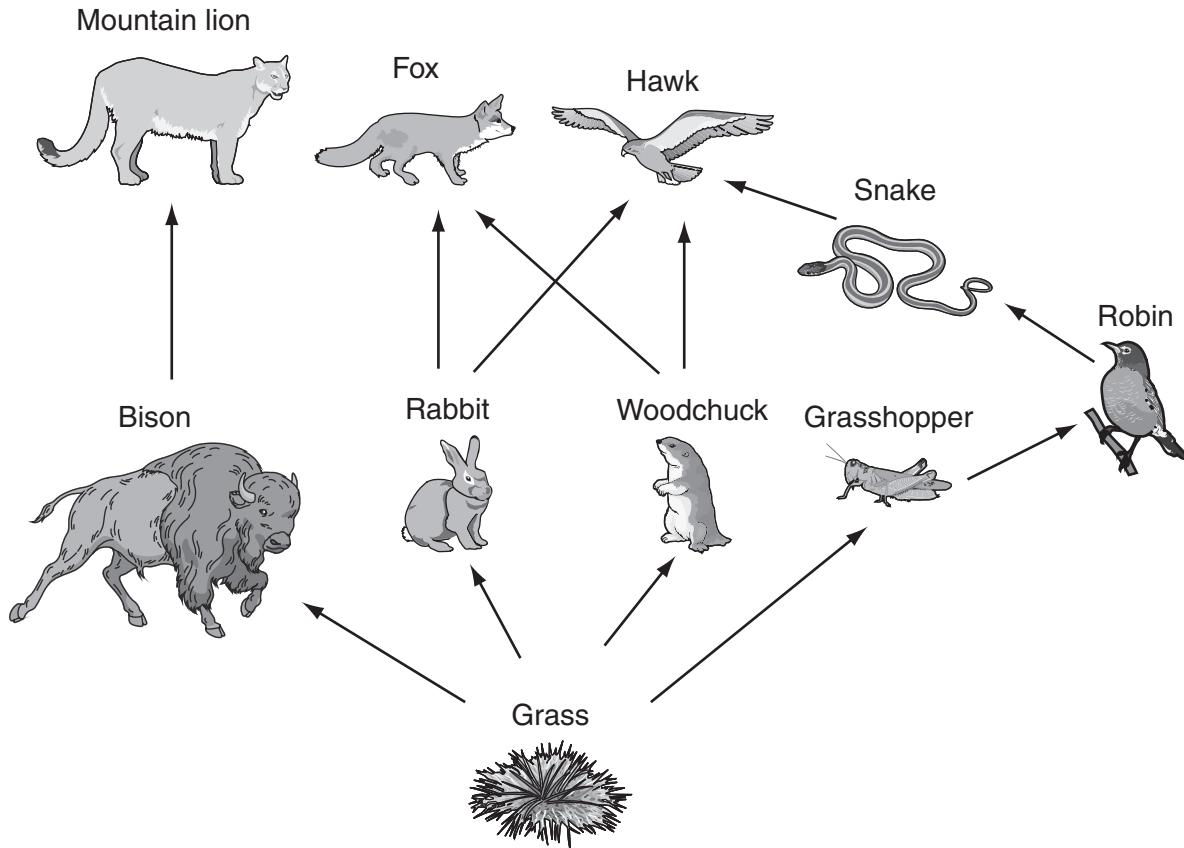
Item Type: MC = multiple choice, CR = constructed response

Answer Key: the letter of the correct answer choice

MEA Science Grade 8 Released Items – Student Work

Constructed-Response Item 11

11 The diagram below shows a grassland food web and the flow of energy and matter.



- Identify the source of the energy for all land-based food webs.
- Describe how the energy flows through each level of the food web shown in the diagram. Include the name of the organism(s) for each level described.

Scoring Guide for Constructed-Response Item 11

Score	Description
4	The student demonstrates a thorough understanding of how energy flows through a food web from its source. The response identifies the source of energy for the food web and describes the flow of energy through each level. The response has no errors or omissions.
3	The student demonstrates a general understanding of how energy flows through a food web from its source. The response has one error or omission.
2	The student demonstrates a limited understanding of how energy flows through a food web from its source. The response has two errors or omissions.
1	The student demonstrates a minimal understanding of how energy flows through a food web from its source. 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 11

Part a

- Original source of energy is the Sun.

Part b

- Level I–Grasses (plants or producers) get energy from the Sun [convert solar energy to chemical energy by the process of photosynthesis]. This is the level at which energy enters the web.
- Level II–Bison (rabbits, woodchucks, grasshoppers, or herbivores) eat the plants to get their energy. (primary consumer)
- Level III–Lions (fox, badgers, birds, snakes, hawks, or carnivores) eat the herbivores. (secondary consumer)

Note: A response that gives a general outline of energy's passage up the food web is given 1 point.

Part a is worth one point, and part b is worth one point for each of the three levels.

a) The energy source would be the sun because plants need the sun to conduct photosynthesis.

B) The grass absorbs the sunlight and goes through photosynthesis. The bison, rabbit, woodchuck and grass hopper all eat the grass; the grass hopper is then eaten by a robin. Next, the bison, rabbit woodchuck and robin are eaten by mountain lions, foxes, hawks. (the robin is eaten by the snake which is eaten by the hawk.)

Summary Annotation Statement:

Part a is correct. Part b correctly identifies the three levels and organisms within them. Full credit.

a) The source of energy for all land-based food webs is the sun.

b) The energy flows through each level when the bison eats the grass the bison receives energy from them. When the mountain lion consumes the bison, the bison and grass energy goes to the mountain lion. The energy is shown with the arrows.

Summary Annotation Statement:

Part a is correct. Part b: levels 2 and 3 are correct, but there is no mention of grass getting energy. 3 points total.

a. The source of energy for all of the food groups is Grass

b. The Grass is eaten by the Bison, Rabbit, Woodchuck, Grasshopper. After those animals have eaten the Grass they are eaten by their predators: The Mountain lion, fox, Hawk, Snake, and Robin. By eating their prey these animals are also eating the grass in which was devoured by their prey.

Summary Annotation Statement:

Part a is incorrect. Part b is correct with regards to levels 2 and 3. No mention of grass getting energy. 2 pts total.

Sample 1-Point Response with Annotations for Constructed-Response Item 11

The Hawk, Eats Rabbits and woodchucks
and so does the fox.

Summary Annotation Statement:

Part a not attempted. Part b has a correct statement regarding level 3. 1 pt total.

Sample 0-Point Response with Annotations for Constructed-Response Item 11

A The source of energy for all
land-based food webs is grass.

Summary Annotation Statement:

Part a is incorrect. Part b is not attempted.

Constructed-Response Item 12

12 Listed below are four examples of matter undergoing change.

1. Sugar dissolving
2. Starch being digested
3. Ice melting
4. Candle wax burning

- a. Choose **three** examples from the list and identify each as a chemical change or a physical change.
- b. Explain your answer for each example you chose in part a.

Scoring Guide for Constructed-Response Item 12

Score	Description
4	The response demonstrates a thorough understanding of the difference between chemical and physical change. Response correctly identifies the type of change for each example and gives an accurate explanation for each. Response has no errors or omissions.
3	The response demonstrates a general understanding of the difference between chemical and physical change. Response has an error or omission.
2	The response demonstrates a limited understanding of the difference between chemical and physical change. Response has errors and omissions.
1	The response demonstrates a minimal understanding of the difference between chemical and physical change. Response is minimal.
0	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 12

Part a and b:

1. Sugar dissolving is an example of a physical change because the granules are simply broken down into smaller sized particles—the sugar ($C_6H_{22}O_{11}$) retains its chemical identity after dissolving; it's still the same substance.
2. Starch digesting is an example of a chemical change because the complex starch molecule is broken down or decomposed into simpler substances (sugars).
3. Ice melting is an example of physical change because the solid H_2O molecules simply gain enough heat energy to change state; the ice retains its chemical identity (H_2O) when it becomes liquid water; although the physical properties are different, ice and water are still the same chemical substance.
4. Candle wax burning is an example of a chemical change because the wax molecules ($C_{30}H_{62}$) react with oxygen (O_2) to produce new substances—carbon dioxide (CO_2) and water vapor (H_2O). Candle wax has a physical change when it melts and resolidifies.

Note: no circular explanation accepted, e.g., chemical change is something that changes chemically.

Each fully identified and explained example is worth 2 points.

Score Point Conversion

6 pts = 4

5 pts = 3

3–4 pts = 2

1–2 pts = 1

A. Starch being digested is a chemical change. Ice melting is a Physical change. Candle wax burning is a chemical change.

B. Starch being digested is a chemical change because after you digest starch it isn't starch anymore, it's something else. Since starch is a new substance, we know that is an example of a chemical change. Ice melting is a physical change because if you melt something it's still the same substance, just in a different form. Candle wax burning is a chemical change because when you burn something it's not the same substance. Also flames is an example of a chemical change.

Summary Annotation Statement:

3 correct IDs and 3 reasonable explanations. 6 pts = score of 4.

a. Sugar dissolving = Physical

ice melting = Physical

candle wax burning = chemical

b. Sugar dissolving is physical because it is just changing form. There are not bonds being broken.

ice melting is physical because of the same reasons. it is just changing form. wax burning is chemical because smoke is a sign of a chemical change.

Summary Annotation Statement:

Part a: 3 correct IDs. Part b: explanation for wax is insufficient for a 4. 5 pts = score of 3.

A. Candle wax = chemical change
Sugar dissolving = physical
Starch being digested - Chemical Change

B. Candle wax is a chemical change because it melts and becomes a chemical.
Sugar dissolving is physical because its dissolving.
Starch being digested is chemical because because it is being digested.

Summary Annotation Statement:

Part a correctly identifies 3 changes. Part b is incorrect. 3 pts = score of 2.

a. Sugar dissolving - physical
Starch being digested - physical
Ice melting - chemical

b. Sugar dissolving - because you need to put sugar in something for it to dissolve.

Starch being digested - because you eat the food for it to digest.

Ice melting - because it melts on its own.

Summary Annotation Statement:

In part a, identifying sugar dissolving as a physical change is correct. Nothing else correct. 1 pt = score of 1.

ice melting sugar dissolving are pritt much
the same thing because water will dissolve
and so will sugar so ice dissolving could
happen to.

Summary Annotation Statement:

Response does not address the prompt in any way.