

MEA 2011–2012

Science Grade 5

The table below shows the entire fifth-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	32	4	8	1	40	5	90 MIN.	48

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 5 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
Practice Test Page Number	1	1	1	2	2	2	2	3	3	3	4	4	4	4	5	5	6	6
Content Strand (<i>Maine 2007 Learning Results</i>)	D2	D4	E3	E5	E1	D1	E2	E5	D4	E2	D4	D3	D2	D2	E2	E1	D3	E4
Depth of Knowledge Code	1	1	1	1	3	2	3	3	2	1	2	2	2	2	2	2	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	4	4
Answer Key	D	D	A	D	B	A	B	A	A	B	A	B	B	D	C	C		
% Who Chose A or Earned 1 Point	6	8	66	7	8	73	12	76	75	1	87	13	8	6	3	4	21	34
% Who Chose B or Earned 2 Points	16	8	14	1	67	10	32	4	7	96	7	69	68	1	25	3	50	31
% Who Chose C or Earned 3 Points	2	12	8	3	9	5	31	2	7	1	3	8	7	6	62	91	21	9
% Who Chose D or Earned 4 Points	76	72	11	89	16	12	25	17	10	1	3	10	18	87	10	2	5	1
Statewide Average Student Score																	2.07	1.26

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 5 Released Items – Student Work

Constructed-Response Item 17

- 17 A student places an ice cube on a black paved road on a hot summer day.
- Describe how the ice cube changes in **five minutes**. Be sure to use “heat energy” in your description.
 - Describe how the ice cube changes in **five hours**. Be sure to use “heat energy” in your description.

Be sure to label parts a and b in your answer booklet.

Scoring Guide for Constructed-Response Item 17

Score	Description
4	The response demonstrates a thorough understanding of how heating and cooling of water and other substances can affect their physical properties. The response provides descriptions of what happens to the ice cube in five minutes and in five hours. The response has no errors or omissions.
3	The response demonstrates a general understanding of how heating and cooling of water and other substances can affect their physical properties. The response has one error or omission.
2	The response demonstrates a partial understanding of how heating and cooling of water and other substances can affect their physical properties. The response has errors or omissions.
1	The response demonstrates a minimal understanding of how heating and cooling of water and other substances can affect their physical properties. The response is minimal or 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 17

Part a: (2 points - two points for a detailed description and one point for a partial description)

In five minutes, one of the following responses:

- It will absorb heat energy and most likely change (melt) from a solid (cube) to a liquid (puddle).
- The heat energy will cause the temperature of the ice to increase.
- The ice cube absorbs heat energy from the pavement, the air, or the Sun and melts.

Part b: (2 points - two points for a detailed description and one point for a partial description)

In five hours, one of the following responses:

- The ice cube melts completely because of heat energy and more time in the Sun or on the pavement.
- The water (puddle) will absorb more heat energy from the pavement and the Sun.
- It will cause the puddle to become smaller or completely disappear because of more heat energy.
- It will cause the change from a liquid to a gas because of more heat energy.

The ice cube that the student placed on the road on a hot day would change in five minutes because the heat energy from the sun would allow the tar to become hot and the ice cube is wide open to the sun. These two things would cause the ice cube to get a lot smaller in 5 minutes. B. The ice cube would change in 5 hours because, as I said before, the heat energy from the sun would cause the tar to get hot and the ice cube is wide open to the sun. But instead of just getting smaller, the ice would completely melt because instead of the ice cube being exposed to the sun for 5 minutes, it would be there for 5 hours.

Summary annotation statement:

The response includes a detailed description of how the ice cube changes in 5 minutes: “[T]he heat energy from the sun would allow the tar to become hot and the ice cube is wide open to the sun... would cause the ice cube to get a lot [a lot] smaller in 5 minutes.” The response also includes a detailed explanation of what would happen to the ice cube in 5 hours: “[I]nstead of just getting smaller, the ice would completely melt.” The response expresses a thorough understanding and receives a score of 4.

The Sun's heat energy has already warmed up the pavement so if you set it down it will start to melt. Plus the Sun's rays are melting it already on top so the hot pavement is melting it on the bottom and the Sun's rays are melting it on top so it will probably turn into a puddle of water.

After five minutes it has already melted so after 5 hours it might already start to evaporate from sitting in the Sun's heat energy.

Summary annotation statement:

The response includes a detailed description: "The suns [sun's] heat energy has already warmed up the pavement...it will start to melt...it will probably turn into a puddle of water." The response mentions evaporation in part b., but does not include a complete description. The response states that after five minutes, the ice cube has already melted. Then in part b., it includes the wording "after five hours it might already start to evaporate." The response is considered general and receives a score of 3.

a. the heat energy will melt it into water
b. the heat energy will make the water evaporate.

Summary annotation statement:

Parts a. and b. include partial descriptions: “[H]eat energy will melt it into water” and “heat energy will make the water evaporate.” For these reasons, the response is considered limited and receives a score of 2.

Ⓐ In five minutes the ice will slowly be melting in to water because of the heat energy that oservobs it.

Summary annotation statement:

The response includes a partial description for part a. only. “[T]he ice will slowly be melting in to [into] water because of the heat energy that oservobs [absorbs] it.” This is considered a minimal response and receives a score of 1.

The ice cube changes in five minutes from a lot of heat energy. The ice cube change in five hours because there was probably not that much heat energy.

Summary annotation statement:

The response repeats information from the prompt, contains no correct elements, and receives a score of 0.

Constructed-Response Item 18

18 A farmer breeds the two chickens shown below.



- a. Describe two physical characteristics an offspring of the chickens could inherit from its parents. Be sure to explain why these characteristics are inherited.
- b. Describe two physical characteristics an offspring of the chickens could **not** inherit from its parents. Be sure to explain why these characteristics are not inherited.

Be sure to label parts a and b in your answer booklet.

Scoring Guide for Constructed-Response Item 18

Score	Description
4	The response demonstrates a thorough understanding of some likenesses between children and parents that are inherited and some that are not. The response describes two characteristics that are inherited and two characteristics that are not inherited. The response has no errors or omissions.
3	The response demonstrates a general understanding of some likenesses between children and parents that are inherited and some that are not. The response has one error or omission.
2	The response demonstrates a limited understanding of some likenesses between children and parents that are inherited and some that are not. The response has errors or omissions.
1	The response demonstrates a minimal understanding of some likenesses between children and parents that are inherited and some that are not. The response is minimal or 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 18

- a. Inherited characteristics describe a physical trait of the chicken (leg length, feather color, feather length, comb size, comb shape, etc.).
The explanation should connect the characteristic with inheritance, genetics, or “got it from its parents.” Any response that includes a learned explanation is not correct.
- b. Not-inherited characteristics describe a physical attribute and provide an explanation that is due to the specific chicken’s life (scars, feather loss, parasites, picking wounds, broken wing, broken feathers, toe loss, etc.).

Each part is 2 points.

Note: Some characteristics (e.g., body size) from part a. could, with appropriate explanation, be accepted as a response for part b.

g a Long tailfeathers. a2 Spotted wings
 a1 explanation. It can inherit the genes from its father
 Chickens can grow long tailfeathers.

a2 explanation. It can inherit the gene for spotted
 wing from its mother.

b1 Scars on its legs. b2 Clipped wings.
 b1 explanation. The chicken cannot inherit scars because
 you get scars by action and reaction to your environment,
 such as attacking another chicken in a fight for a mate.

b2 explanation. Chickens aren't born with clipped wings.
 It can get clipped wings by trying to fly and
 getting its wings clipped by its master.

Summary annotation statement:

The response describes two physical characteristics, “long tail feathers” and “spotted wings,” that an offspring of the chickens could inherit from its parents. The response includes two explanations: “It can inherit the genes from its [its] father” and “it can inherit the gene for spotted wing from its [its] mother.” The response also includes two physical characteristics that could not be inherited from its parents, “[s]cars on its [its] legs” and “clipped wings,” with two explanations, “...because you get scars by action and reaction to your environment” and “[c]hickens aren't born with clipped wings.” The response expresses a thorough understanding and receives a score of 4.

a Two things that the offspring could inherit are
 a The offspring could have the same spotted feathers like the chicken on the right because the chicken was born with those feathers so they are in its genes, so it can be passed on.
 a The chicken could inherit the shape of the chicken on the left's tail because the tail is in its genes so it can be passed on like the first example. a It is hard to tell if there is anything that is not in its genes so I will give two examples. a Say if the chicken on the left lost a wing in an accident that does not mean the offspring will have only one wing because it was not inherited. a If the chicken on the right loved corn that does not mean the offspring loves corn because it can decide if he likes corn. Those are two not inherited traits and two inherited traits.

Summary annotation statement:

The response includes two physical characteristics, "same spotted feathers" and the same tail shape, with an explanation: "The chicken was born with those feathers, so they are in its [its] genes, so it can be passed on." In part b., one physical characteristic, "one wing," and the explanation "lost a wing in an accident" receives credit, although, "loves corn" is not considered a physical characteristic and does not receive credit. The response is considered general and receives a score of 3.

A: The offspring could inherit feather color, size.

B. The offspring couldn't inherit toenail size, feather loss.

Summary annotation statement:

The response includes only physical characteristics in parts a. and b., without explanations. For this reason, the response is considered limited and receives a score of 2.

1: A one way an offspring can inherit the parent's physical characteristics is the color of the feathers.

Summary annotation statement:

The response includes one physical characteristic, "color [color] of the feathers." This is considered a minimal response and receives a score of 1.

A. Both chickens are black and white. The first chicken has bigger feet.

B. The first chicken has hair, and the second one doesn't. He is bigger than the second chicken.

Summary annotation statement:

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