

MEA 2009–2010

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	1	2	2	2	2	3	3	3	3	4	4	4	4	5	6
Content Strand (Maine 2007 Learning Results)	E5	E5	D3	E1	D2	D1	E2	D2	E3	D3	D3	D2	E1	D2	E2	E3	D4	E4
Depth of Knowledge Code	2	2	2	1	2	1	3	2	2	2	2	1	1	1	2	2	2	3
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	A	D	C	C	D	D	C	A	D	B	B	B	D	C	D	A		
% Who Chose A or Earned 1 Point	83	1	4	13	1	7	6	93	5	9	10	7	18	19	18	68	17	29
% Who Chose B or Earned 2 Points	1	2	34	9	31	6	6	4	6	72	57	81	23	4	23	11	29	20
% Who Chose C or Earned 3 Points	16	13	45	73	14	9	48	2	22	11	10	4	5	74	12	9	28	24
% Who Chose D or Earned 4 Points	0	84	18	5	55	79	39	1	67	7	22	8	54	3	47	12	17	24
Statewide Average Student Score																	2.24	2.37

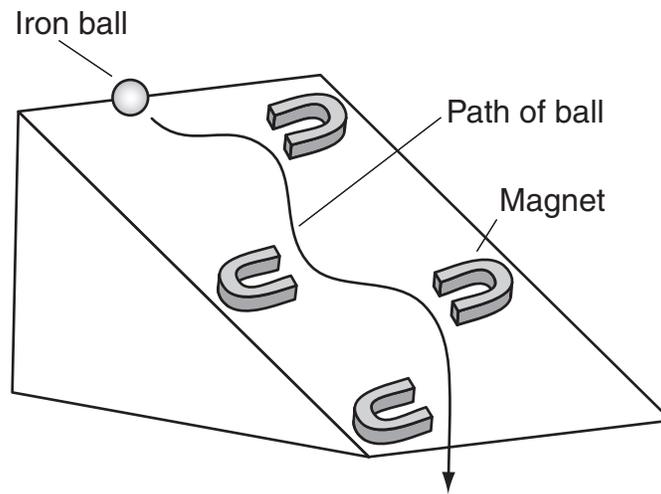
Content Strands: See “MDOE Regulation 132—Learning Results: Parameters for Essential Instruction” at <http://www.maine.gov/education/lres/pei/index.html>.

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

Answer Key: the letter of the correct answer choice

Constructed-Response Item 17

- 17 The diagram below shows an iron ball and a ramp with several magnets on it. The ball does not stick to any magnet, but the magnets are close enough to affect the motion of the ball. The ball rolls slowly down the ramp, following a curved path.



- Explain why the ball does not roll straight down the ramp.
- Describe a change that would make the ball roll more slowly down the ramp.
- Describe a change that would make the ball roll more quickly down the ramp.

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

Scoring Guide for Constructed-Response Item 17

Score	Description
4	Response demonstrates a thorough understanding of how various forces affect the motion of an object. Response explains why the ball follows a curved path and explains how to make the ball move more quickly and more slowly. Response has no errors or omissions.
3	Response demonstrates a general understanding of how various forces affect the motion of an object. Response has an error or omission.
2	Response demonstrates a limited understanding of how various forces affect the motion of an object. Response has two errors or omissions.
1	Response demonstrates a minimal understanding of how various forces affect the motion of an object. Response has one correct piece of information.
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 17

- a. the path of the ball is not straight because the ball is pulled by the magnets which makes the path curved (wobbly), or the path of the ball is not straight because the ball is pulled by the magnets, but the ball doesn't get close enough to stick to the magnets
 - did not accept an explanation in part (a) that described the magnets "letting the ball go" or "releasing the ball," since the magnetic force does not diminish. The ball simply moves beyond it.
 - since the ball is labeled simply as iron, and not as carrying a charge in its own right, discussions in part (a) that described the magnets "pushing" the ball were not accepted.
- b. make the ball less smooth, make the ramp less smooth, decrease the pitch of the ramp, increase the number of magnets to make the curves longer, make ramp sticky, increase strength of magnets
 - accepted "push the magnets closer" would cause the magnetic field to increase in strength
 - did not accept "Put a magnet on the top/bottom," because lack of clarity about the position of the magnet makes it unclear how the ball would be affected
- c. make the ball more smooth, make the ramp more smooth, increase the pitch of the ramp, decrease the number of magnets to make the curves shorter, remove all the magnets so ball goes straight down, make ramp slippery, decrease strength of magnets, non-magnetic ball
 - accepted "pull the magnets apart" would cause the magnetic field to decrease in strength
 - did not accept "put a magnet on the top/bottom" because lack of clarity about the position of the magnet makes it unclear how the ball would be affected

Notes:

- If parts (b) and (c) gave the same action as both slowing and speeding up the ball, no credit was given for either, as no understanding was shown.
- If a response to part (b) or (c) gave both an action that would create the desired effect, and one that would create the opposite effect, no credit was given.
- Graphic answer is allowed.

Part (a) 2 pts

Part (b) 1 pt

Part (c) 1 pt

17.

(A) This is why the ball would not roll straight down the ramp. It would not roll straight down the ramp because the force of the magnets brings the ball towards them, but doesn't completely hold onto them. The ball gets pulled by the force of the magnets, making it slow down and go in a wavy shape.

(B) A change that would make the ball roll more slowly down the ramp is to add more magnets. If you added more magnets the ball would have to be pulled in by more magnets. The ball would take longer to get down because it has to turn more often.

(C) A change that would make the ball roll more quickly down the ramp is to either take away some of the magnets or all of the magnets. This way the ball wouldn't have to be pulled in by as many magnets or none at all. It would have less ground to cover.

Summary annotation statement:

The response is clear as to why the ball has a curved path, explaining that 'the force of the magnets brings the ball towards them, but does not completely hold onto them,' and that this force results in 'it slow down and go in a wavy shape.' A correct method is provided for slowing the ball: additional magnets. The approach for making the ball roll more quickly down the ramp is also valid: removal of some or all the magnets. In both parts (b) and (c), the response also explains why this is correct, and the effect on the ball, though not required, shows a command of the material. The response receives a score of 4.

17.

A. the magnets are pulling it since its made of iron!

B. put magnets between the magnets that are already there.

C. take away all the magnets.

Summary annotation statement:

The response provides a partial explanation as to why the path is curved. It is not clear whether the ball does not stick to or sticks and releases from the magnets on its path down the ramp. Various phrases would have been sufficient such as 'curves the path' or 'cause the ball to wobble going down the ramp.' The two provided mechanisms for altering how quickly the ball rolled down are valid. The response provides a partial explanation for part (a), while parts (b) and (c) receive full credit. This shows a general understanding and receives a score of 3.

17.

A. The ball does not role straight down the ramp because of friction.

B. The ball would role more slowly down the ramp if it was not as steep.

C. The ball would role more quickly down the ramp if it was more steep.

Summary annotation statement:

The response does not provide an explanation for the path shown in the diagram and receives no credit for part (a). Making the ramp less steep is a valid method to make the ball roll more slowly. The response is also correct that increasing the steepness of the ramp would result in the ball rolling more quickly down the ramp. The information provided in parts (b) and (c) is correct but shows a limited understanding, and the response is scored a 2.

17.

a. It does not roll straight because there magnets and the ball is iron.

b. It could go slow by having the magnets a little far away from the ball.

c. It can go faster by taking the magnets away from the ramp.

Summary annotation statement:

The explanation for the path mentions the magnets but does not discuss the attractive force or the reason for ball not rolling straight down; no credit is given for part (a). The response in part (b) presents a change: move 'the magnets a little far away from the ball' is unclear—it is taken to mean that the magnets would be farther away from the ball which would result in the ball rolling more quickly down the ramp; no credit is given for part (b). The mechanism presented in part (c) is valid: 'taking the magnets away' would result in a quicker rolling ball. The response contains one correct element, expressing a minimal command of the content, and receives a score of 1.

17.

a. The ball does not roll straight down the ramp because it has curved path that forces it to go down that path.

b. A change that would make the ball roll down the ramp more slowly is if the path had more swervey path then it would take more time to reach the bottom of the ramp.

c. A change that would make the ball go more quickly down the ramp is if it had less curved lines then it would reach the bottom of the ramp quicker.

Summary annotation statement:

The response presents explanations and mechanisms for change based on an incorrect interpretation of the graph. The response indicates that the ball is following a path carved into the ramp and describes changes that could be made to this path. No credit is given, and the response receives a score of 0.

Constructed-Response Item 18

18 The list below can be used to describe humans.

- Color blindness (not able to see some colors)
- Smoker or nonsmoker
- Clothing color
- Eye color
- Hair color
- Honesty
- Height

a. Draw the T-chart shown below, including the labels, in your answer booklet. Place each characteristic from the list into one of the two groups.

Inherited	Not Inherited

b. Choose two characteristics from the list and explain why they 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 thorough understanding of how some likenesses between children and parents are inherited, and some are not. Response correctly sorts the descriptors into two groups and explains 2 descriptions as not inherited. Response has no errors or omissions.
3	The response demonstrates general understanding of how some likenesses between children and parents are inherited, and some are not. Response has one error or omission.
2	The response demonstrates partial understanding of how some likenesses between children and parents are inherited, and some are not. Response has two errors or omissions.
1	The response demonstrates minimal understanding of how some likenesses between children and parents are inherited, and some are not. Response has one correct piece of information.
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 18

- a. Height, hair color, eye color, color blindness = inherited; Smoker/nonsmoker, clothing color, honesty = not inherited
- b. Not inherited descriptions should have reference to obtaining descriptions by choice or decisions. Not having similar traits to a parent is not an acceptable explanation for a trait not being inherited.

Notes:

To receive partial credit in part (a), a response needs to have at least 3 traits correct, except for a minimal 1 score. For a minimal 1 score, 1 or 2 correct traits are acceptable.

Part (a) is 2 pts and part (b) is 2 pts.

18.

A.

<u>inherited</u>	<u>Not inherited</u>
color blindness	Smoker
eye color	clothing color
Hair color	honesty
<u>Height</u>	

B. Being a Smoker isn't inherited because you smoke if you want to.

Clothing color isn't inherited because you where whatever color you want.

Summary annotation statement:

The response sorts all the presented traits correctly as either inherited or not inherited. The two traits discussed in part (b), being a smoker and clothing color, are explained accurately as being not inherited since they are the result of choices a human makes. Phrases such as '... you smoke if you want to' and '... where whatever color you want' clearly indicate a decision was made. The response receives a score of 4; it is thorough and does not contain an error.

18.

A inherited	not inherited.
color blindness	smoker or nonsmoker
hair color	clothing color
eye color	
Honesty	
Height	

b. smoker and nonsmoker isn't inherited because you can choose if you are gonna smoke or not. Same with clothing color, you can choose.

Summary annotation statement:

The response correctly sorts all the presented traits except for honesty, which is identified as an inherited trait. For part (b), being a smoker/nonsmoker and clothing color are clearly explained as not inherited since a choice is what leads to the observed trait. The response presents a general understanding, one error in the sorting of the traits, and a clear explanation as to why two specific traits are not inherited and receives a score of 3.

18.

a	inherited	not inherited
	nonsmoker	color blindness
	Eye color	smoker
	Hair color	clothing color
	Height	honesty

b I did not inherit color blindness because no one is color blind in my family and clothing color I choose my own color clothing.

Summary annotation statement:

The response incorrectly assigns color blindness as not inherited and being a nonsmoker as inherited. Since nonsmoker/smoker was presented in both categories, it is not given credit for the smoker being assigned as not being inherited. More than 3 traits are correctly sorted, so the response receives partial credit part (a). Part (b) also receives partial credit for stating that clothing color is a choice. The explanation that color blindness is not inherited since 'no one is color blind in my family' is a single genetic case and does not show that people acquire non-inherited traits by choice or decisions. The response presents a partial understanding and receives a score of 2.

18.

a.

Inherited	Not inherited
Clothing color	Color blindness
eye color	Smoker or non smoker
Hair color	
Honesty	
height	

B: Color blindness and Smoker and nonsmoker are not inherited because no one had it on my mom and dad's side of the family. None of my relatives smoke so we don't smoke.

Summary annotation statement:

The response incorrectly assigns honesty and clothing color as inherited traits and color blindness as not an inherited trait; partial credit is awarded since other assignments are correct. Part (b) takes 'color blindness' and 'smoker and nonsmoker' and treats the topic of not being inherited in a case specific genetic manner; the gene is not present in this specific genetic pool to pass on. No credit is awarded in part (b) since it does not correctly respond to the prompt. The partial credit in part (a) shows a minimal understanding, and the response receives a score of 1.

18.

a.

inherited	Non inherited
Smoker / Non smoker	Color blindness
clothing color	Eye color
Honesty	hair color
	Height

b. color blindness - you

cannot help it.

Height - you cannot help
it, either.

Summary annotation statement:

The table present has assigned all the traits incorrectly; no credit is given for part (a). Part (b) presents two traits that are actually inherited with a statement that 'you cannot help it.' This further confuses the issues since the response uses two incorrectly assigned traits to the non-inherited group with an explanation more in line with inheritance. The response provides no correct material and receives a score of 0.