2023

NSCAS NEBRASKA STUDENT-CENTERED ASSESSMENT SYSTEM

Grade 8 - Item Type Sampler
Science
Summative Assessment

Directions:

On the following pages of your booklet are questions for the Grade 8 *Nebraska Student-Centered Assessment System–Science (NSCAS–S)* Item Type Sampler.

Read these directions carefully before beginning this item type sampler.

This item type sampler will include several different types of questions. Multiple choice questions will ask you to select an answer from among several answer choices. Multiple select questions will ask you to select multiple correct answers from among several answer choices. For some questions, there may be two parts, Part A and Part B. Some questions will ask you to construct an answer by following the directions given.

For all questions:

- Read each question carefully and choose the best answer.
- You may use scratch paper to make notes.
- Be sure to answer ALL the questions in your booklet.

When you come to the word STOP at the end, you have finished the Grade 8 Science NSCAS–S Item Type Sampler.

STOP.

Water Balloon Challenge

1. **Use the information to answer the question.**

Some teachers volunteer for a water balloon challenge. Each student gets one balloon to launch at a teacher. The goal is to get water on as much of the teacher as possible. The students can fill their balloons with as much water as they want, and they must use a catapult to launch the balloons. The catapult can launch the balloon at a maximum speed of 10 meters per second (m/s).

Some science students decide to work together to figure out the best balloon size and the best launch speed to get the most water on the teachers. The students learn that balloons with the most kinetic energy will have the biggest splash radius upon impact. The students measure the mass of each balloon they fill with water. Then, they determine the relationship between mass and kinetic energy. The students want the balloons' speed to stay constant while they test various masses, so they set the catapult to launch the balloons at a speed of 7 m/s. They launch each balloon and calculate its kinetic energy.

Water Balloon Mass and Kinetic Energy

Balloon Number	**Water Balloon Mass** (kilograms)	**Kinetic Energy** (joules)
1	0.55	13.5
2	0.21	5.1
3	0.58	14.2
4	0.17	4.2
5	0.86	21.1

Which statement BEST describes the relationship between mass and kinetic energy?

A. When kinetic energy increases, mass increases.

B. When mass increases, kinetic energy increases.

C. When kinetic energy increases, mass decreases.

D. When mass increases, kinetic energy decreases.

Go on to the next page.

Water Balloon Challenge

2. **Use the information to answer the question.**

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Next, the students decide to launch balloons at different speeds to see how speed affects the kinetic energy of the balloons. The students use five water balloons with the same mass. The students record data they collect and calculate in a table.

Water Balloon Speed and Kinetic Energy

Balloon Launch Speed (m/s)	**Kinetic Energy** (joules)
4	4.8
5	7.5
7	14.7
8	19.2
9	24.3

Which statement BEST describes the cause-and-effect relationship between speed and kinetic energy?

A. When kinetic energy increases, speed increases.

B. When kinetic energy increases, speed decreases.

C. When speed increases, kinetic energy increases.

D. When speed increases, kinetic energy decreases.

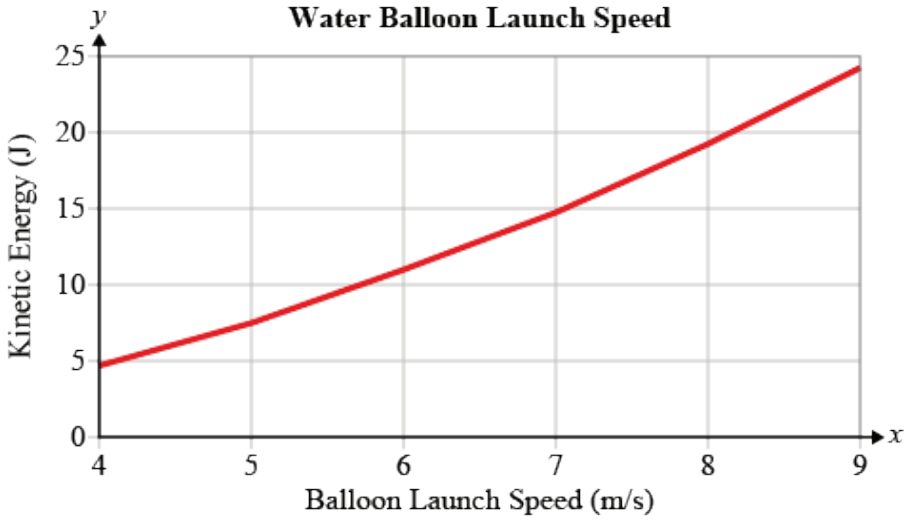
Go on to the next page.

Water Balloon Challenge

3. **Use the graph to answer the question.**

Next, the students decide to launch balloons at different speeds to see how speed affects the kinetic energy of the balloons. The students use five water balloons with the same mass. The students record data they collect and calculate in a table.

The students then graph the data they collected.



What is the approximate kinetic energy, in joules (J), of a water balloon moving at a speed of 6 m/s?

A. 9 J

B. 11 J

C. 14 J

D. 15 J

Go on to the next page.

Water Balloon Challenge

4. **Use the information to complete the task.**

Some teachers volunteer for a water balloon challenge. Each student gets one balloon to launch at a teacher. The goal is to get water on as much of the teacher as possible. The students can fill their balloons with as much water as they want, and they must use a catapult to launch the balloons. The catapult can launch the balloon at a maximum speed of 10 meters per second (m/s).

The students want to explain how changing one variable affects other variables in the water balloon challenge. The students use the equation for kinetic energy (KE): $KE = \frac{1}{2}mv^2$, where m = mass and v = velocity (speed).

Select **all** of the statements that correctly describe a cause-and-effect relationship between the mass, speed, or kinetic energy of the water balloons.

A. If mass doubles, then speed doubles.

B. If mass doubles, then speed is halved.

C. If mass doubles, then kinetic energy doubles.

D. If mass doubles, then kinetic energy is halved.

E. If speed doubles, then kinetic energy quadruples.

F. If speed doubles, then kinetic energy is quartered.

Go on to the next page.

Cattle Genetics

5. **Use the information to complete the task.**

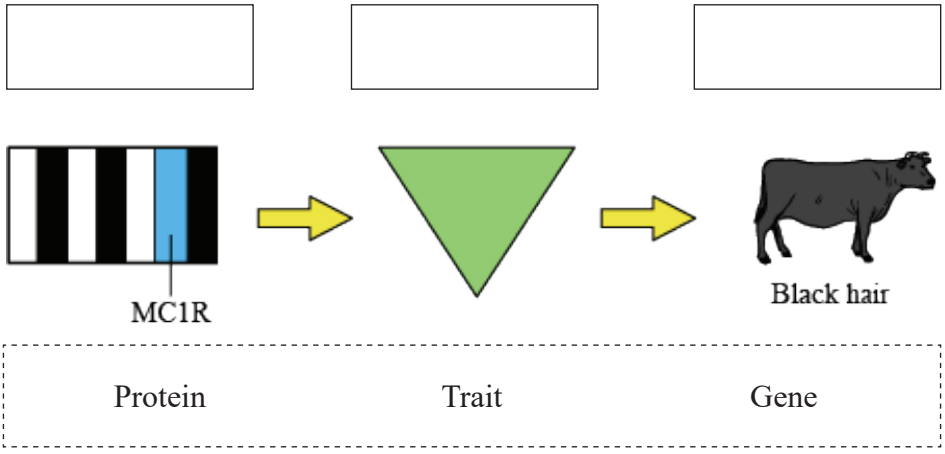
A rancher has a population of cattle with a variety of traits for hair color, including white, black, and red.

Some cattle with white hair on their face are getting a cancer around the eye. The white hair has light skin underneath. This skin is vulnerable to the sun's ultraviolet light, which can damage skin cells and cause cancer. The presence of white hair is related to genetics.

The white-hair trait occurs only if a particular gene (the SILV gene) shuts off the process that results in black or red hair colors. The coding for this process is located on the MC1R gene. The list shows different conditions that result in black or red hair colors in cattle:

- If at least one copy of the black trait is present on the MC1R gene, the hair will be black.
- If two copies of the red trait are present on the MC1R gene, the hair will be red.
- If the SILV gene does not turn off the MC1R gene, the hair will be either black or red.

Students want to build a model to show how different genetic parts are related. Select and write the words in the boxes to label the model.



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Cattle Genetics

6. **Use the information to complete the task.**

A rancher has a population of cattle with a variety of traits for hair color, including white, black, and red.

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- If two copies of the red trait are present on the MC1R gene, the hair will be red.
- If the SILV gene does not turn off the MC1R gene, the hair will be either black or red.

Characterize the role of the genes that code for cattle hair color. Select and write words in the blanks to correctly complete the sentence.

If the _____ gene _____

the _____ gene, the effect on the

cattle is _____.

SILV	MC1R
does not turn off	turns off
neutral	possibly harmful

Go on to the next page.

Cattle Genetics

7. **Use the information to answer the question.**

A rancher has a population of cattle with a variety of traits.

Another challenge for the rancher is that some of the cows are giving birth to calves with a rare, but fatal, genetic condition called tibial hemimelia (TH). A particular mutation of the ALX4 gene on a chromosome causes TH.

Students create a model of a condensed, normal chromosome.

ALX4 Gene on a Chromosome

The shaded regions on the model represent genes on the chromosome. The width of these genes depends on the amount of genetic code that the gene contains.

A deletion of part of the ALX4 gene from the chromosome causes TH. How should the students change the chromosome model to BEST represent a chromosome with the TH mutation?

A. Students should make the region representing the ALX4 gene slightly thicker.

B. Students should make the region representing the ALX4 gene slightly thinner.

C. Students should duplicate the region representing the ALX4 gene on the chromosome.

D. Students should move the region representing the ALX4 gene to a new place on the chromosome.

Cattle Genetics

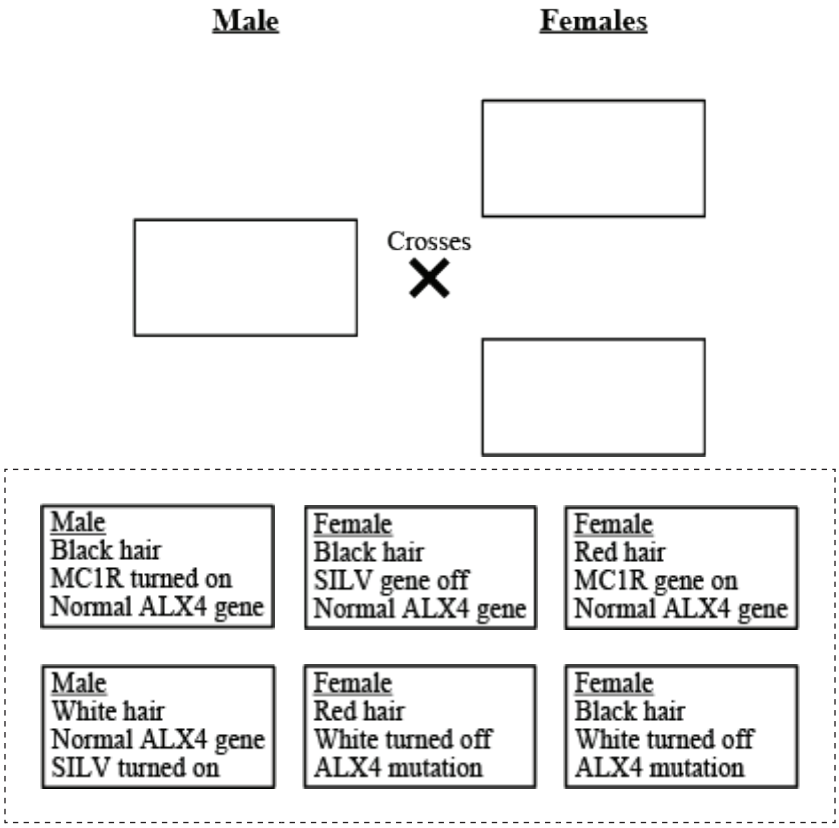
8. **Use the information to complete the task.**

The rancher must consider the genetics for both TH and hair color when breeding the cattle. The list summarizes the genes of concern:

- **ALX4 gene:** A mutation on this gene causes the fatal condition called TH.
- **SILV gene:** When turned on, this gene shuts off the MC1R gene and prevents coding for black and red hair colors.
- **MC1R gene:** When turned on, this gene codes for black and red hair colors.

The rancher wants to select one male cow and two female cows to mate to produce healthy offspring.

Select and write in **one** male and **two** female cows in the boxes to make two healthy crosses.



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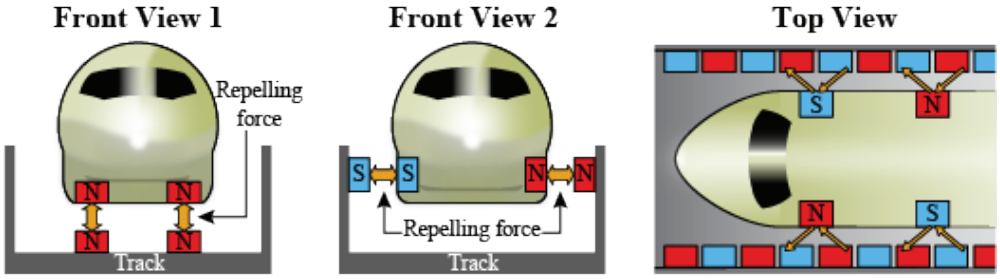
A Floating Train

9. **Use the information to answer the question.**

A student sees a video with a "floating" train. The student wants to learn more about this train and why it seems to float.

The student reads this information from an article in a travel magazine:
"Have you heard of a train powered by magnets? Did you know that you could travel across the state of Nebraska on such a train almost as fast as if you flew in an airplane? This is all possible on a Maglev train. Maglev is short for 'magnetic levitation.' Maglev trains use powerful electromagnets to float a train car above a rail or guide. Functioning like regular bar magnets, the matching poles of these powerful electromagnets repel one another. This results in a magnetic field strong enough to lift a train."

The student also finds a diagram showing magnetic levitation.



What role do magnets play in keeping the train above the tracks?

A. The track has magnets that repel the metal in the train car and lift the train.

B. The train car has magnets that repel the metal of the track and lift the train.

C. The track and train car have magnets with like poles facing each other, which lifts the train.

D. The track and train car have magnets with opposite poles facing each other, which lifts the train.

Go on to the next page.

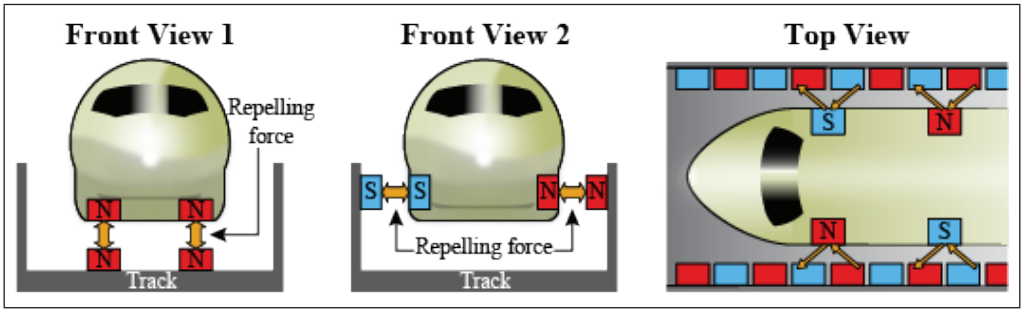
A Floating Train

10. **Use the information to answer the question.**

The student reads more information about these trains.

Two sets of electromagnets are set into the rails at certain distances to do different jobs.

- Front View 1: One set of electromagnets makes the train float above the rail.
- Front View 2 and Top View: A second set of electromagnets uses forces of attraction and repulsion to keep the train centered horizontally on the track and to move the train forward. The top view shows four electromagnets on the train car instead of wheels. Two of these electromagnets have the south pole facing out; the other two have the north pole facing out. The rail magnets line the track in alternating polarity and interact with the train car magnets. The regular pattern of attraction from the opposite poles and repulsion from like poles moves the train car forward.



Which question is BEST answered by the information shown?

A. How does electricity cause a magnet to move?

B. How much energy is needed to move magnets?

C. How many magnets are needed to move an object?

D. How do opposing forces work together to move an object?

Go on to the next page.

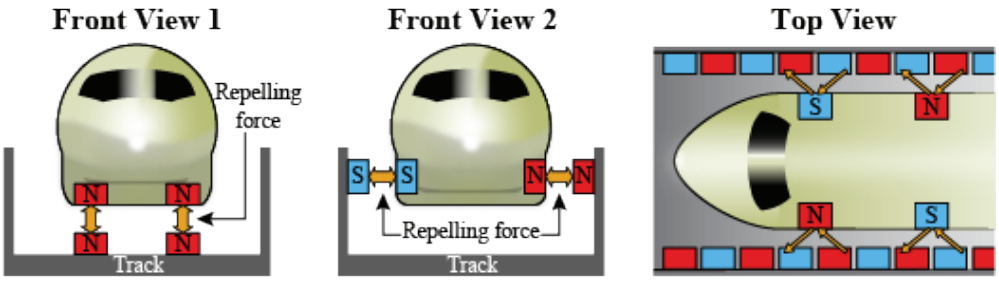
A Floating Train

11. **Use the information to answer the question.**

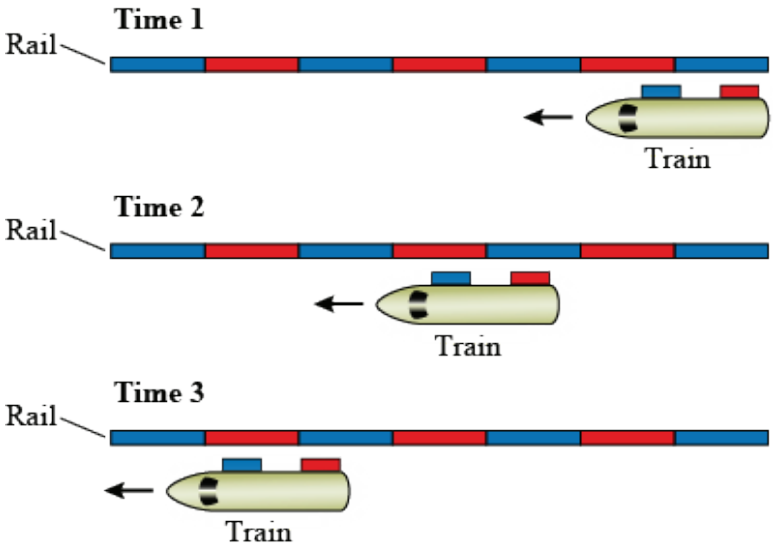
The student reads more information about these trains.

Two sets of electromagnets are set into the rails at certain distances to do different jobs.

- Front View 1: One set of electromagnets makes the train float above the rail.
- Front View 2 and Top View: A second set of electromagnets uses forces of attraction and repulsion to keep the train centered horizontally on the track and to move the train forward. The top view shows four electromagnets on the train car instead of wheels. Two of these electromagnets have the south pole facing out; the other two have the north pole facing out. The rail magnets line the track in alternating polarity and interact with the train car magnets. The regular pattern of attraction from the opposite poles and repulsion from like poles moves the train car forward.



The student drew a model of how the train moves forward.



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Based on the model, which conclusion can BEST be made about how the train moves forward? Select and circle the correct choices to complete the sentence.

As the train encounters rail magnets with (**alternating**, **identical**) poles, the magnets on the train are alternately attracted by (**pulling**, **pushing**) and repelled by: (**pulling** or **pushing**).

Go on to the next page.

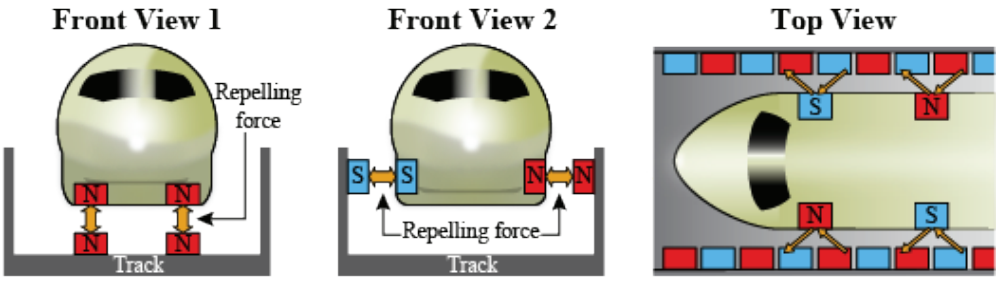
A Floating Train

12. **Use the information to answer Part A and then answer Part B.**

The student reads more information about these trains.

Two sets of electromagnets are set into the rails at certain distances to do different jobs.

- Front View 1: One set of electromagnets makes the train float above the rail.
- Front View 2 and Top View: A second set of electromagnets uses forces of attraction and repulsion to keep the train centered horizontally on the track and to move the train forward. The top view shows four electromagnets on the train car instead of wheels. Two of these electromagnets have the south pole facing out; the other two have the north pole facing out. The rail magnets line the track in alternating polarity and interact with the train car magnets. The regular pattern of attraction from the opposite poles and repulsion from like poles moves the train car forward.



The student knows that electromagnets make the train move because the electric currents generate the magnetic fields in this system. The student wonders how the train stops.

Part A

Which claim can BEST be made about the role of an electromagnet in a train's movement?

A. The electromagnet reduces the generation of energy that is released by the magnets.

B. The electromagnet increases the production of energy that is released by the magnets.

C. The electromagnet produces a current that generates a magnetic field in the magnets.

D. The electromagnet reverses the current that results in a magnetic field in the magnets.

Go on to the next page.

Part B
Which statement BEST describes how an electromagnet can be used to stop a train?

A. The current flow in an electromagnet can be stopped to prevent the generation of attractive and repulsive forces.

B. The current flow in an electromagnet can be decreased to increase the generation of attractive and repulsive forces.

C. The current flow in an electromagnet can be increased to decrease the generation of attractive and repulsive forces.

D. The current flow in an electromagnet can be held constant to slow the generation of attractive and repulsive forces.

A Floating Train

13. **Use the information to complete the task.**

The student knows that electromagnets make the train move because the electric currents generate the magnetic fields in this system.

The student wonders what happens to the train when electricity stops flowing through the system.

Complete the hypothesis to explain what will happen to the train if the electricity stops flowing through the system. Select and write the phrases in the spaces.

If the electricity stops flowing, _____
because _____.

the train will stop

the train will keep going

the train needs wheels instead of electricity

the electromagnets need electricity to work

STOP.

2023 NSCAS Science Grade 8
Item Type Sampler Answer Key

Sequence	Key	Points
1.	**B**	1
2.	**C**	1
3.	**B**	1
4.	**C, E**	2
5.	Gene, Protein, Trait	1
6.	If the SILV gene does not turn off the MC1R gene, the effect on the cattle is neutral. OR If the SILV gene turns off the MC1R gene, the effect on the cattle is possibly harmful.	1
7.	**B**	1
8.	<u>Male</u> Black hair MC1R turned on Normal ALX4 gene <u>Female</u> Black hair SILV gene off Normal ALX4 gene <u>Female</u> Red hair MC1R gene on Normal ALX4 gene OR <u>Male</u> Black hair MC1R turned on Normal ALX4 gene <u>Female</u> Red hair MC1R gene on Normal ALX4 gene <u>Female</u> Black hair SILV gene off Normal ALX4 gene	1
9.	**C**	1
10.	**D**	1
11.	alternating, pulling, pushing	1
12.	**Part A: C** **Part B: A**	2
13.	the train will stop, the electromagnets need electricity to work	1