

**2024 MCAS Informational
Webinar on Scoring
Constructed-Responses**

**Sample Constructed-Response
Item Training Pack**

**Science and Technology/Engineering
Grade 8**

Riding Bicycle

This item has two parts.

Two students are riding identical bicycles on a level sidewalk. Student R has a mass of 55 kg and student S has a mass of 40 kg.

Part A

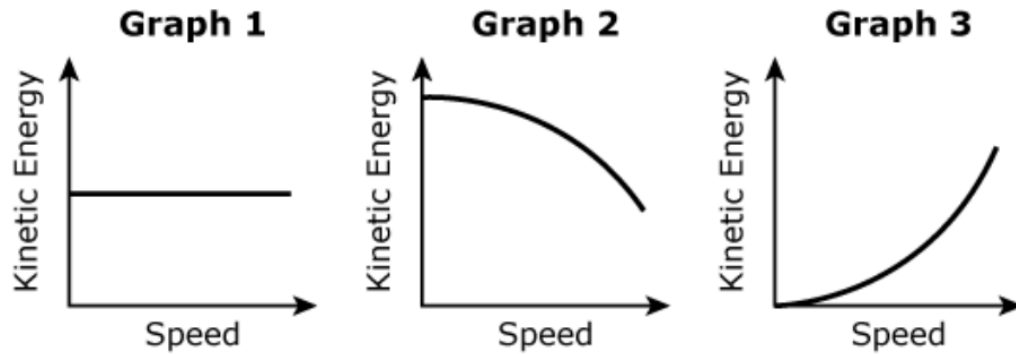
Both students are traveling at a speed of 3 m/s.

Determine whether student R has a larger, a smaller, or an equal amount of kinetic energy compared to student S., Explain your reasoning.

Part B

Student R is at rest, begins to ride, and then moves faster and faster.

Identify which graph (1, 2, or 3) best represents the relationship between student R's speed and kinetic energy. Explain your reasoning.



Scoring Guide

Score	Description
2	The response demonstrates a thorough understanding of the relationship among kinetic energy, mass, and speed of an object. The response correctly compares the kinetic energy of student R with the kinetic energy of student S and clearly explains the reasoning. The response also correctly identifies the graph that best represents the relationship between student R's speed and kinetic energy and clearly explains the reasoning.
1	The response demonstrates a partial understanding of the relationship among kinetic energy, mass, and speed of an object.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Scoring Notes

Part A

Student R has a greater amount of kinetic energy, because [the students are riding at the same speed and] (any one of the following):

- student R has more mass.
- student R has a mass of 55 kg while student S has a mass of 40 kg.
- student R's kinetic energy was 247.5 [Joules] while student S's kinetic energy was 180 [Joules].

Part B

Graph 3, because the kinetic energy of an object increases as its speed increases.

Each part is worth 1 point.

Anchor Set of Student Responses
(with scores)
Riding Bicycle

Anchor Score 2

This question has two parts.

Two students are riding identical bicycles on a level sidewalk. Student R has a mass of 55 kg and student S has a mass of 40 kg.

Part A

Both students are traveling at a speed of 3 m/s.

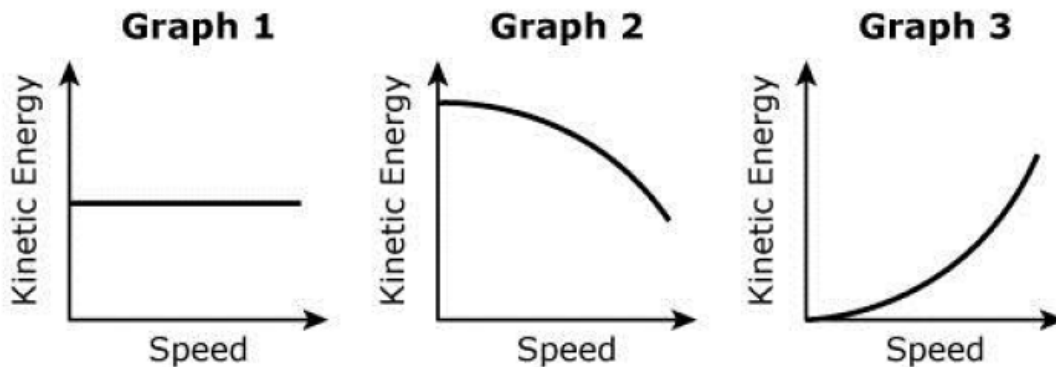
Determine whether student R has a larger, a smaller, or an equal amount of kinetic energy compared to student S. Explain your reasoning.

Student R has a larger amount of kinetic energy compared to student S because student R has a higher amount of mass and is going at the same speed.

Part B

Student R is at rest, begins to ride, and then moves faster and faster.

Identify which graph (1, 2, or 3) best represents the relationship between student R's speed and kinetic energy. Explain your reasoning.



Graph 3 because as the student speeds up his kinetic energy gradually gets higher and that is what is displayed on the graph.

Anchor Score 1

This question has two parts.

Two students are riding identical bicycles on a level sidewalk. Student R has a mass of 55 kg and student S has a mass of 40 kg.

Part A

Both students are traveling at a speed of 3 m/s.

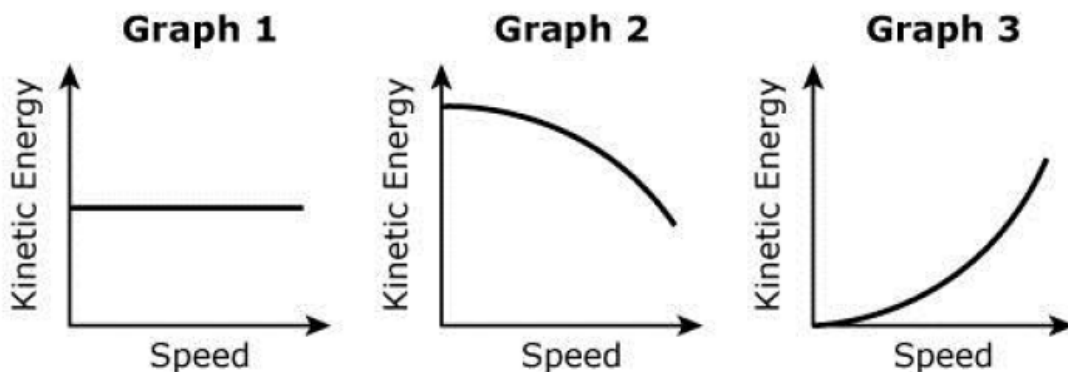
Determine whether student R has a larger, a smaller, or an equal amount of kinetic energy compared to student S. Explain your reasoning.

Student R has an equal amount of kinetic energy to student S. This is because they are both traveling at the same speed of 3 m/s.

Part B

Student R is at rest, begins to ride, and then moves faster and faster.

Identify which graph (1, 2, or 3) best represents the relationship between student R's speed and kinetic energy. Explain your reasoning.



Graph 3 best shows the relationship between student R's speed and kinetic energy, because as the speed increases, the kinetic energy also increases.

Anchor Score 0

This question has two parts.

Two students are riding identical bicycles on a level sidewalk. Student R has a mass of 55 kg and student S has a mass of 40 kg.

Part A

Both students are traveling at a speed of 3 m/s.

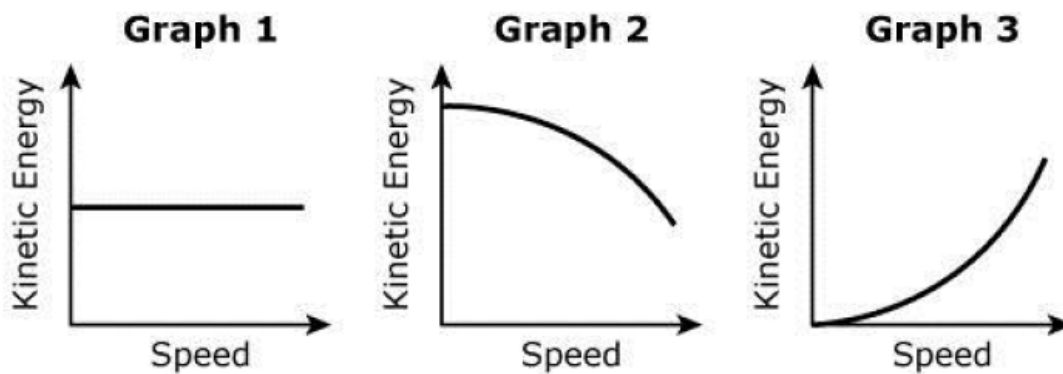
Determine whether student R has a larger, a smaller, or an equal amount of kinetic energy compared to student S. Explain your reasoning.

Student R has less kinetic energy, because it takes more to push his extra mass.

Part B

Student R is at rest, begins to ride, and then moves faster and faster.

Identify which graph (1, 2, or 3) best represents the relationship between student R's speed and kinetic energy. Explain your reasoning.



Graph 2 is the one that best represents. Graph 2 starts at the top of the kinetic energy line, indicating student R's rest, then the line gradually does down and right, showing his acceleration at the loss of his kinetic energy.

**Set of Student Responses without
Scores (for educator practice)**

Riding Bicycle

Response A

This question has two parts.

Two students are riding identical bicycles on a level sidewalk. Student R has a mass of 55 kg and student S has a mass of 40 kg.

Part A

Both students are traveling at a speed of 3 m/s.

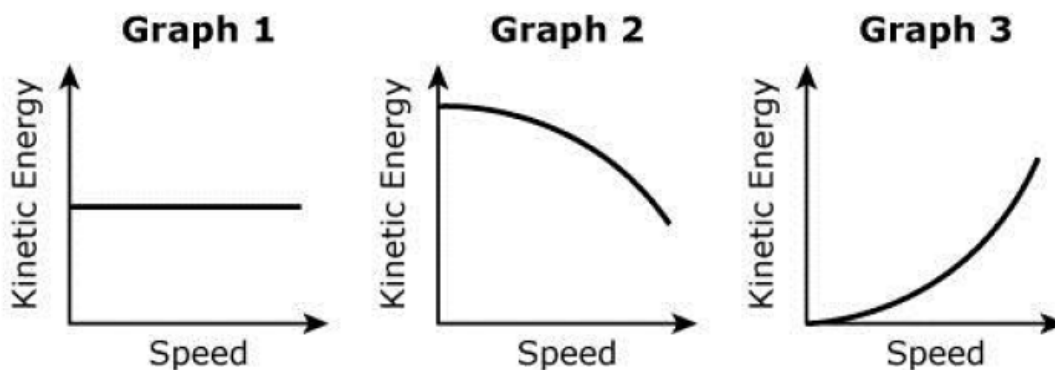
Determine whether student R has a larger, a smaller, or an equal amount of kinetic energy compared to student S. Explain your reasoning.

Student R has the same amount of kinetic energy as student S. While student R may be heavier, they are going at the same pace as student S. Student R may have more potential energy, but the kinetic energy of the two is currently the same.

Part B

Student R is at rest, begins to ride, and then moves faster and faster.

Identify which graph (1, 2, or 3) best represents the relationship between student R's speed and kinetic energy. Explain your reasoning.



Graph 3. As speed increases, so should kinetic energy, which graph 3 properly conveys.

Response B

This question has two parts.

Two students are riding identical bicycles on a level sidewalk. Student R has a mass of 55 kg and student S has a mass of 40 kg.

Part A

Both students are traveling at a speed of 3 m/s.

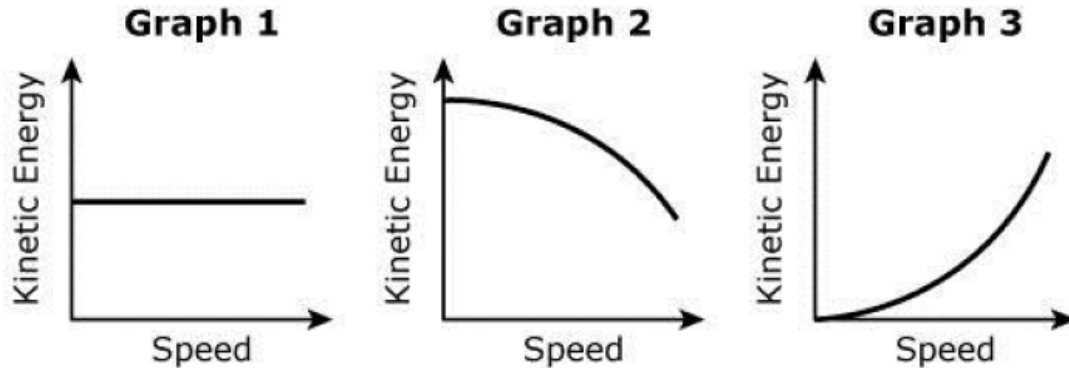
Determine whether student R has a larger, a smaller, or an equal amount of kinetic energy compared to student S. Explain your reasoning.

Student R has more kinetic energy because they have more mass than student S.

Part B

Student R is at rest, begins to ride, and then moves faster and faster.

Identify which graph (1, 2, or 3) best represents the relationship between student R's speed and kinetic energy. Explain your reasoning.



Graph 3 best represents the relationship between student R's speed and kinetic energy because as they gain more speed they gain more kinetic energy.

Response C

This question has two parts.

Two students are riding identical bicycles on a level sidewalk. Student R has a mass of 55 kg and student S has a mass of 40 kg.

Part A

Both students are traveling at a speed of 3 m/s.

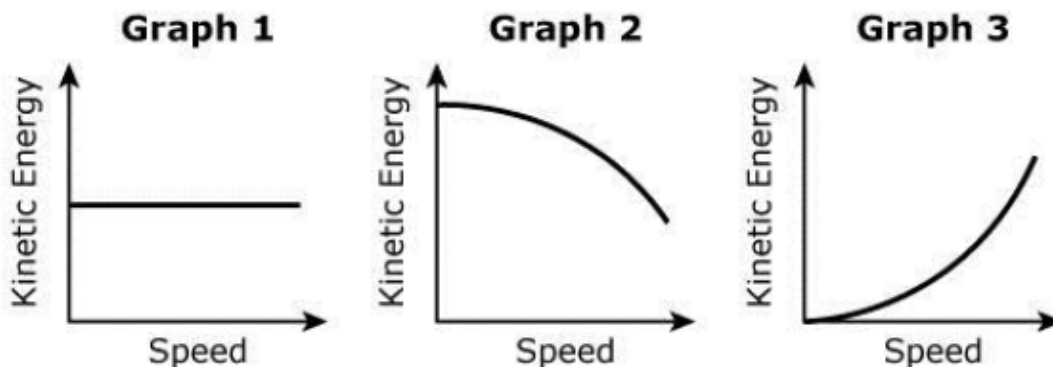
Determine whether student R has a larger, a smaller, or an equal amount of kinetic energy compared to student S. Explain your reasoning.

Student R has a larger amount of kinetic energy compared to Student S. This is because Student R has a mass of 55 kg, while student s has a mass of 40kg.

Part B

Student R is at rest, begins to ride, and then moves faster and faster.

Identify which graph (1, 2, or 3) best represents the relationship between student R's speed and kinetic energy. Explain your reasoning.



Graph 3 best represents the relationship between student R's speed and kinetic energy. Firstly, Graph 3 is able to point out when Student R is at rest, showing there is no speed and no kinetic energy. In fact, the graph also points out how Student R is beginning to ride by showing a small increase in speed and kinetic energy. Lastly, the graph highlights how Student R starts getting faster and faster by showing an increase in speed and kinetic energy. When there is an increase in speed, there is an increase in the amount of movement and kinetic energy. In conclusion, this is how graph 3 best represents the relationship between student R's speed and kinetic energy.

Response D

This question has two parts.

Two students are riding identical bicycles on a level sidewalk. Student R has a mass of 55 kg and student S has a mass of 40 kg.

Part A

Both students are traveling at a speed of 3 m/s.

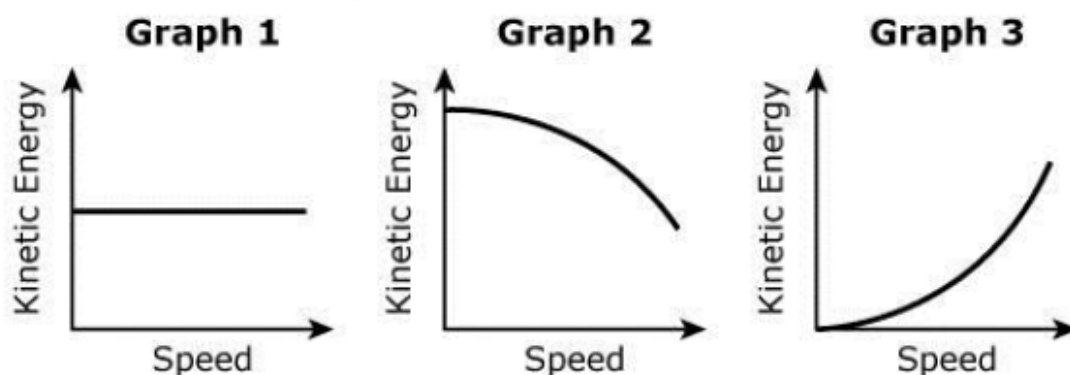
Determine whether student R has a larger, a smaller, or an equal amount of kinetic energy compared to student S. Explain your reasoning.

Student R has a smaller amount of kinetic energy than student S. This is because student R carries more weight making it likely that they will weigh the bike down. While student S, weighing less, will probably make the bike move fast as it not being weighed down as much.

Part B

Student R is at rest, begins to ride, and then moves faster and faster.

Identify which graph (1, 2, or 3) best represents the relationship between student R's speed and kinetic energy. Explain your reasoning.



I think student R's relationship with kinetic energy is represented in graph 1. I believe this because the kids are riding on a level sidewalk. If they were to be riding down a hill and not a level sidewalk, student R would be represented in graph 3.

Response E

This question has two parts.

Two students are riding identical bicycles on a level sidewalk. Student R has a mass of 55 kg and student S has a mass of 40 kg.

Part A

Both students are traveling at a speed of 3 m/s.

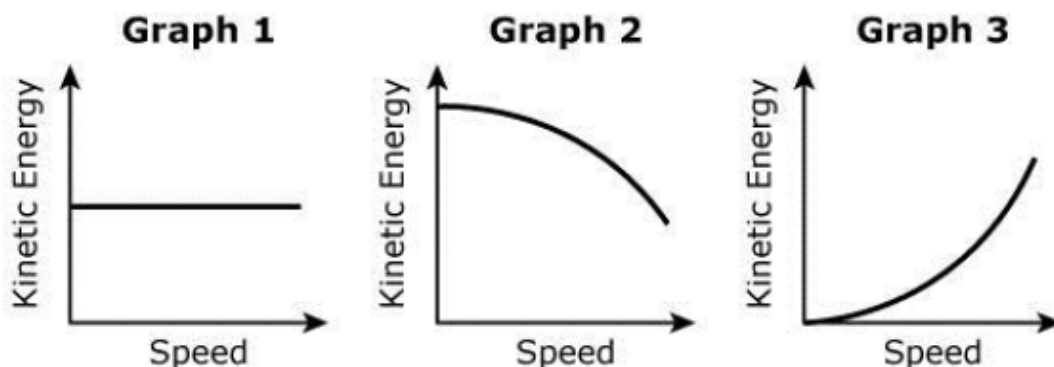
Determine whether student R has a larger, a smaller, or an equal amount of kinetic energy compared to student S. Explain your reasoning.

Student R has a larger amount of kinetic energy compared to student S because it has a higher mass of 55 kilograms. While student S has a mass of 40 kilograms. If they are both traveling at the same speed on the same level then student R has a larger amount of kinetic energy.

Part B

Student R is at rest, begins to ride, and then moves faster and faster.

Identify which graph (1, 2, or 3) best represents the relationship between student R's speed and kinetic energy. Explain your reasoning.



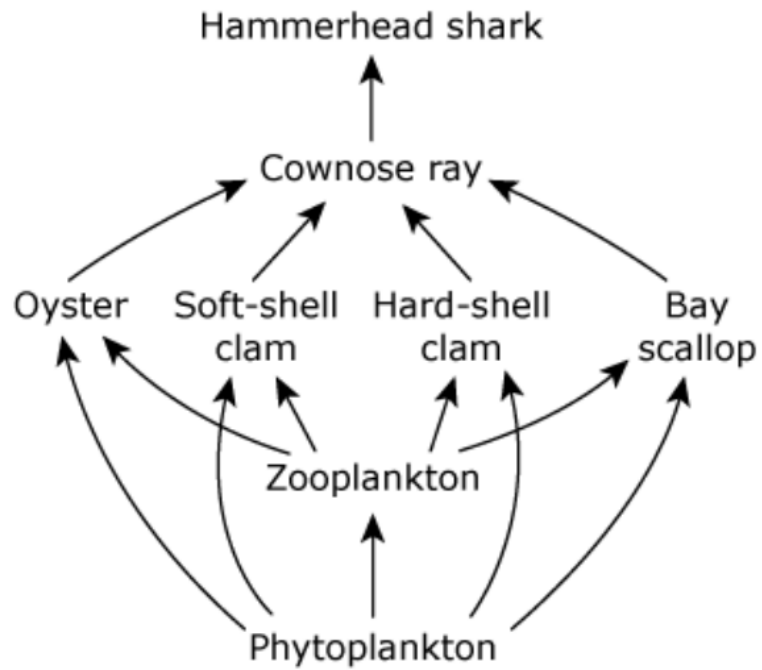
Graph 2 best represents the relationship between student R's speed and kinetic energy because it shows that the speed keeps going forward. The kinetic energy started high because the student started at a rest.

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**Sample Constructed-Response
Item Training Pack**

**Science and Technology/Engineering
Grade 5
Cownose Rays**

Sharks are large fish that live in the ocean. Hammerhead sharks are a part of a marine ecosystem, as shown in the food web.



This question has three parts.

Cownose rays are an important part of the marine ecosystem.

Part A

Identify the ecological relationship (competitive, parasitic, or predatory) between cownose rays and oysters in the ecosystem. Explain your reasoning.

Part B

Describe what would most likely happen to the size of the cownose ray population (increase, decrease, or stay the same) if there were a large decrease in the phytoplankton population in the ecosystem. Explain your reasoning.

Part C

Based on the food web, describe what would most likely happen to the hammerhead shark population if the cownose rays were removed from the ecosystem. Explain your reasoning.

Scoring Guide

Score	Description
3	The response demonstrates a thorough understanding of the effect of scarce resources on the size of populations in an ecosystem. The response correctly identifies the ecological relationship between cownose rays and oysters in this ecosystem and clearly explains the reasoning. The response clearly describes what would happen to the size of the cownose ray population if there were a large decrease in the phytoplankton population and clearly explains the reasoning. The response also clearly describes what would happen to the hammerhead shark population if the cownose rays were removed from the ecosystem and clearly explains the reasoning.
2	The response demonstrates a partial understanding of the effect of scarce resources on the size of populations in an ecosystem.
1	The response demonstrates a minimal understanding of the effect of scarce resources on the size of populations in an ecosystem.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Scoring Notes

Part A

The relationship is predatory because cownose rays eat oysters OR the oyster are prey for the cownose rays.

Part B

The cownose ray population would decrease because (any of the following):

- zooplankton eat the phytoplankton, and oysters, clams, and scallops eat the zooplankton, and the rays eat the oysters, clams, and scallops.
- ecosystems need producers as a food source for other organisms [and the food web would collapse without producers].

Part C

Any one of the following:

- The hammerhead shark population would decrease because the cownose ray is their only/biggest/main food source.
- The hammerhead shark population would go extinct/die out because the cownose ray is the only food source for the hammerhead sharks.
- Hammerhead sharks would migrate/move to a different area [to find food].

Note: For scores going from 0 to 1, responses with 3 correct IDs in Parts A, B, or C, receive 1 pt without explanation.

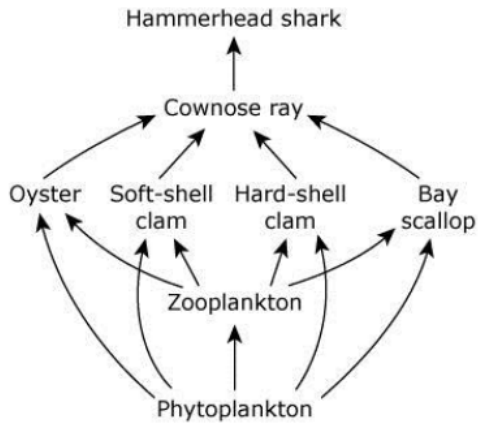
Each part is worth one point.

**Anchor Set of Student Responses
(with scores)**

Cownose Rays

Anchor Score 3

Sharks are large fish that live in the ocean. Hammerhead sharks are a part of a marine ecosystem, as shown in the food web.



This question has three parts.

Cownose rays are an important part of the marine ecosystem.

Part A

Identify the ecological relationship (competitive, parasitic, or predatory) between cownose rays and oysters in the ecosystem. Explain your reasoning.

Predatory, because Cownose rays hunt and prey on Oysters, eating them to survive.

Part B

Describe what would most likely happen to the size of the cownose ray population (increase, decrease, or stay the same) if there were a large decrease in the phytoplankton population in the ecosystem. Explain your reasoning.

A decrease because the Phytoplankton is a food source to almost all of the Cownose's food sources, meaning they decrease in population and that in turn gives the Cownose less food, decreasing the size of its population.

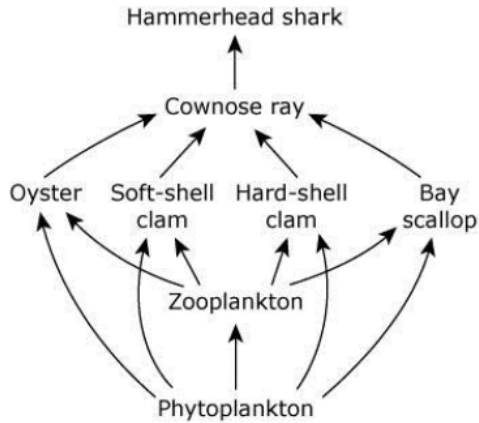
Part C

Based on the food web, describe what would most likely happen to the hammerhead shark population if the cownose rays were removed from the ecosystem. Explain your reasoning.

The Hammerhead shark population would falter as the Cownose seems to be its only source of food according to this food web, meaning they'd lose the food source they use to survive and thrive.

Anchor Score 2

Sharks are large fish that live in the ocean.
Hammerhead sharks are a part of a marine ecosystem,
as shown in the food web.



This question has three parts.

Cownose rays are an important part of the marine ecosystem.

Part A

Identify the ecological relationship (competitive, parasitic, or predatory) between cownose rays and oysters in the ecosystem. Explain your reasoning.

They are in a predatory relationship, as the cownose ray eats oysters.

Part B

Describe what would most likely happen to the size of the cownose ray population (increase, decrease, or stay the same) if there were a large decrease in the phytoplankton population in the ecosystem. Explain your reasoning.

I think that the cownose ray population would increase because phytoplankton are the source of food for the cownose ray's food.

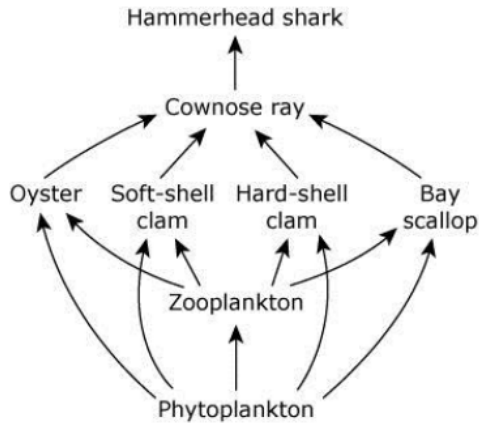
Part C

Based on the food web, describe what would most likely happen to the hammerhead shark population if the cownose rays were removed from the ecosystem. Explain your reasoning.

The hammerhead sharks would probably die off, as according to the food web they only eat cownose rays.

Anchor Score 1

Sharks are large fish that live in the ocean. Hammerhead sharks are a part of a marine ecosystem, as shown in the food web.



This question has three parts.

Cownose rays are an important part of the marine ecosystem.

Part A

Identify the ecological relationship (competitive, parasitic, or predatory) between cownose rays and oysters in the ecosystem. Explain your reasoning.

The ecological relationship between Cownose rays and Oysters are predatory. Oysters are eaten by Cownose rays which must mean that an Oyster is a Cownose rays pray.

Part B

Describe what would most likely happen to the size of the cownose ray population (increase, decrease, or stay the same) if there were a large decrease in the phytoplankton population in the ecosystem. Explain your reasoning.

The size of the cownose ray would most likely stay the same. Many of what a cownose ray eats eats zooplankton and phytoplankton, so a decrease in phytoplankton would mean more zooplankton are eaten.

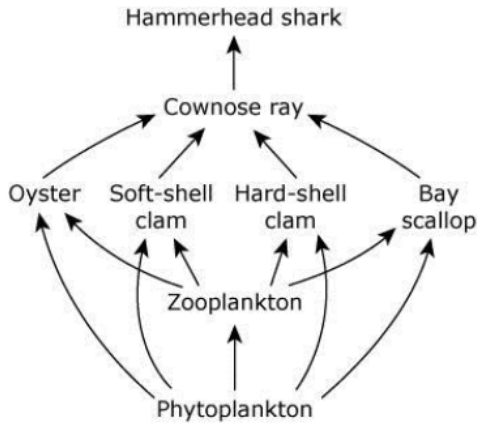
Part C

Based on the food web, describe what would most likely happen to the hammerhead shark population if the cownose rays were removed from the ecosystem. Explain your reasoning.

Hammerhead sharks would start eating oysters and bay scallops, as that was what was eaten by cownose rays.

Anchor Score 0

Sharks are large fish that live in the ocean. Hammerhead sharks are a part of a marine ecosystem, as shown in the food web.



This question has three parts.

Cownose rays are an important part of the marine ecosystem.

Part A

Identify the ecological relationship (competitive, parasitic, or predatory) between cownose rays and oysters in the ecosystem. Explain your reasoning.

The relationship between cownose rays and oysters is parasitic because Oyster eats Cownose rays but Cownose rays don't eat Oyster.

Part B

Describe what would most likely happen to the size of the cownose ray population (increase, decrease, or stay the same) if there were a large decrease in the phytoplankton population in the ecosystem. Explain your reasoning.

The population would stay the same because phytoplankton all in the bottom of the food web, and they don't eat cownose rays.

Part C

Based on the food web, describe what would most likely happen to the hammerhead shark population if the cownose rays were removed from the ecosystem. Explain your reasoning.

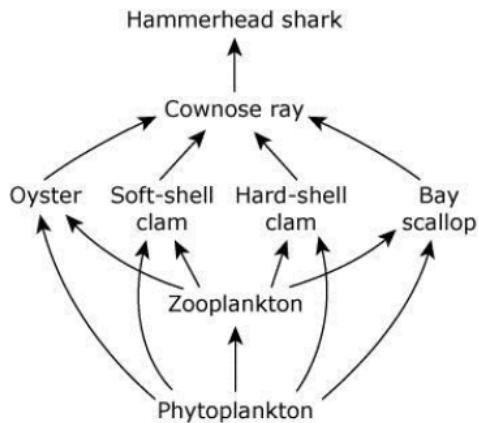
The population of the hammerhead shark would increase because there wouldn't be cownose eating them for food.

**Set of Student Responses without
Scores (for educator practice)**

Cownose Rays

Response A

Sharks are large fish that live in the ocean.
Hammerhead sharks are a part of a marine ecosystem,
as shown in the food web.



This question has three parts.

Cownose rays are an important part of the marine ecosystem.

Part A

Identify the ecological relationship (competitive, parasitic, or predatory) between cownose rays and oysters in the ecosystem. Explain your reasoning.

The relationship between cownose rays and oysters is predatory. This is because oysters are a food source for cownose rays, they do not compete and do not have a parasitic relationship either.

Part B

Describe what would most likely happen to the size of the cownose ray population (increase, decrease, or stay the same) if there were a large decrease in the phytoplankton population in the ecosystem. Explain your reasoning.

If the phytoplankton population decreased, the cownose ray population would stay the same. These two animals do not have a direct relationship, so if one is affected, the other will be affected, but not greatly.

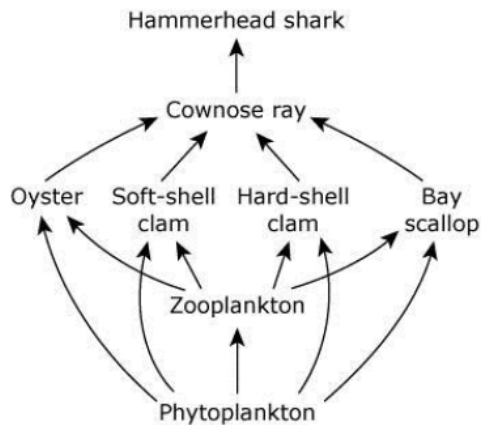
Part C

Based on the food web, describe what would most likely happen to the hammerhead shark population if the cownose rays were removed from the ecosystem. Explain your reasoning.

If the cownose rays were removed from the ecosystem, it is most likely that the hammerhead shark population would die off. Because they have a direct predatory relationship, and the hammerhead shark used cownose rays as a food source, one of them being removed from the ecosystem would greatly affect the other.

Response B

Sharks are large fish that live in the ocean. Hammerhead sharks are a part of a marine ecosystem, as shown in the food web.



This question has three parts.

Cownose rays are an important part of the marine ecosystem.

Part A

Identify the ecological relationship (competitive, parasitic, or predatory) between cownose rays and oysters in the ecosystem. Explain your reasoning.

They both get food from the same sources which would cause them to fight for it. Their relationship is competitive since both of them need that food.

Part B

Describe what would most likely happen to the size of the cownose ray population (increase, decrease, or stay the same) if there were a large decrease in the phytoplankton population in the ecosystem. Explain your reasoning.

The cownose rays population would increase. If they were on top of the hammerhead shark they would have better luck with getting food and living longer and those rays having babies and increasing their population.

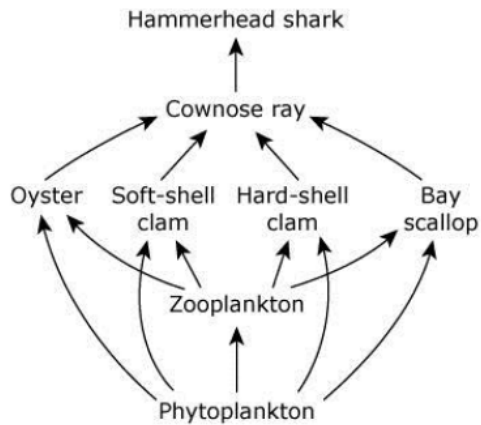
Part C

Based on the food web, describe what would most likely happen to the hammerhead shark population if the cownose rays were removed from the ecosystem. Explain your reasoning.

The hammerhead sharks wouldnt have any competition if the rays were removed. They would live happily ever after.

Response C

Sharks are large fish that live in the ocean. Hammerhead sharks are a part of a marine ecosystem, as shown in the food web.



This question has three parts.

Cownose rays are an important part of the marine ecosystem.

Part A

Identify the ecological relationship (competitive, parasitic, or predatory) between cownose rays and oysters in the ecosystem. Explain your reasoning.

They are a predatory relationship

Part B

Describe what would most likely happen to the size of the cownose ray population (increase, decrease, or stay the same) if there were a large decrease in the phytoplankton population in the ecosystem. Explain your reasoning.

The population would decrease

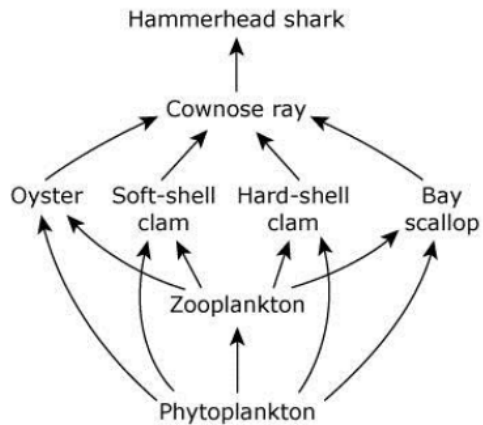
Part C

Based on the food web, describe what would most likely happen to the hammerhead shark population if the cownose rays were removed from the ecosystem. Explain your reasoning.

They would decrease

Response D

Sharks are large fish that live in the ocean. Hammerhead sharks are a part of a marine ecosystem, as shown in the food web.



This question has three parts.

Cownose rays are an important part of the marine ecosystem.

Part A

Identify the ecological relationship (competitive, parasitic, or predatory) between cownose rays and oysters in the ecosystem. Explain your reasoning.

The ecological relationship between the cownose rays and oysters is predatory. This is because the arrow in the food web points the oysters to the cownose ray, this tells us that the cownose ray preys on the oysters. So it would make the relationship between them predatory.

Part B

Describe what would most likely happen to the size of the cownose ray population (increase, decrease, or stay the same) if there were a large decrease in the phytoplankton population in the ecosystem. Explain your reasoning.

The size of the cownose ray would decrease due to phytoplankton population decrease. Since some of the prey of the cownose ray all eat zooplankton, but because zooplankton eats phytoplankton this means that the zooplankton population will decrease and so will all its predators. Also since the prey of the cownose ray also eat phytoplankton their population will also decrease. With this the cownose ray will have to fight for survival and some will end up dying of starvation.

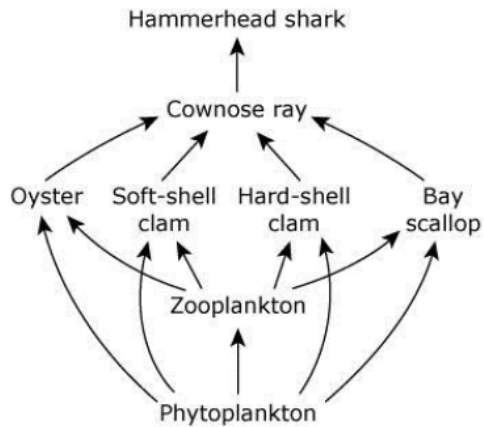
Part C

Based on the food web, describe what would most likely happen to the hammerhead shark population if the cownose rays were removed from the ecosystem. Explain your reasoning.

This would lead to overpopulation for oysters, soft-shell clam, hard-shell clam and bay scallop. Since all of the predators for these animals are gone they will continue to populate and since no other animal is eating them this will lead to an overcrowded sea area.

Response E

Sharks are large fish that live in the ocean. Hammerhead sharks are a part of a marine ecosystem, as shown in the food web.



This question has three parts.

Cownose rays are an important part of the marine ecosystem.

Part A

Identify the ecological relationship (competitive, parasitic, or predatory) between cownose rays and oysters in the ecosystem. Explain your reasoning.

Cownose rays have a predatory relationship because cownose rays hunt and eat oysters.

Part B

Describe what would most likely happen to the size of the cownose ray population (increase, decrease, or stay the same) if there were a large decrease in the phytoplankton population in the ecosystem. Explain your reasoning.

If there was a decrease in phytoplankton then there would be a decrease in cownose rays because the clams, oysters, and scallops all depend on zooplankton that eats phytoplankton so if there was a decrease in phytoplankton then there would be a decrease in zooplankton which means there would be a decrease in clams, oysters, and scallops which are the things cownose rays eat.

Part C

Based on the food web, describe what would most likely happen to the hammerhead shark population if the cownose rays were removed from the ecosystem. Explain your reasoning.

If cownose rays were removed from the ecosystem then hammerhead sharks would be extinct because the hammerhead eats cownose rays so if they disappeared then the sharks would not have their food source and the sharks would starve.