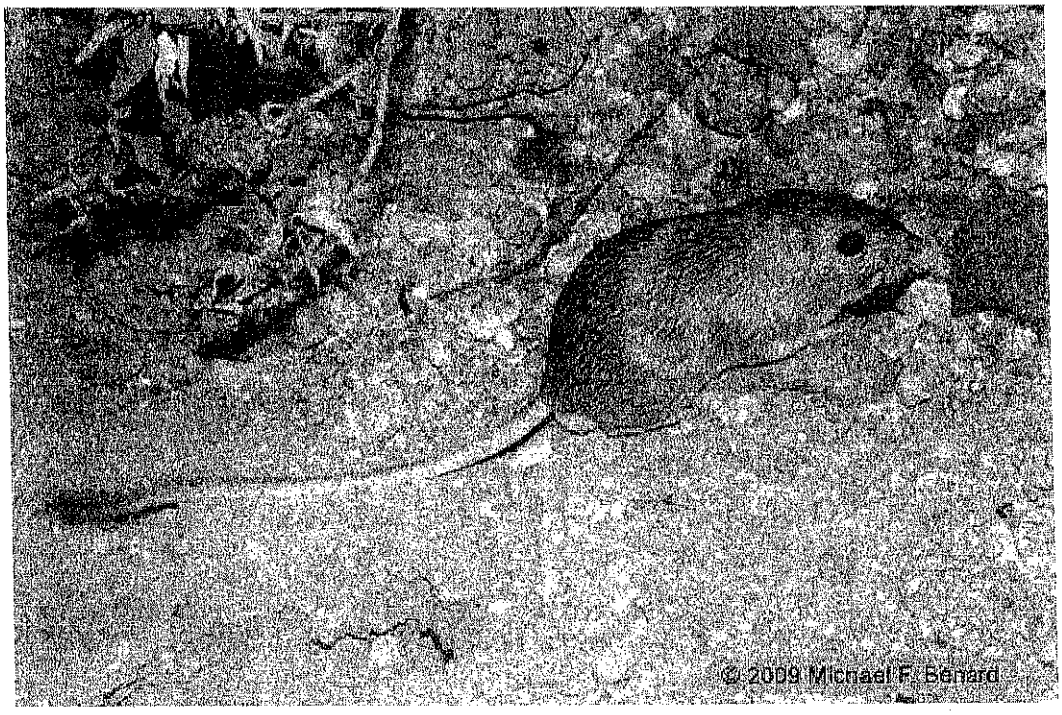
Exam Review - Work on Today + tomorrow

Name: _____ Hour: _____ Date: _____

Key

Unit 8.1 Lesson 03: Rock Pocket Mice ✓ Wednesday

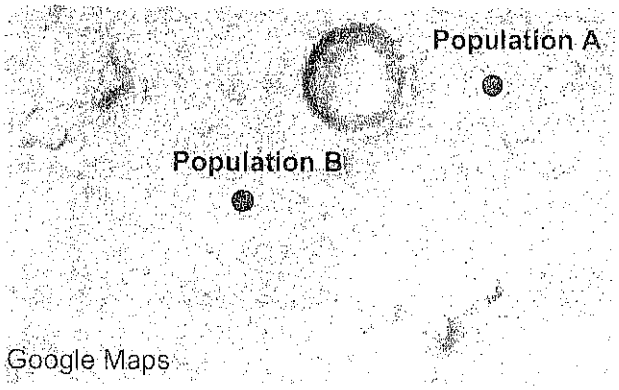
Instructions: Read the information about rock pocket mice and answer the questions that follow.

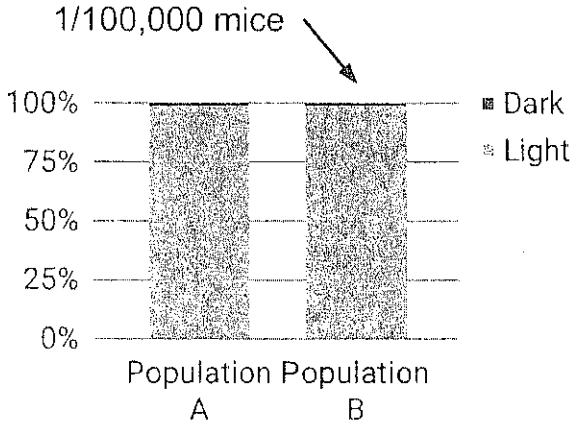


Rock pocket mice are small, nocturnal animals that live in the American southwest. Based on fossil evidence, rock pocket mice have lived in this area for about 125,000 years. From studying the genes of rock pocket mice, scientists can tell that these rock pocket mice had light-colored fur that was similar in color to the rocky soil in the area. This light-colored coat helped camoflauge the rock pocket mice to keep them hidden from owls and other predators that use sharp vision to spot their prey.

On occasion, a rock pocket mouse was born with dark colored fur. Dark colored fur mice may be found in a population of tan mice with a frequency of about 1 for every 100,000 births. In this investigation, you will consider changes in two populations of rock pocket mice living in Pinacate Peaks as shown in the figure below.

Pinacate Peaks Rock Pocket Mice 100,000 Years Ago





☐ Sandy Colored Soil

1. How could a rock pocket mouse with the dark colored fur trait appear in a population of light-colored rock pocket mice? (choose one answer)
   a. It is not possible because light-colored rock pocket mice would pass their fur color traits onto their offspring
   b. A dark colored mouse could occur in a tan colored mouse population due to a random genetic mutation.
   c. A baby rock pocket mice could change its fur color to stand out from its siblings.
   d. The rock pocket mouse could roll in charcoal until its fur was stained black.

2. Once introduced, do you predict that dark colored mice would increase in number in a location where the rocky soil is light in color? Why or why not?

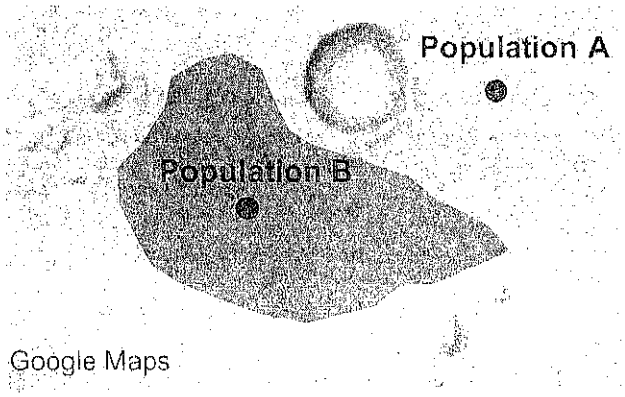
No, dark colored mice would not increase in number because dark fur in a light colored would not be a beneficial mutation. Predators would be more likely to see and kill the dark colored mice, so they would be less likely to live and reproduce.

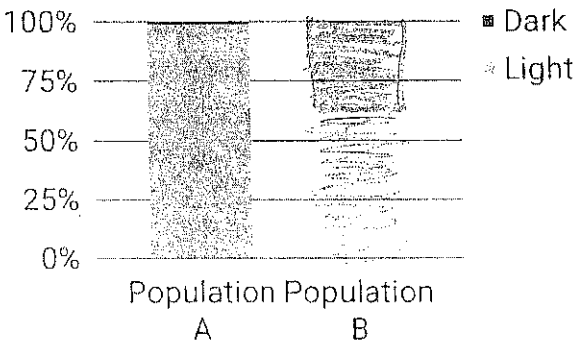
About 11 thousand years ago, a series of volcanic eruptions produced large patches of black lava over a 40 mile wide area within the rock pocket mouse territory. These lava flows resulted in large areas covered in dark rock and soil where the light-colored sandy soil had once been.

As in earlier times, occasionally, a dark-colored fur rock pocket mouse was born into the population of light-colored fur mice. Due to the lava flows, the environment in which the mice lived changed and the rocky soil became dark in color.

Examine the stacked bar graph that shows the distribution of light and dark rock pocket mice living in Pinacate Peaks:

Pinacate Peaks Rock Pocket Mice 10,000 Years Ago





Sandy Colored Soil

Rocky Black Soil

3. **Complete the graph** by shading in what you predict the distribution of light and dark colored rock pocket mice will be in Population B.

4. For Population B, you predicted the proportion of light and dark colored rock pocket mice by shading the last column. Support your prediction using your knowledge of natural selection.

a. In Population B, would having a mutation that causes dark fur benefit, harm, or have no effect in a population that live on dark, rocky soil?

benefit

b. In Population B, will the dark fur mutation affect the rock pocket mice ability to survive and reproduce. Why or why not?

the dark fur will provide better camoflauge on the dark soil which will increase the chance that the mice with dark fur will not be seen by predators and survive long enough to reproduce.

c. In the future, how do you predict the proportion of dark fur rock pocket mice will change in Population B?

Population B will have a greater proportion of rock pocket mice.

5. Imagine that some dark rock pocket mice have a mutation that causes light yellow fur on their bellies. Predict whether the percentage of mice with the yellow belly fur trait will increase, decrease or stay the same in the population. Support your prediction using your knowledge of natural selection.

The percentage of yellow belly fur mice will not change in the population. Because predators cannot see the belly fur of the rock poket mice, having yellow belly fur does not provide an advantage of disadvantage, so mutations in belly fur color will not result in greater chances

Pumpkinseed sunfish and bluegill are two types of related fish commonly found in Michigan lakes. Sometimes these fish can produce hybrids, an offspring in which one parent is a pumpkinseed and the other is a bluegill. These offspring are known as hybrid sunfish. Hybrid sunfish grow very quickly because they are better at getting food than either pumpkinseeds or bluegill. Even though hybrid sunfish grow faster than the pumpkinseeds and bluegill, the hybrid sunfish are much less likely to reproduce than the bluegill or pumpkinseed.

6. Is a hybrid sunfish more or less likely than a bluegill or pumpkinseed to pass on its traits to the next generation? Why?

less likely because the hybrids are not good at reproducing. To pass your traits onto the next generation you need to reproduce and the hybrids are not good at reproducing.

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Instructions: You have one class period to complete the assessment below, which contains a total of eight questions. Good luck!

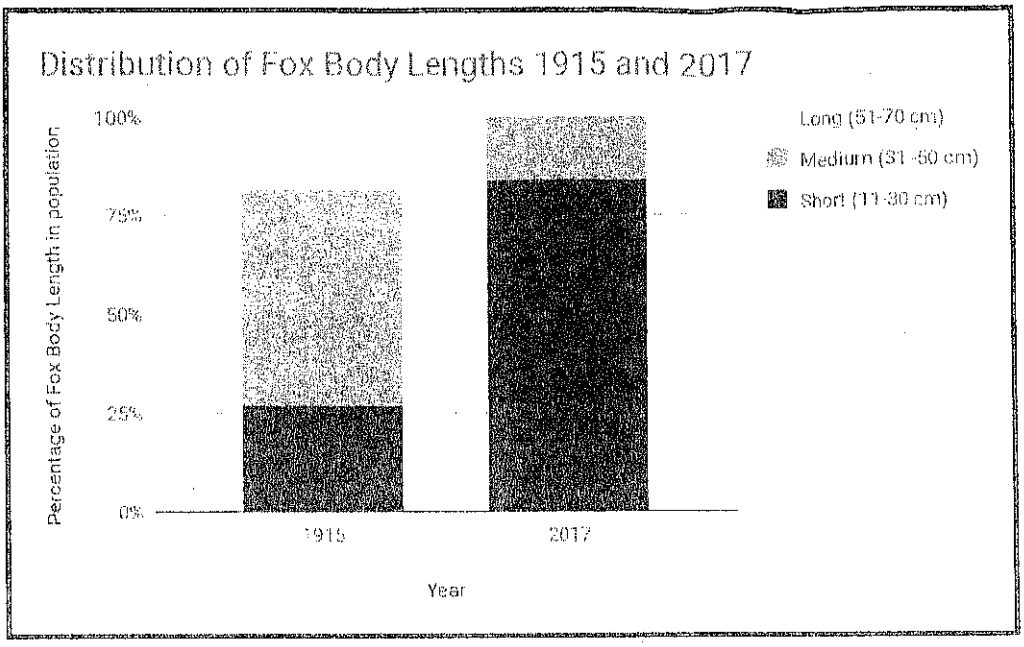
1. A population is a group of individuals of the same species. Can the percentage of individuals with certain traits in a population change because the environment changes?[1] Circle **one** answer below.

   a. Yes, when the environment changes, individuals in a population can change their inherited traits to better fit the environment, and this changes the percentage of individuals with certain traits in that population.
   b. Yes, when the environment changes, individuals with certain inherited traits survive and reproduce and other individuals with different inherited traits die, and this changes the percentage of individuals with certain traits in a population.
   c. No, the percentage of individuals with certain inherited traits in a population changes randomly from one generation to the next, never as a result of changes to the environment.
   d. No, the percentage of individuals with certain inherited traits in a population cannot change because a population is all one species and so will always have the same inherited traits.

2. Which of the following is **TRUE** about individuals of the same species?[1] Circle **one** answer below.

   a. Individuals of the same species may have different inherited traits. These different inherited traits may cause differences in each individual's chances of survival and reproduction.
   b. Individuals of the same species have the same inherited traits, therefore each individual has an equal chance of surviving and reproducing as any other individual of the same age and gender.
   c. Individuals of the same species have the same inherited traits but different acquired traits, such as what they have learned and skills they have developed. Only these different acquired traits can cause differences in each individual's chances of survival and reproduction.
   d. Individuals of the same species may have different inherited traits, but these different traits do not cause differences in each individual's chances of survival and reproduction.

3. A population of foxes has been studied for over 100 years. Every few years, scientists count and measure the length of more than 200 individuals in the population. These scientists hypothesize that body length is an important trait that affects the survival of the foxes. The stacked bar chart below shows the distribution of their measured body lengths at two different points in time.



Part A

In what year were long body lengths more common? Circle one answer below.

a. 1915
b. 2017
c. 1962
d. There is not enough information to tell.

Part B

Based only on these data, what trait in this population was better adapted to the environmental conditions during 2017? Circle **one** answer below.

a. Long body length
b. Short body length
c. Longer tail
d. There is not enough information to tell.

Part C

Fill in the blanks below to complete the sentence. For a trait to become common in a population, it must increase the probability of Survival and reproduction.

4. Peppered moths have two color varieties, as shown in *Image 1*: mostly **light** (A, circled) with dark dots, and mostly **dark** (B). These moths have been studied in England for many years.

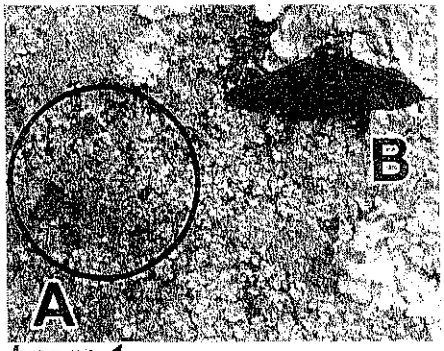


Image 1

Both images: Kettlewell, 1956. Heredity

In the year 1850, **very few dark moths** were found in the population. However, by 1900, nearly all of the moths were dark, and **very few light moths** could be found. Some scientists believed that this was because of increasing air pollution during this time, which made the bark of trees darker, as shown in *Image 2*. Darker tree bark made light moths (A) easier for predators to find, compared to dark moths (B, circled).

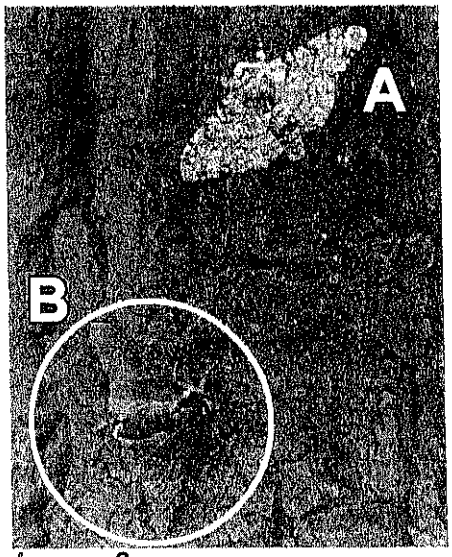
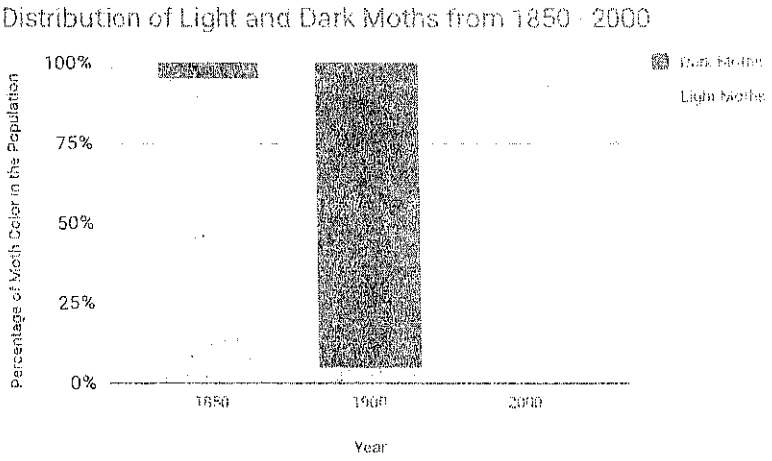


Image 2

In 1956, laws to reduce air pollution in England were passed. This led to tree bark becoming lighter again. The percentage population for light and dark moths in England in 1850 and 1900 are shown in the stacked bar chart.



Part A: Circle **one** answer in each parentheses in the following sentence:.

Comparing the stacked bar chart for 1900 to what you would expect for the stacked bar chart for 2000, you would expect the height of the bar representing **light moths** in the chart to **(increase/decrease)** and the height of the bar representing **dark moths** to **(increase/decrease)**.

Part B: Describe why you predicted the distribution of light and dark moths would change after 1900.

We would expect the distribution of traits to change because the environment changed. In 2000 the trees were white again so the light moths would have better camoflage and would be more likely to survive and reproduce.

5. Skin cancer is a disease that occurs when skin cells grow in an uncontrolled way. It can be caused by UV light, which can alter the genetic sequence of skin cells. Which choice below best describes how UV light might cause skin cancer? Circle **one** answer below.
   a. UV light changes the genetic code that makes the proteins in the skin cell. The new code changes the structure and function of these proteins. When the proteins that control cell growth change in a way that makes them no longer work, cancer is the result.
   b. UV light changes the shape of the proteins in the skin cells. These proteins change the genes in the cell. This makes the cell grow uncontrollably resulting in cancer.
   c. UV light makes skin cells grow faster. Overtime, the skin cells adapt to the UV light by growing faster and faster. Eventually they grow so fast that their growth is no longer controlled, this results in cancer.
   d. None of the above.

6. A disease called CF is a condition that causes excess mucus production in the lungs and if untreated causes early death.

Part A

CF is caused by a deletion of 3 letters in the gene sequence. How might this deletion cause excessive mucus production? Circle **one** answer below.

   a. The 3 missing letters in the gene sequence are needed to build a protein that controls the production of mucus.
   b. The 3 letters in the gene sequence don't matter, at least 6 letters must be missing to affect proteins.
   c. The gene sequence does not matter. The protein is what determines mucus production.
   d. None of the above

Part B

CF is seen in a higher percentage of people today than it was 200 years ago. Which explanation for this increase is most likely? Circle **one** answer below.

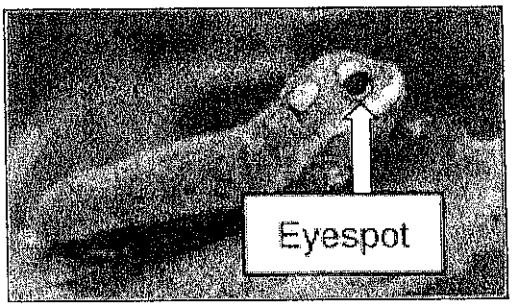
   a. The thick mucus is better at trapping air pollution. Due to an increase in air pollution, CF has become a more common as our bodies' adapt to pollution.
   b. Medical advances have helped people with CF survive longer, increasing the likelihood that people with CF will live long enough to reproduce.
   c. CF only occurs in boys.
   d. None of the above.

7. "Eyespots" are a common adaptation in some Michigan insects, such as swallowtail butterfly caterpillars, shown here with eyespots. Some scientists believe eyespots may help defend against predators. However, not all caterpillars have this adaptation.

Scientists tracked caterpillars with and without eyespots for three days. The number of caterpillars surviving over time is shown in the table below.

	Number of Caterpillars Surviving	
Time	*With eyespots*	*Without eyespots*
0 hours	24	24
40 hours	14	12
80 hours	8	6

Data after Hossie and Sherratt, 2012. Animal Behavior.



Circle one answer to complete the claim below.

Part A

Claim:

I would expect the caterpillars **with** eyespots to become (**more** / **less**) common in the population over time.

Then, complete your scientific explanation by supporting your claim with evidence and reasoning.

Part B

Evidence:

by the end of the study, more caterpillars with eyespots survived, compared to those without eyespots.

Part C

Reasoning:

the study showed that caterpillars with eyespots were more likely to survive than those without eyespots. This means that they will have a greater chance of reproducing. Over time the organisms with traits that allow them to reproduce more successfully will become more common in the population.

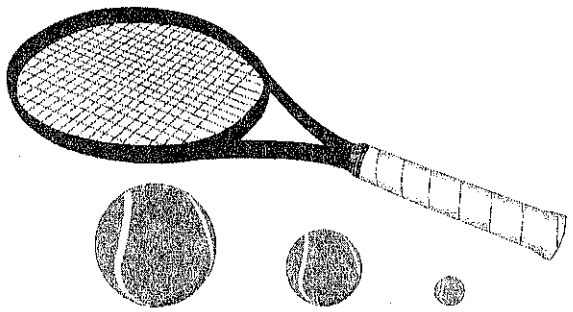
8. A population is a group of individuals of the same species. Could a population living today differ from their ancestors from many generations ago? Why or why not?[1] (AAAS EN026002) Circle **one** answer below.
    a. Yes, they could differ after many generations because an environmental change can cause individuals in each generation to try to change some of their inherited traits to ones that are better suited to the new environment.
    b. Yes, they could differ after many generations because an environmental change can affect which inherited traits are best adapted to the new environment, and therefore which individuals are more likely to survive and reproduce.
    c. Yes, they could differ after many generations because an environmental change can cause individuals to use some of their inherited traits more than before and pass down better versions of those traits to their offspring.
    d. No, they could not differ after many generations because all members of a population are the same species and therefore have the same set of inherited traits.

Name: _____ Hour: _____ Date: _____

Unit 6.4 Lesson 04: Bikini Bottom Tennis

Instructions: Read the scenario below. Then, use the information in the scenario, data tables, and your knowledge of the relationships among change in motion, force, and mass to answer the questions.

Spongebob and Patrick are practicing tennis to prepare for Spongebob's upcoming match against Squidward. Patrick notices that sometimes the ball has greater or lesser change in motion after being hit, but doesn't know why. Spongebob thinks that if they can figure out how to control the change in motion of a ball, then he will be able to use this information to beat Squidward in next week's underwater match. To make things even more complicated, Bikini Bottom Tennis is played with three balls of different masses! Spongebob makes a plan to figure out how to control the change in motion of any ball that they use in the match.



Spongebob decides to set up three different investigations:

- In Investigation 1, he will change the mass of the ball he uses (10 g, 60 g, or 110 g).
- In Investigation 2, he will change the side on which he swings (left side, right side, or overhead).
- In Investigation 3, he will change the force he uses to hit the ball (low, medium, and high).

In all three investigations, he will hit the balls indoors, where water movement and water temperature are the same. He will record the force, the side on which he swings, and the mass of the ball. He will measure the change in motion using accelerometers attached to the balls.

Part 1: Investigation Components

1. What is the purpose of these investigations?
   to figure out how Spongebob can control the change in motion of any ball during his tennis match against Squidward
2. What are the independent variables in EACH of the investigations? How do you know?
   mass of ball, force of hit, side of swing. the ind. variable are variables/conditions that are purposefully changed in the investigation
3. What is the dependent variable in all three investigations? How do you know?
   the change in motion of the ball. the dependent variable is the measured result of the investigation
4. Which constants are the same in all three investigations?
   water movement, temperature

Part 2: Investigation Results

Spongebob recorded the force, the mass of the ball, and the side on which he swung his racket in each investigation, but the accelerometer data went missing. Examine the data tables. Then, use your knowledge of change in motion to answer the questions below.

Investigation 1:

Trial	Force on Ball	Mass of Ball	Side of Swing
A	Medium	10 grams	Left
B	Medium	60 grams	Left
C	Medium	110 grams	Left

Investigation 2:

Trial	Force on Ball	Mass of Ball	Side of Swing
D	High	60 grams	Left
E	High	60 grams	Right
F	High	60 grams	Overhead

Investigation 3:

Trial	Force on Ball	Mass of Ball	Side of Swing
G	Low	60 grams	Right
H	Medium	60 grams	Right
I	High	60 grams	Right

5. In **Investigation 1**, which trial would result in the least change in the motion of the ball?
   a. Trial A
   b. Trial B
   c. Trial C
   d. The change in motion will always be the same.

   How do you know?
   the mass of the ball is the greatest

6. In **Investigation 2**, which trial would result in the greatest change in the motion of the ball?
   a. Trial D
   b. Trial E
   c. Trial F
   d. The change in motion will always be the same.

   How do you know?
   the mass and force are always the same.

7. In **Investigation 3**, which trial would result in the greatest change in the motion of the ball?
   a. Trial G
   b. Trial H
   c. Trial I
   d. The change in motion will always be the same.

   How do you know?
   the force on the ball is the greatest

8. After examining the data, Patrick decides that Investigation 2 was not necessary to achieve their purpose. Why do they only need information from Investigations 1 and 3?
   Investigation 2 was not needed because only information on force and mass are required to determine the change in motion.

Part 3: Playing the game!

The day of the match is here. With his new knowledge about how each of these variables affects the change in motion of the ball, Spongebob goes out to play. The data from his first six swings are below.

Swing	Force on Ball	Side of Swing	Mass of Ball (grams)
#1	High	Right	60 g
#2	High	Overhead	10 g
#3	Medium	Overhead	60 g
#4	Low	Right	60 g
#5	Medium	Left	10 g
#6	Low	Left	110 g

9. Examine the data for **Swing #1**. If the other variables are kept the same, which of the following **balls** would result in **less** change in motion?
   a. 10 g
   b. 60 g
   c. 110 g
   d. There is not enough information to tell.

10. Examine the data for **Swing #5**. If the other variables are kept the same, which of the following **forces** would result in **greater** change in motion?
    a. Low
    b. Medium
    c. High
    d. There is not enough information to tell.

11. In which swing would the ball have greatest change in motion? How do you know?
    Swing #2 it is hit with the highest force and the ball has the smallest mass

12. In which trial would the ball have the least change in motion? How do you know?
    Swing #6 the ball has the highest mass and is hit with the lowest force

Part 4. Relationships among force, mass, and change in motion in a collision

13. What information is required to determine the change in motion of an object?

Information on the mass of the object and the forces acting on the object

14. If the mass of an object stays the same, but the object is hit with a greater force, what happens to the change in motion of the object?

Change in motion will increase

15. If the mass of the object increases, what must happen to the force with which it is hit to achieve the same change in motion?

force must increase

16. If the change in motion of an object is less, but it is hit with the same force, what must have happened to the mass of the object?

mass must increase