4th Grade Science:
Study Guide
Topic: Collisions

Key Concepts:

- **Energy Transfer**: When objects collide, energy is transferred from one object to another. For example, when a bat hits a ball, the energy from the bat is transferred to the ball, making it move.
- **Kinetic Energy**: The energy an object has because of its motion. When you hit a ball with a mallet, you give it kinetic energy.
- **Energy Transformation**: Energy can change from one form to another, like kinetic energy changing to sound or heat during a collision.
- **Collisions**: When objects collide, energy is transferred or transformed. How much an object compresses or stretches depends on the material and amount of energy involved.

1. To play croquet, you hit a ball through metal hoops with a wooden mallet. If your ball touches another player's ball, you can "send" the other player's ball off course.

What will happen when the player strikes the ball with the mallet?
Correct Answer: B. Kinetic energy will travel through the ball that is hit with the mallet and the other ball will move.

- **Explanation**: When you hit a ball with a mallet, the kinetic energy from the mallet is transferred to the ball. This energy is then passed to the second ball, causing it to move. This is an example of energy transfer through contact.

2. Cole performed an investigation using different balls. He collected data on how the balls compressed and stretched after a collision.

What question was Cole most likely investigating?

Correct Answer: C. Which ball needs the most energy to collide?

- **Explanation**: Based on the data collected, Cole was trying to understand which ball required more energy to compress and stretch back during a collision. This shows how different materials and masses affect energy transfer in collisions.

3. Based on Cole's data, which conclusion is best supported by the evidence?

Correct Answer: C. The table tennis ball compressed and stretched the least.

- **Explanation**: A table tennis ball is much lighter and less dense than other balls like basketballs or golf balls. Therefore, it does not compress or stretch as much during a collision, which aligns with Cole's findings.

4. Look at the picture of a bat hitting a ball.

What three things take place when the bat makes contact with the ball?

Correct Answer: A. Energy transfer causes a change in motion.

Also Correct: C. Some of the ball's kinetic energy is transformed into thermal energy.

Also Correct: D. Sound energy is transferred to the surroundings.

- **Explanation**: When the bat hits the ball, energy is transferred from the bat to the ball, causing it to move (kinetic energy). Some energy is also transformed into sound (the crack of the bat) and thermal energy (a small amount of heat due to friction).

5. A snowball hits a brick wall.

Which two statements describe the energy involved when the snowball and the wall collide?

Correct Answer: A. The change in the snowball's speed is evidence for a change in energy.

Also Correct: D. The kinetic energy of the snowball is transferred to the surroundings and to the chunks of snow that spread out.

- **Explanation**: When the snowball hits the wall, its speed decreases rapidly, which is a sign that energy has changed form. The energy from the moving snowball is transferred to the surrounding air and the broken pieces of snow, demonstrating energy transfer and transformation.

6. Look at the picture of a hammer hitting a nail.

As the two objects collide, the (nail / motion of the hammer / hammer / sound) is evidence of a change in energy.

Correct Answer: Motion of the hammer.

- **Explanation**: The motion of the hammer shows that energy is being transferred to the nail, driving it into the wood. The hammer's kinetic energy is transferred to the nail, causing it to move.