

Name _____

Energizing the World: Understanding Kinetic Energy

Open-Ended Response Answer Key

1. The kinetic energy of an object is calculated using the formula $KE = 0.5 \times \text{mass} \times \text{velocity}^2$. If we have two identical cars with the same mass but different velocities, the car moving at 60 miles per hour will have four times the kinetic energy of the car moving at 30 miles per hour. This is because kinetic energy is directly proportional to the square of the velocity. Therefore, the faster-moving car has more kinetic energy.
2. Examples of kinetic energy being converted into other forms of energy include:
 - When a car brakes, its kinetic energy is converted into heat energy due to friction between the brake pads and the wheels.
 - When a bouncing ball comes to a stop, its kinetic energy is converted into sound energy as it makes a noise upon impact with the ground.
 - In hydroelectric power plants, the kinetic energy of flowing water is converted into electrical energy as it turns turbines.
3. To calculate the kinetic energy (KE) of a bicycle with a mass (m) of 15 kilograms moving at a velocity (v) of 8 meters per second, we can use the formula $KE = 0.5 \times m \times v^2$: $KE = 0.5 \times 15 \text{ kg} \times (8 \text{ m/s})^2 = 480 \text{ joules (J)}$.
4. Understanding kinetic energy is crucial in various fields, including physics, engineering, and transportation. In physics, it helps explain the motion of objects and is a fundamental concept in mechanics. In engineering, it is essential for designing efficient machines and vehicles. In transportation, kinetic energy plays a role in vehicle safety and energy efficiency, such as in the design of brakes and airbags. Additionally, understanding kinetic energy is essential in sports and recreational activities, where it affects the performance of athletes and the behavior of objects in motion.

