2024-Ph-H2-Q3

Section: Our Dynamic Universe
Topic: Collisions, Explosions and Impulse

Summary:
A Newton's Cradle is used as a desk ornament. When one ball is raised and released, a force is transmitted through the stationary balls, causing the opposite ball to swing upwards.
The question asks for a **comment on the physics principles demonstrated by a Newton's Cradle.**

Solution:

- Newton's Cradle demonstrates **conservation of momentum**:

The total momentum before and after the collision of the balls remains constant.

- It also demonstrates **conservation of energy** (approximately, ignoring sound and heat losses):

The kinetic energy is transferred through the balls, causing the last ball to swing out.

- It illustrates **Newton's third law**:

The ball striking the stationary ones exerts a force on them, and they exert an equal and opposite force on the ball.

- Additionally, **elastic collisions** are effectively modeled, as the balls bounce with minimal deformation.

Guidance for Students:

- Think of Newton's Cradle as a real-world model of ideal elastic collisions.
- Momentum and energy transfer are central principles in this setup.

Revision Tips:

- **Momentum:** $p = mv$ is always conserved.
- **Energy:** In elastic collisions, kinetic energy is (approximately) conserved.
- **Newton's 3rd law:** Every action has an equal and opposite reaction.
