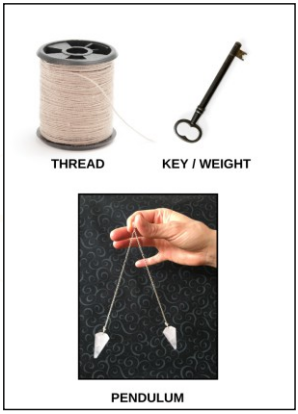
POTENTIAL AND KINETIC ENERGY

Kinetic energy is defined as the energy that an object possesses due to its motion.
Gravitational potential energy is defined as the energy stored in an object due to its position in a gravitational field.

Experiment 1 - Pendulum Swing

Materials

- String
- Key



Step-by-Step Instructions

1. Tie one end of the string to a small weight (e.g. a key) Hold the other end of the string, ensuring the weight hangs freely.
2. Pull the weight to one side and release it gently to start swinging.
3. Observe how the speed changes as the pendulum swings.

Concept Explanation

At the highest point of the swing, the pendulum has maximum gravitational potential energy due to its height. As it swings downward, the potential energy converts into kinetic energy which is greatest at the bottom of the swing. This continuous transfer keeps the pendulum moving. However, the air resistance acting on the key will slow it down and eventually bring it to a stationary position.This means that the speed of the pendulum will be maximum at the middle (lowest point) and slowest at the right and left most points (highest points

Reflection Questions

1. Where does the pendulum move the fastest? At the top or at the bottom? Why?
2. What happens to a pendulum in vacuum?
3. What happens to the swing height if you let the pendulum keep going? Why?

Fun Facts & Extensions

A pendulum clock keeps time by using the regular swinging motion of a pendulum, which oscillates back and forth at a consistent rate due to the force of gravity. The clock's escapement mechanism interacts with the pendulum to release energy at precise intervals, allowing the gears to advance and accurately measure time.

Real Life Uses of Pendulum

Seismometers: Pendulums are used in earthquake-detecting instruments to measure ground movement.

Amusement Park Rides: Rides like the pirate ship swing mimic the pendulum's motion for thrills.

Wrecking Balls: The pendulum effect helps direct force when demolishing buildings.

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Experiment 2 - Rubber Band Catapult

Materials

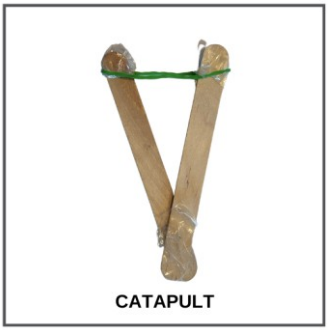
- Ruler/Icecream stick
- Rubber bands
- Small objects like paper clips
- Tape

Step-by-Step Instructions

1. Secure 2 popsicle sticks or rulers in a V shape with tape
2. Secure a rubber band on the other ends
3. Use the band as a lever to launch small objects (like a paper clip).
4. Observe how far the objects travel based on how much you stretch the rubber bands

Concept Explanation

The stretched rubber band stores strain potential energy, which converts into kinetic energy when released. This propels the object being pulled back forward.



Reflection Questions

1. How does stretching the rubber band more affect the launch distance? Think in terms of potential energy and transfer of energy.
2. Why does a heavier object travel a shorter distance?

Fun Facts & Extensions

Catapults were used by civilizations like the Greeks and Romans to hurl projectiles during warfare.

Real Life Uses of Catapult

Aircraft Launchers : Uses a rapid, controlled release of stored energy to propel projectiles with high force, allowing for greater distance and speed to escape gravity.

Warfare : Catapults were used in war as siege weapons to launch heavy projectiles (such as rocks, flaming objects) or to breach walls

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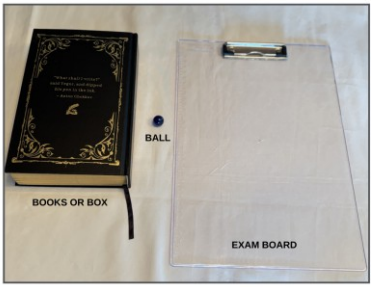
Experiment 3 - Ball Drop

Materials

- A ball
- A ramp (like a board tilted against a box)

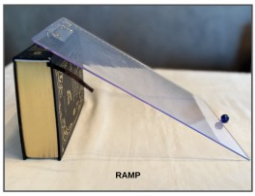


Step-by-Step Instructions

1. Place the ball at the top of the ramp.
2. Observe the ball staying still (it has potential energy due to its position).
3. Release the ball and watch it roll down the ramp (its potential energy converts into kinetic energy)

Explanation

The ball at the top of the ramp has potential energy because of its position. As it rolls down, the potential energy is converted into kinetic energy, causing the ball to accelerate.



Reflection Questions

1. What is the relation of kinetic energy to speed? Answer according to the observation.
2. What happens when the ramp is made steeper? This may help you answer the previous question.

Fun Facts & Extensions

The concept of potential and kinetic energy was first introduced by the French mathematician and physicist Jean le Rond d'Alembert in the 18th century, helping to lay the foundation for the study of energy in physics.

Real life uses of Ramp

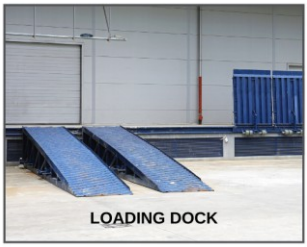
Wheelchair Ramps: Provide easier access to buildings for people using wheelchairs.

Loading Docks: Ramps help load heavy items onto trucks or ships.

Slides: A playground slide is a practical example of an inclined plane.

Roads and Highways: Curved or sloped roads, like mountain roads or freeway ramps, make it easier for vehicles to climb hills.

Construction Equipment: Inclined planes are used in conveyor belts and dump trucks for moving materials.



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