

INERTIA, MOTION AND FRICTION

INERTIA - Inertia is the tendency of things to stay the way they are. If something is not moving, it will stay still unless you push or pull it. If something is moving, it will keep moving unless something stops it.

MOTION - Motion is when something moves from one place to another. Things stay still or keep moving unless a force (push or pull) changes that. The harder you push, the faster something moves.

FRICTION - Friction is a force that slows things down when they rub against each other.

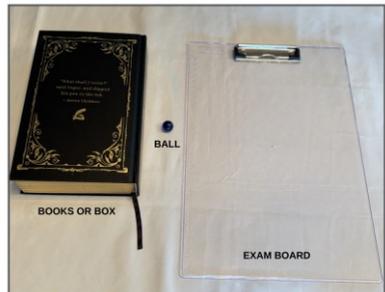
Experiment 1 - Rolling Ball

Materials

- Chopping board/Exam board
- Pile of books
- Ball

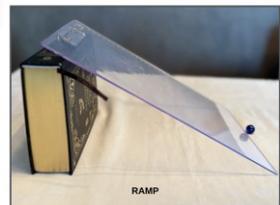
Step-by-Step Instructions

1. Set up a ramp using a book or cutting board.
2. Place a ball at the top of the ramp and let it roll down.
3. Observe how the ball keeps moving until something stops it.



Concept Explanation

Inertia is an object's tendency to resist changes in its motion. Once the ball starts rolling, it keeps moving unless acted upon by another force (e.g., friction).



Reflection Questions

1. What stops the ball from rolling forever? Think along the lines of friction.
2. How would this work differently on a smoother surface? Compare the stopping distance.

Fun Facts & Extensions

Space objects move endlessly due to the lack of friction in the vacuum of space and the principles of inertia and momentum, which keep them in motion unless acted upon by an external force.

Real life benefits of Inertia

Satellite Orbits: Satellites stay in motion around the Earth because of inertia, requiring minimal additional energy.

Sports: Understanding inertia helps athletes control their movements, like stopping or turning quickly in soccer or basketball.

Space Exploration: Rockets and spacecraft use the laws of motion to escape Earth's gravity and navigate space.

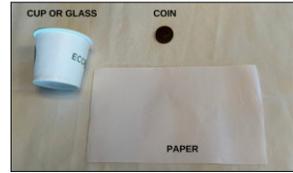


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Experiment 2 - Coin Drop (Inertia)

Materials

- A glass
- A piece of paper
- A coin

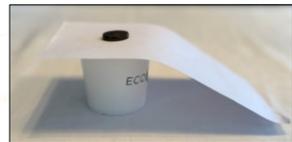


Steps

1. Place the glass on a table and cover it with a small piece of paper.
2. Put a coin on top of the paper.
3. Quickly flick the paper away.

Explanation

The coin stays in place and falls into the glass due to inertia—it resists the change in motion caused by flicking the paper.



Reflection Questions

1. Why does the coin fall straight into the glass instead of moving with the paper when it is flicked?
2. How does this experiment demonstrate Newton's First Law of Motion?

Fun Facts & Extensions

The same principle of inertia is why you would notice that objects that are in a moving train do not move unless acted upon even though the train is in motion. When the train stops, however, the object moves toward the front. This is because the body only moves when acted upon due to its inertia. The train stopping produces an opposite force in the object or person, making them jolt forward.

Real Life Uses of Inertia

Seatbelts in Cars: Inertia keeps passengers moving forward during a sudden stop. Seatbelts counteract this by holding passengers in place, preventing injury.



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Experiment 3 – Ramp and Ball (Friction)

Material

- Chopping board/Exam board
- Pile of books
- Ball
- Sand paper/ Towel/Ribbed paper
- Tape

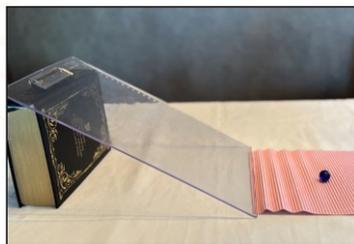
Step-by-Step Instructions

1. Roll a ball down a ramp.
2. Add a rough surface (e.g., sandpaper) to observe the effect on speed.



Concept Explanation

Heavier objects fall faster due to their greater momentum, but friction can slow them down. Friction between the ball and the surface resists motion. The smoother the surface, the less friction there is, allowing the ball to roll farther.



Reflection Questions

1. Which ball rolled faster, and why?
2. How did the rough surface affect the results? Think in terms of speed, distance and time.

Fun Facts & Extensions

Galileo studied motion by rolling balls down inclined planes to slow their movement and make precise observations. He used a smooth, grooved ramp to guide the balls and measured their positions at equal time intervals. By adjusting the ramp's slope, he observed that the distance travelled by the balls changed uniformly.

Real Life Uses of Friction

Walking and Driving: Friction between your shoes and the ground prevents slipping. Similarly, friction between tires and the road allows cars to move and stop safely.

Brake Systems: Brakes in cars and bikes use friction to slow down or stop.

Industrial Applications: Machines use controlled friction to cut, drill, or grip objects during manufacturing.

Sports Gear: Friction is adjusted in sports, like using cleats for better grip or waxing skis to reduce resistance.

Energy Conservation: Reducing unwanted friction in engines or machinery improves efficiency and saves energy.



FRICITION FOR TYRES



FRICITION FOR WALKING PATHS



STUDS FOR FOOTBALL SHOES



LACK OF FRICTION CAUSES SLIPS



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