Friction

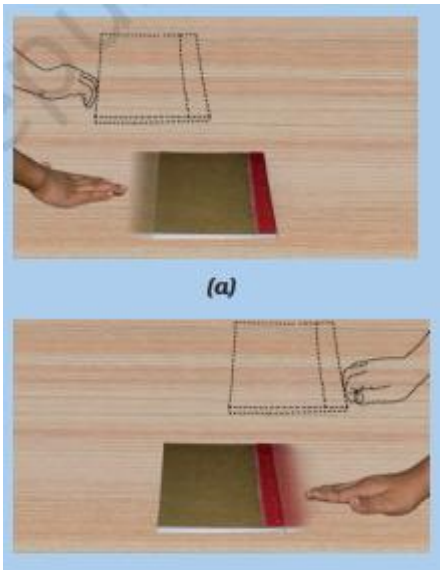
- **What is friction?** A force that opposes motion between two surfaces in contact. It always acts in the direction opposite to the applied force.
- **Why does friction occur?** Due to irregularities (microscopic bumps and grooves) on the surfaces in contact. These irregularities interlock and resist motion.

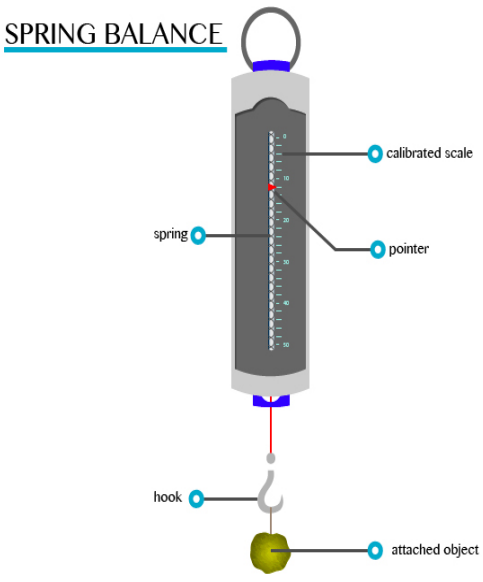
Factors Affecting Friction

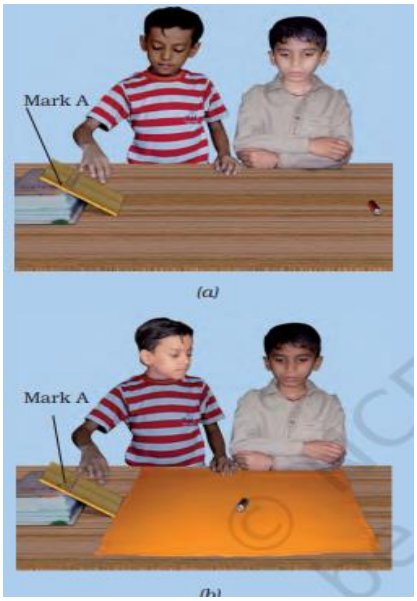
- **Nature of surfaces:** Rougher surfaces have more irregularities, leading to greater friction. Smoother surfaces have less friction.
- **Force pressing surfaces together:** Increasing the force pushing the surfaces together increases friction. (Example: It's harder to push a heavy box than a light one).
- **State of motion:**
    - **Static friction:** The friction that needs to be overcome to start an object moving from rest.
    - **Sliding friction:** The friction that needs to be overcome to keep an object moving at a constant speed. Static friction is usually greater than sliding friction.

Key Concepts from the Activities

- **Activity 9.1 (Book and Table):** Demonstrates that friction opposes motion. Pushing the book in either direction results in friction acting in the opposite direction.







- **Activity 9.2 (Brick and Spring Balance):** Shows how the nature of the surfaces affects friction. Pulling a brick covered with different materials (polythene, jute) changes the amount of force required to move it.
- **Activity 9.3 (Inclined Plane and Pencil Cell):** Illustrates how the surface on which an object moves affects the distance it travels before stopping. A rougher surface (like cloth or sand) increases friction and stops the cell sooner.

Important Notes for Exams

- Friction is a contact force. It only exists when two surfaces are touching.
- Friction generates heat. (Rub your hands together to feel this!)
- Friction can be both helpful and harmful. It helps us walk, drive cars, and write, but it also causes wear and tear on machines.
- Lubricants (like oil or grease) reduce friction by making surfaces smoother.

Friction: A Necessary Evil

- **Friction is essential for:**
    - **Grip:** Walking, holding objects, writing, driving (tires on the road).
    - **Starting and stopping motion:** Applying brakes in vehicles.
    - **Construction:** Fixing nails, tying knots.
- **Friction is also harmful because it:**
    - **Causes wear and tear:** Worn-out shoes, steps, machine parts.
    - **Produces heat:** Leading to energy loss in machines.

Examples of Friction in Daily Life

- **Helpful Friction:**
    - Easier to hold a rough kulhar (earthen pot) than a smooth glass tumbler.
    - Chalk rubbing off on a blackboard.

Fig. 9.9 : *Rubbing of your palms makes you feel warm*

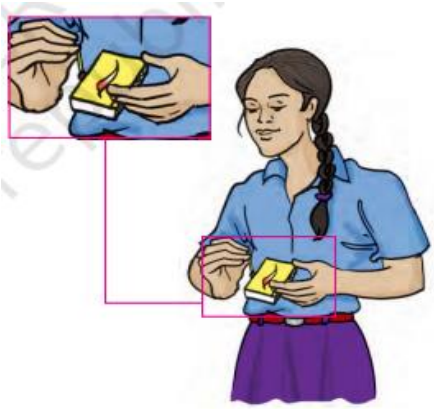


Fig. 9.10 : *Stricking a matchstick produces fire by friction*

- **Harmful Friction:**
    - Difficulty walking on a wet, muddy track or marble floor.
    - A mixer jar getting hot when running.

Fluid Friction (Drag)

- **What is it?** The friction experienced by objects moving through fluids (liquids and gases).
- **Factors affecting fluid friction:**

- **Speed of the object:** Higher speed = more friction.
- **Shape of the object:** Streamlined shapes reduce friction.
- **Nature of the fluid:** Thicker fluids (like honey) have more friction than thinner fluids (like water).

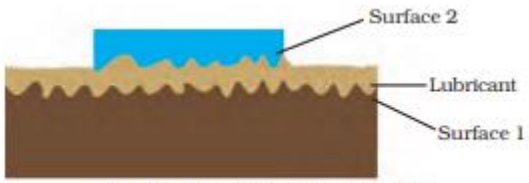


Fig. 9.13 : *Action of lubricant*


Fig. 9.12 : *Powder is sprinkled on the carrom board to reduce friction*

- **Reducing fluid friction:**
  - **Streamlined shapes:** Inspired by birds and fish, airplanes and vehicles are designed to reduce drag. This helps them move efficiently through fluids and save energy.

Important Notes for Exams:

- Fluid friction is also called "drag."
- Air resistance is an example of fluid friction.
- Understanding fluid friction is crucial in designing vehicles and objects that move through air or water.

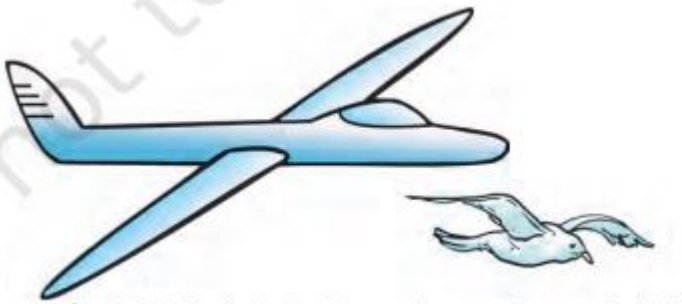


Fig. 9.17 : *Similarity in shapes of an aeroplane and a bird*