A. Intro to FM&E

Introduction to Force, Motion, and Energy

Have you ever wondered why things move or stay still? How do objects change their position or shape? The answers to these questions lie in the fascinating concepts of force, motion, and energy. Let's dive into the world of physics to understand these essential principles.

Force: Push & Pull

Force is a push or pull that can change the state of an object. When you push a toy car, it starts moving. When you pull a wagon, it follows you. Both pushing and pulling are examples of force. Forces can make things speed up, slow down, or change direction.

Friction

Have you noticed that it's harder to slide something heavy across the floor than something light? That's because of a force called friction. Friction is like a little invisible roadblock that tries to stop things from moving. When you push an object, friction pushes back, making it harder to move.

Friction can also help. When you ride your bike, the tires grip the road due to friction, allowing you to pedal forward. It is the reason you can walk without slipping on the floor.

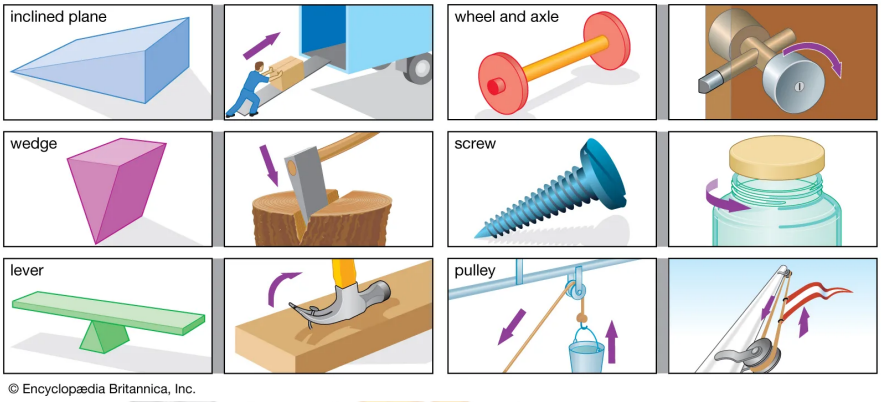
Net Force: Combining Push & Pull

If two people are pushing a box in the same direction, the box moves faster. But what happens if one person pushes to the right, and another pushes to the left? In this case, the forces are opposite, and we call them balanced forces. The box will not move because the forces cancel each other out.

When forces act in the same direction, they add up. We call this the net force. A strong net force makes things move faster, while a weak net force slows them down.

Simple Machines

Simple machines are special tools that help us do work with less force. They make our lives easier by changing the amount or direction of the force we apply.



There are six types of simple machines:

1. **Lever**

A lever is like a seesaw. It pivots on a point called the fulcrum. Think of how a crowbar helps you lift heavy objects with less effort.

2. **Wheel & Axle**

   This is like a doorknob or a bicycle wheel. When you turn the wheel, it makes the axle rotate, and vice versa.

3. **Pulley**

   A pulley is like a wheel with a groove. You can use a rope or belt to lift heavy things with less effort.

4. **Inclined Plane**

   An inclined plane is like a ramp. It helps you move heavy objects to a higher or lower surface with less force.

5. **Wedge**

   A wedge is like a triangle or a knife. It helps you split things apart or hold them together.

6. **Screw**

   A screw is like a twisty ramp. It helps you hold things together, like when you put a screw into a piece of wood.

Now, let's test your knowledge with some questions!

1. What is force?

   A) A force is the name of a new toy.

   B) A force is a push or pull that can change the state of an object.

   C) A force is a type of energy.

   D) A force is a type of motion.

2. What force makes it harder to slide heavy objects across the floor?
    A) Motion
    B) Push
    C) Friction
    D) Pull

3. When two people are pushing a box in opposite directions, we call them:
    A) Moving forces
    B) Balanced forces
    C) Accelerated forces
    D) Frictional forces

4. How does friction help us when we ride a bike?
    A) It slows us down.
    B) It makes the tires flat.
    C) It helps us pedal forward by gripping the road.
    D) It makes us fall off the bike.

5. What is the net force when two people are pushing a box in the same direction?
    A) Zero net force
    B) Strong net force
    C) Weak net force
    D) Negative net force

6. Which simple machine can help you lift heavy objects with less effort, like a crowbar?
    A) Lever
    B) Screw
    C) Wheel and Axle
    D) Inclined Plane

7. Which simple machine is like a triangle or a knife and helps you split things apart or hold them together?
    A) Wedge
    B) Screw

C) Pulley
D) Wheel and Axle

8. What is the name of the point where a lever pivots?
   A) Base
   B) Center
   C) Apex
   D) Fulcrum

9. Which simple machine helps you move heavy objects to a higher or lower surface with less force?
   A) Inclined Plane
   B) Lever
   C) Wheel and Axle
   D) Pulley

10. What is a pulley's shape, and how does it help us?
   A) It is like a doorknob, and it helps us turn things.
   B) It is like a ramp, and it helps us move heavy objects.
   C) It is like a wheel with a groove, and it helps us lift heavy things with less effort.
   D) It is like a triangle, and it helps us split things apart.

ANSWERS & EXPLANATIONS

1. B) A force is a push or pull that can change the state of an object.
    - The passage defines force as a push or pull that can cause a change in the state of an object.

2. C) Friction.
    - The passage explains that friction is the force that makes it harder to slide heavy objects across the floor.

3. B) Balanced forces.
    - The passage describes balanced forces as forces acting in opposite directions, canceling each other out, and making the box not move.

4. C) It helps us pedal forward by gripping the road.
    - The passage mentions that friction helps when we ride a bike by allowing the tires to grip the road, enabling us to pedal forward.

5. B) Strong net force.
    - The passage states that when two people push a box in the same direction, the forces add up, creating a strong net force that makes the box move faster.

6. A) Lever.
    - The passage explains that a lever is like a seesaw and helps lift heavy objects with less effort, like a crowbar.

7. A) Wedge.
    - The passage describes a wedge as a simple machine that helps split things apart or hold them together, like a triangle or a knife.

8. D) Fulcrum.
    - The passage mentions that the point where a lever pivots is called the fulcrum.

9. A) Inclined Plane.
    - The passage explains that an inclined plane is like a ramp and helps move heavy objects to a higher or lower surface with less force.

10. C) It is like a wheel with a groove, and it helps us lift heavy things with less effort.
    - The passage describes a pulley as a simple machine that is like a wheel with a groove and helps lift heavy objects with less effort using a rope or belt.