25SCHOOLS

FREE LEARNING NOTES FOR ZAMBIA

FORM 1

Physics

Forces and their effects

Lesson notes for learners · Competence-Based Curriculum

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When you push a loaded wheelbarrow, kick a football or pull water from a borehole, you are using forces. A force is a push or a pull that can change how an object moves or what shape it has. In this note you learn about the main kinds of force, how forces act on an object together, and what forces can do to a body.

AFTER THESE NOTES YOU SHOULD BE ABLE TO

- Say what a force is
- Name and describe applied, frictional, gravitational, normal, tension and air resistance forces
- Explain balanced and unbalanced forces and what each does to an object
- Describe the effects of a force on the shape, size, speed and direction of a body
- Give everyday examples of forces

KEY WORDS

force	a push or a pull that can change the state of motion of an object
applied force	a force that a person or an object applies to another body
frictional force	a force that opposes motion between two surfaces in contact
gravitational force	a force that attracts objects towards each other because of their mass
normal force	a force that acts at right angles to the surface of contact between two objects
tension force	a force that acts along a string or wire, pulling objects towards each other
air resistance	a force that opposes the motion of an object through the air
balanced forces	equal forces acting on an object from opposite directions

1 What is a force

A force is a push or a pull that causes an object to change its state of motion. A force can change the speed of an object, its direction, or both. A force has a size, called its magnitude, and a direction. The point where the force is applied is the point of application. Because a force has both size and direction, it is a vector quantity.

2 Kinds of force

An applied force is a force that a person or an object applies to another body, such as pushing a cart. Friction opposes the motion between two surfaces in contact, which is why a box slides more slowly on rough ground. Gravitational force attracts objects towards each other because of their mass. The normal force acts at right angles to the surface where two objects touch. Tension acts along a string or wire, such as a rope pulling a bucket. Air resistance opposes the motion of an object through the air.

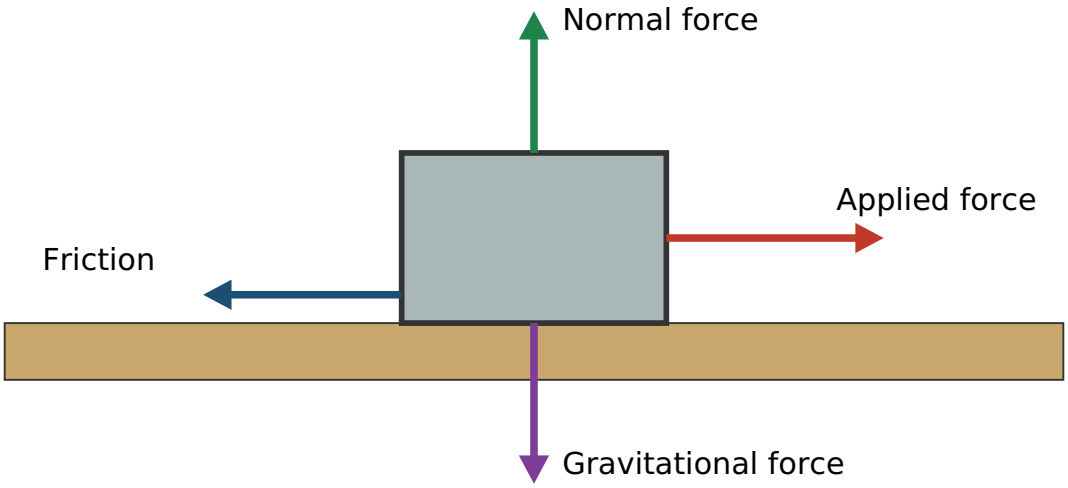

Figure 1. Four forces acting on a box being pushed along the ground

3 Balanced and unbalanced forces

Balanced forces act on an object from opposite directions and are equal. An object acted on by balanced forces will most likely stay still. Unbalanced forces act from opposite directions and are not equal. An object acted on by unbalanced forces moves.

In the drawing of the box above, the box moves to the right only when the applied force is greater than the friction acting against it.

Type	The forces are	The object will most likely
Balanced	Equal and in opposite directions	Stay still
Unbalanced	Not equal, in opposite directions	Be in motion

Figure 2. Balanced and unbalanced forces compared

WORKED EXAMPLE

Two learners in a tug-of-war pull on a rope with equal forces in opposite directions. What happens to the rope, and why?

The two forces are equal and act in opposite directions

So they are balanced forces

An object acted on by balanced forces will most likely stay still

So the rope does not move

4 The effects of a force on a body

A force can change the shape or size of an object. This is called deformation. Examples are compressing and stretching a spring, kneading dough and kicking a football. A force can also change the speed or direction of a moving object. Pushing a stationary ball makes it move, and a player's kick can change the direction of a rolling ball.

TRY THIS

Use clay, playdough, a spring or a rubber band. Squeeze, stretch and press each one, and record what happens to its shape or size. Then push a block or a ball along a table with different forces and note when it moves and when it stays still.

REMEMBER

- A force is a push or a pull that can change an object's speed, direction or both
- Force is a vector: it has magnitude and direction
- Types of force include applied, friction, gravitational, normal, tension and air resistance
- Balanced forces are equal and opposite and an object most likely stays still
- Unbalanced forces are not equal and the object moves
- A force can change the shape or size of an object

? Check yourself

1. What is a force?
2. Name the force that opposes motion between two surfaces in contact.
3. What happens to an object acted on by balanced forces?

4. Give two effects a force can have on an object.
5. What is the force that acts along a rope or wire called?
6. You are a learner at a school in Luangwa. A farmer pushes a loaded wheelbarrow along a sandy path. At first it does not move, then it moves when he pushes harder. (a) Name the force that the farmer applies and the force that acts against it. (b) Say whether the forces are balanced or unbalanced when
7. A boy kicks a football along the ground at a school field. The ball starts moving, then a girl kicks it from the side and it changes direction. Later it slows down and stops on the grass. (a) What effect did each kick have on the ball? (b) Name the force that slows the ball on the grass. (c) Say whe

ANSWERS

1. A push or a pull that causes an object to change its state of motion.
2. Frictional force.
3. It will most likely stay still.
4. Any two of: change its shape, change its size, change its speed, change its direction.
5. Tension force.
6. (a) The farmer's applied force, and friction. (b) Balanced when it does not move, unbalanced when it moves. (c) When he pushes harder the applied force becomes greater than friction, so the forces are unbalanced and the wheelbarrow moves.
7. (a) The first kick made it move and the side kick changed its direction. (b) Friction between the ball and the grass, and air resistance. (c) Unbalanced, because the forces opposing the motion are greater than the force driving it, so the ball does not keep moving.

Written by 25Schools to follow the Form 1 Physics syllabus of the Zambian competence-based curriculum. Free for learners to read, download and share. More notes and quizzes at 25schools.com.