

UNIT 6: FORCES AND MOTION.

Lesson summary

Vocabulary

Types of bodies.
Kinematic
Dinamic

Grammar

Passive voice: the...
is called kinematic.
Relative clauses:

Content Objetives

The lesson aims to help students:
Develop an understanding of how bodies move.
Differentiate between several types of interactions.
Understand cocepts like speed, aceleration, reference frame, ...



1.- BRAIN STORMING

What is a force?
What is aceleration?
What is speed?
Do you know the relationship between forces and movement?

I think...
Under my opinion...
Firstly...
In one hand...
In the other hand...



**Work in pairs.**

Do you really know when you move?

In the picture on the left, two friends are talking on the phone, one inside a car and the other inside a bus.

Discuss with your partner:

- Which of the two is moving?
- Who is moving away from whom?
- Can you find a fixed point?

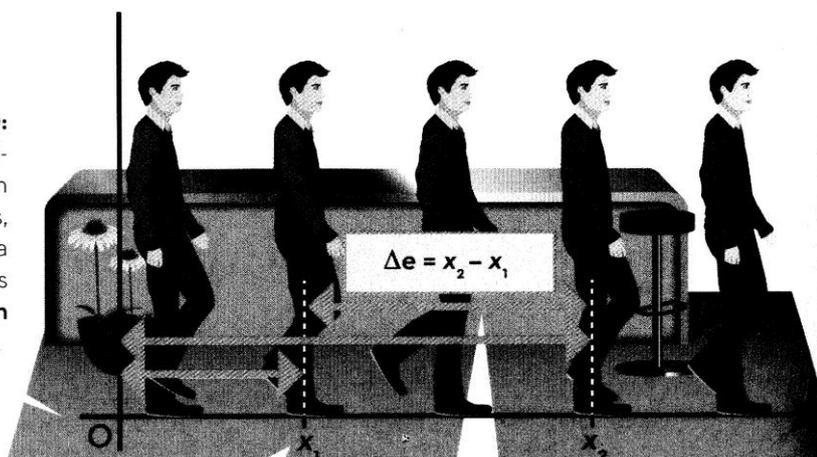
**READING.****Kinematics:**

The science that studies motion is called kinematics.

In order to study the motion of a body, we need to define concepts:

Reference frame (RF):

This consists of an oriented straight line in which motion occurs, called the **axis**, and a point that we accept is at rest, called the **origin** of the reference frame.



Position: distance from the object to the origin of the reference frame. Its sign depends on the side of the axis it is on.

Displacement: difference between any two positions.

A body moves when it varies its position in regard to the origin of the reference frame. It is called moveable.

- Velocity or speed:

Velocity is the measurement of the rate at which bodies move. It is calculated as the ratio between the displacement and the time used. Its units in the International System (SI) are m /s.

$$v = \frac{\Delta e}{\Delta t} = \frac{x_{final} - x_{initial}}{\Delta t}$$

- Acceleration

Acceleration is the measurement of the rate at which the velocity of a body varies. It is calculated as the ration between the variation of velocity and the time. Its units in the International System (SI) are m /s².



VOCABULARY

Acceleration

Motion

Displacement

Move (v)

In regard to

Position

Kinematic

Reference frame

Measurement

Velocity



ACTIVITIES

1.- In an 800 – metre race, we observe that world champion passes the 150 m mark after 18 seconds and 75 hundredths.

a) How fast is he running?

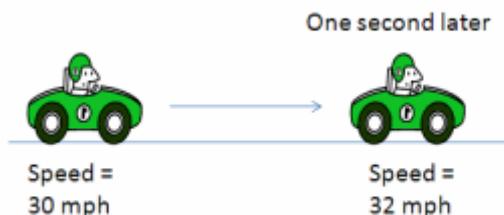


b) What will be the final time of the race if he maintains this speed?

2.- Indicate which animal runs faster:

- A wolf that runs 200 metres in 12 seconds.
- A grey squirrel that runs 45 metres in 3,75 s.

3.- A car move with a speed of 30 mph. One second later its speed is 32 mph. Determinate the acceleration of the car. Express the result in units of the International System.



READING. The concept of force.

We define force as any interaction between two bodies by contact or at a distance that causes a deformation or a change in their state of resting or motion. Its unit of measurement is the newton (N).

- Forces can act by contact.

A body can be deformed when a force is applied and its length varies along the force's line of action.



There are three types of bodies according to the behaviour they demonstrate with respect to deformation:

- RIGID BODIES:** they don't deform under the action of a force. As a consequence of this behaviour, they break and fracture.
- PLASTIC BODIES:** they deform when force is applied to them, but they do not regain their initial length when the force disappears.
- ELASTIC BODIES:** they deform when a force is applied to them, and they do regain their initial length when the force disappears.



A rock is a rigid body, clay is a plastic body, and a spring is an elastic body.

- Forces can act at a distance.

A) The force of gravity.

Gravity is a force that acts at a distance between two bodies that have mass. It increases with the value of these masses and decreases with the distance that separates these bodies.

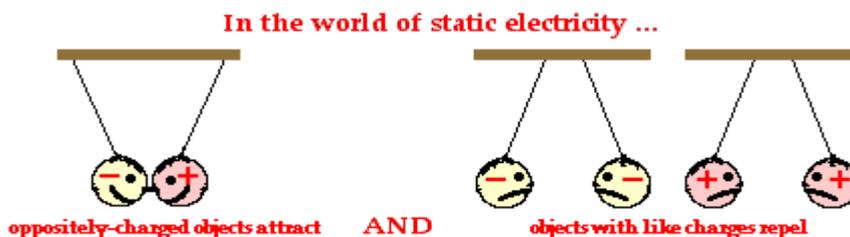
When we are near the surface of a planet, gravity has a special name: weight force. Its calculation is simple:

$$W = m \cdot g$$

where m is the mass of the body in kilograms and g is known as gravitational acceleration ($g = 9.8 \text{ m/s}^2$).

B) Electric force.

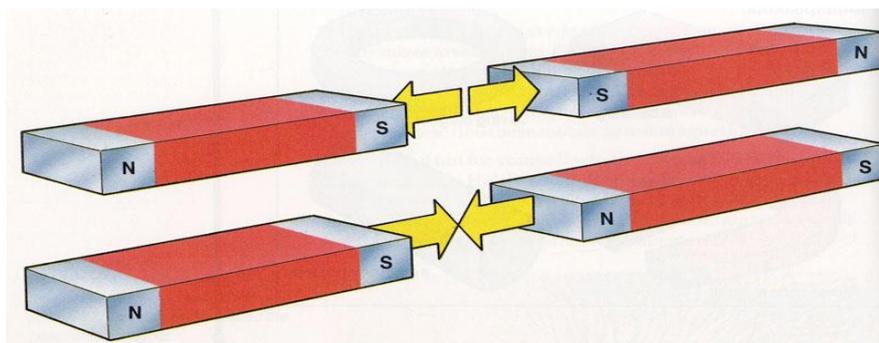
When two bodies are charged, a force appears between them with the following characteristics:



C) Magnetic force.

When we experiment with magnets, we can see the following characteristics:

- ✓ It acts at a distance and decreases when the distance increases.
- ✓ It can be attractive or repulsive.
- ✓ The magnet has two differentiated parts called the north poles (N) and south poles (S). Like poles repel and unlike poles attract.
- ✓ It only affects certain metals like iron.

**VOCABULARY**

Charge

Interaction

Clay

Iron

Deform (v)

Magnet

Deformation

Mass

Force

Poles

Gravity

Weigh

Increase

**ACTIVITIES:**

1.- Calculate your mass and your weigh on the Earth, Moon, Mars, Jupiter and the Sun. Compare your results with your partner.

Gravity values (m/s^2): Mercury 2.8; Earth 9.8; Moon 1.6; Mars 3.7; Jupiter 22.9; Sun 274.

2.- Determine the gravity of a planet, knowing that 5.3 kg weigh 23.32N.

3.- You weigh a rock in Io, one of Jupiter's moons and you obtain the value 36.2N. You bring it to Earth and it weighs 196N. What gravity does Io have?



LISTENING.

<https://www.youtube.com/watch?v=WndJsQgUeW4>

Answer these questions:

a) What is a force?

b) How many types of forces do you know? Give examples.

<http://fisquimed.wordpress.com>

