Dynamics -	PHYSI	CS
Dynamics	FIIJ	

1842

Galilean relativity INEVV

Introduction:

Physics is a science in continuous development, during its evolution many things have changed, such as the problems to be faced and the tools created to solve them. One thing, however, has remained unchanged: the method of investigation based on experimentation, of which Galileo laid the foundations. This didactic unit, through the execution of simple experiences, can help the teacher to demonstrate how Galileo's principle of relativity was used by Newton in formulating the laws of mechanics.



The principle of equivalence	NEW	8124

Introduction:

Free fall is defined as the movement of an object when only the force of gravity acts on it.

A person who was in a spacecraft in an area of the universe in total absence of gravity would see all the objects around him floating.

If, however, without his knowing it, the rockets under the floor capable of accelerating the vehicle upwards were fired, the person would see the objects fall to the ground, as if the vehicle were in a gravitational field. With this didactic unit it is possible to verify the principle of equivalence between gravity and acceleration proposed by Einstein.



Topics

- The properties of matter Newton's first law •
- •
- Newton's second law .
- . The inertial references
- The principle of relativity in classical physics
- The force of gravity
- The free fall
- Inertial mass and gravitational mass That strange force of gravity • •
- Newton's Doubts .
- . The gravitational oscillator
- When a reference is not inertial; the apparent forces •
- The lift • Einstein's thought

Equipment supplied

1 Dynamometer 1N 1 Magnetic anchor 1 Rod with hook 1 Metal cylinder with hook 5g 1 Table vise 3 Metal rods 1 Support for vertical magnet 1 Support for vertical magnet 1 Coil 400 turns 1 Coil 1600 turns 2 Core for threaded reel 2 Threaded disc 3 Electric cable 100 cm	1 Transparent bottle with iron cap and float 1 Magnet 1 sheet of aluminum foil 1 Newton's tube 1 Hand pump 1 Support for dynamometer 1 Skeins of thread 1 Wooden ball with hook 1 Wooden ball with hook 1 PVC ball with hook 1 Aluminum ball with hook 1 Torlley 1 Metal cylinder with hooks 50g 1 Table vice with pulley
1 graduated disc 3 Electric cable 100 cm 1 graduated glass 250 cc	1 Table vice with pulley

Equivalence between gravity and acceleration The principle of equivalence in general relativity

Consequences of the principle of equivalence

•

•

•

Dynamics - PHYSICS

1520

The interactions in physics

NEW

Introduction:

How is it possible that such small elements of matter can give rise to so many different phenomena and, above all, can form bodies that are extremely larger than themselves, such as gigantic planets and clusters of stars?

This question is answered in the fact that, as was previously stated, all particles have properties through which they interact.

This didactic unit allows to verify that there are no single forces as all the interactions satisfy the 3rd principle of dynamics.



The quantization of the electric charge

Electrostatics and magnetism - analogies

The ampere experience - the electromagnetic interaction

The unit of measurement of the intensity of electric current

Magnetism

in the yes

•

•

•

•

•

.

.

•

The magnetic poles

The magnetic forces

The atomic nucleus The weak interaction

• The strong interaction

The magnetic interaction

The experience of oersted Faraday's experience

Topics

- Matter
- The interactions
- The first astronomical systems •
- The Copernican system .
- Kepler's laws •
- The curvilinear motion .
- The dynamics of planets with circular orbit The gravitational interaction •
- The law of universal gravitation
- Electricity
- The electric charge
- •
- The electrostatic interaction The electrostatic state of a body the electroscope •
- Coulomb's law

Equipment supplied

1 Apparatus of the ellipse	1 Roll of adhesive tape
1 Lanyard	1 Linear magnet
1 rubber ball with hook	1 Transparent plate
1 Dynamometer 2,5 N	1 Iron filings
1 Pair of cylinders	1 Teaspoon
2 PVC rods	1 Pair of magnetic needles
1 Set of five rods with support	1 Compass
2 cables of 100cm	1 Apparatus of electromagnetic interactions
2 Alligator clips	1 Electric cable 25cm
1 glass flask 250ml	1 protractor
1 Rod for electroscope	1 Pair of magnetic pendulums
1 sheet of aluminum foil	





PHYSICS - Dynamics

Plane to study the motion

8101

The motion plane, consisting of the superposition of a layer of plastic and one of aluminum, allows to deepen the basic motions of the dynamic: the uniform straight motion and the uniformly accelerated straight motion. Uniform motions can be achieved by using the metal surface upwards, thanks to the electromagnetic induction, generated by the movement of the magnetic cart on the aluminium. Vice a versa, by placing the cart on the plastic surface it is possible to obtain accelerated motions. Thanks to the special support, the motion plane becomes an inclined plane which also makes possible considerations on friction and mechanical energy conservation. The

supplied material allows the use of a distance sensor for the study of motions in real time, in order to graphically and analytically deepen the laws that rules these motions.



Topics

- Distance sensor
- The operating principle of the distance sensor
 Set up
- How to verify if the sensor sees the trolley
- The magnetic glider
- Uniform rectilinear motion
- Uniformly accelerated rectilinear motion
- The fundamental law of dynamics
- The motion of a long trolley along an inclined surface

Equipment supplied

1 Aluminum plane 100 cm
1 Surface inclination device
1 Rigid board with window
1 Rigid board with rubber surface
1 Spring
1 Base
1 Bosshead

1 Folding ruler 9 Masses 10 g 1 Metallic rod 35 cm 1 Magnetic glider 1 Mass holder 20 g 1 Telescopic table clamp with pulley

Equipment for online use - not supplied

1 Distance sensor code 9041 + interface code 9001
Or
1 USB distance sensor code 9066





8105

Kit to study rolling motion

Additional kit for product code 8101.

Thanks to this kit it is possible to perform experiments on roto-translational motion. The movement of bodies that roll on a plane is roto-translating as they translate while they rotate. However, their rotation does not take place around the axis passing through the center of gravity, but around the axis passing through the points of contact with the rolling plane. The study of these phenomena is facilitated by using the movement plan (code 8101) and using a real-time data acquisition system (code 9041 + 9001).

Equipment supplied



Galileo's cart

Additional kit for product code 8101.

What is meant by "reference frame" in physics? This additional kit for the motion plane (cod. 8101) exhaustively answers this question, focusing on the so-called inertial frames. The interest for this class of frames comes from the fact that they are the references in which the Newton's first principle of dynamics is valid.

With the supplied material you are able to subject the Galilei's cart to different types of motion and find out in which situations it behaves as an inertial reference frame.



8123

PHYSICS - Dynamics



Online low friction track

Anodized aluminium track, length: 120cm, on which two friction trolleys, fitted with two wheels mounted on low-friction bearing, can scroll.

Topics

- · How to mount the rail • Gliders · The distance sensor
- Elastic collisions • Uniform motion • Inelastic collisions

· Conservation of energy

· The impulse-momentum theorem

- Uniformly accelerated motion
 Newton's second law Oscillations of a spring-mass system

Equipment for online use - not supplied



Equipment supplied

Stand with one support

Stand with double support

Track

1 End run shore

1 End run with pullev

2 Photocell supports

2 Stands with bar

1 Mass 500 g

1 Linear ruler

2 Coil springs

1 Central pivot

2 Side pivots

2 Pivots for springs

9 slotted masses 10 g with holder

1417

With this kit it is possible to measure time interval between two occurences when time is too brief to be measured with a time marker. For example, oscillation time, or

1 Timer and photocells (2pcs)	1 Spring
1 Metal rod 70 cm	9 masses 10 g
1 Base	2 Spheres for pendulum
2 Bosshead	1 String
1 Linear ruler	1 Box
1 Rod with book	





1 Support for inclined plane

1 Friction-trolley with bumper

2 Reflectors

4 Magnets

1 Allen key

1 USB-cable

1 Friction-trolley without bumper

8119