

Glossary

acceleration

the rate at which an object's velocity changes over a period of time

carrier particle

a fundamental particle of nature that is surrounded by a characteristic force field; photons are carrier particles of the electromagnetic force

dynamics

the study of how forces affect the motion of objects and systems

external force

a force acting on an object or system that originates outside of the object or system

force

a push or pull on an object with a specific magnitude and direction; can be represented by vectors; can be expressed as a multiple of a standard force

force field

a region in which a test particle will experience a force

free-body diagram

a sketch showing all of the external forces acting on an object or system; the system is represented by a dot, and the forces are represented by vectors extending outward from the dot

free-fall

a situation in which the only force acting on an object is the force due to gravity

friction

a force past each other of objects that are touching; examples include rough surfaces and air resistance

inertia

the tendency of an object to remain at rest or remain in motion

inertial frame of reference

a coordinate system that is not accelerating; all forces acting in an inertial frame of reference are real forces, as opposed to fictitious forces that are observed due to an accelerating frame of reference

law of inertia

see Newton's first law of motion

mass

the quantity of matter in a substance; measured in kilograms

net external force

the vector sum of all external forces acting on an object or system; causes a mass to accelerate

Newton's first law of motion

a body at rest remains at rest, or, if in motion, remains in motion at a constant velocity unless acted on by a net external force; also known as the law of inertia

Newton's second law of motion

the net external force \mathbf{F}_{net} on an object with mass m is proportional to and in the same direction as the acceleration of the object, \mathbf{a} , and inversely proportional to the mass; defined mathematically as $\mathbf{a} = \frac{\mathbf{F}_{\text{net}}}{m}$

Newton's third law of motion

whenever one body exerts a force on a second body, the first body experiences a force that is equal in magnitude and opposite in direction to the force that the first body exerts

normal force

the force that a surface applies to an object to support the weight of the object; acts perpendicular to the surface on which the object rests

system

defined by the boundaries of an object or collection of objects being observed; all forces originating from outside of the system are considered external forces

tension

the pulling force that acts along a medium, especially a stretched flexible connector, such as a rope or cable; when a rope supports the weight of an object, the force on the object due to the rope is called a tension force

thrust

a reaction force that pushes a body forward in response to a backward force; rockets, airplanes, and cars are pushed forward by a thrust reaction force

weight

the force \mathbf{w} due to gravity acting on an object of mass m ; defined mathematically as: $\mathbf{w} = m\mathbf{g}$, where \mathbf{g} is the magnitude and direction of the acceleration due to gravity