Motion in one dimension

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Motion in One Dimension is among the earliest lessons in Newton's Classical Mechanics. This page first introduces the terms and then shows users how they are applied to different forms of motion in one dimension. No knowledge of physics is required to understand the content on this page.

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Definition [edit]

Motion is defined as "the action or process of moving or changing place or position". In physics, motion is tracked over time. For the concept of motion in one direction, picture a train going along a straight track. The subject of motion in physics is called a, "body". The three properties of motion in one direction are: displacement (x), velocity (v), and acceleration (a). All of these three are linked together very closely.

Displacement [edit]

Displacement is defined as the distance (x) a one-dimensional object is from a center point, or an origin. Displacement is plotted against time in a curved graph. A body, in motion in one dimension, can only move left and right.

Picture a train that travels along a straight track. The origin is a point on that track, and as the body moves, the distance between the body and the origin is its displacement. If displacement of our train, given the variable (x), is worked out to be negative, then the train is |x| meters on the left hand side of the origin. If (x) is worked out to be positive, then the train is x meters on the right hand side of the origin.

Velocity [edit]

Velocity is defined as the rate of which displacement changes over time. The higher the velocity, the faster a body is moving.

Acceleration [edit]

Acceleration is the rate of change of velocity with time. A body with a positive acceleration is gaining velocity over time. A body with a negative acceleration is loosing velocity over time.

Motion with Constant Velocity [edit]

This is the simplest type of motion in one dimension. A body will have motion with constant velocity if it is sliding over a horizontal surface with minimal friction. A puck sliding across a hockey rink, or a square block of ice traveling along a flat kitchen floor are two examples of bodies, which have motion of constant velocity.

Motion with constant velocity is plotted on a graph of displacement vs. time.

The equation for the line is: $x = x_0 + vt$, where (x_0) is the displacement, (v) is the velocity, and (t) is the time.

The slope of the line in the graph, or dx/dt calculates the velocity, which is constant. Obviously the acceleration (a) in the equation is equal to d^2x/dt^2, and "0", because the velocity of the body is constant, and therefore not increasing, or decreasing.

Category: Physics