Newtons second law essay sample

OBJECTIVES:

1. To numerically examine the relationship between force, mass and acceleration. 2. To find the acceleration of the cart in the simulator. 3. To find the distance covered by the cart in the simulator in the given time interval.

EQUIPMENT:

1. Newton’s Second Law of Motion Virtual Lab simulator. 2. Computer

Figure 1. 1: Newton’s Second Law of Motion simulator

INTRODUCTION:

Newton’s laws are applied to objects which are idealized as single point masses in the sense that the size and shape of the object’s body are neglected in order to focus on its motion more easily. This can be done when the object is small compared to the distances involved in its analysis, or the deformation and rotation of the body are of no importance. In this way, even a planet can be idealized as a particle for analysis of its orbital motion around a star. Newton’s second law of motion can be used conveniently to derive the equation of motion of a system under the following conditions: 1. The system undergoes either pure translation or pure rotation. 2. The motion takes place in a single plane.

3. The force acting on the system either have a constant orientation or are oriented parallel to the direction along which the point of application moves.

THEORICAL PRINCIPLE:

Newton’s second law of motion states that the rate of change of momentum of a body directly proportional to the force acting on it and takes place in the direction of the applied force.

The mathematical expression of Newton’s second law of motion is F (mv-mu)/t

F m(v-u)/t

F ma

Where m is the mass of a body, v is the final velocity of the body, u is the initial velocity of the body and t is the time in seconds. This law can be written as:

F a , when mass of the body is a constant

F 1/m , when the force acting on the body is a constant

The second law can also be used to relate the net force and the momentum ‘ p’ of the body F net = ma= m(dv/dt)= d(mv)/dt= dp/dt

Therefore, Newton’s second law also states that the net force is equal to the time derivative of the body’s momentum Fnet = dp/dt

Consistent with the first law, the time derivative of the momentum is non-zero when the momentum changes direction, even if there is no change in its magnitude. The relationship also implies the conservation of momentum. When the net force on the body is zero, the momentum of the body is constant. Both statements of the second law are valid only for constant-mass systems, since any mass that is gained or lost by the system will cause a change in momentum that is not the result of an external law requires modification if the effects of special relativity are to be taken into account, as

it cannot be said that momentum is the product of inertial mass and velocity. The equation for T, the tension of the cable in the experiment are given by, T = mg-ma

T = Ma + μMg

The acceleration of an object can be found out using the below equation that is used in the experiment for the track slider set up a = (mg – μMg) / (M + m)

A = acceleration of the cart

m = mass of the hanging weight

g = gravitational acceleration (simulator used gravity of earth's 9. 80 m/s2)

μ = coefficient of friction

M = mass of the cart

The distance can be found out by

s = (1/2)at2

s = displacement of the cart

a = acceleration of the cart

t = time for the cart to travel distance S

Performing the simulation:

Variable region:

1. Change friction:

This slider helps you to change the Co efficient of Friction of the surface. 2. Change hanging weight:

This slider helps you to change the hanging weight. The change will be in grams. 3. Change cart weight:

This slider is used to change the cart weight. The change will be in grams. 4. Change pointer position:

This slider is used to change position of the pointer. The pointer is used to measure and calculate the time for reaching the pointer position. 5. Start button:

This button is used to start the movement of the cart.

6. Reset button:

This button is used to reset the cart to the initial position.

Measurement Region:

1. Time taken to reach the pointer will show the time taken by the cart to reach the pointer position in seconds. 2. The pointer distance will show the pointer position distance. 3. The acceleration shows the acceleration of the cart.

PROCEDURE:

Experiment A : To Verify Force is Proportional to Acceleration 1. The experiment is started by selected Simulator. All the variables was checked and is make sure are in almost zero position. For a start, a cart is readily placed on the table and tied with a twine. At the edge of the table, there is a weightage hanged to a pulley so that a constant acceleration can be applied. 2. The pointer is fixed to 100cm and cart weight to 50g throughout Experiment A. (let the friction, μ at 0. 001 state) 3. The hanging weight is adjusted accordingly (see table 1) and the Start button is pressed. To change the next value, the scale is adjusted by moving to right and reset is pressed. The start button will eventually appeared and the step is repeated until finish. The findings were observed and recorded.

Experiment B: To Verify Force is Proportional to Mass

1. Every variables is reset to its initial position (almost zero values) 2. The values was set accordingly to Table 2. All values is repeated and recorded in given table. Every observation is recorded.