College of Applied Physics and Astronomy
Physics for Health Sciences Laboratory
Motion along a straight line with constant speed

A worksheet Using https://phet.colorado.edu/en/simulation/legacy/forces-1d Interactive
Simulation

Name: …………………………………….

ID:…………………………………………….

Before you start the experiment, please visit Phet interactive simulation using the following link and download the forces in 1 dimension simulation. Then explore the simulation Features and get familiar with it's components.

https://phet.colorado.edu/en/simulation/legacy/forces-1d

Objectives:

1. To study motion a long a straight line with uniform (constant) speed.
2. Analyze graphical results.

Theory:

The speed of an object moves a long straight line is the distance traveled by the object in a time interval. This can be written as:

$$v = \frac{\Delta x}{\Delta t}$$

Where v is the speed of the object in m/s, Δx is the distance traveled, and Δt is the time interval.

The acceleration of the object is the rate of change of the speed of an object with respect to time.

$$a = \frac{\Delta v}{\Delta t} = \frac{v_2 - v_1}{t_2 - t_1}$$

If the object moves with constant speed, then $\Delta v = 0$ and the acceleration is zero.so whenever the object move with constant speed a long a straight line; it's speed and direction does not change then it's acceleration is always zero.

Procedure:

1. Visit the link below, download the forces in 1-dimension interactive simulation.
   https://phet.colorado.edu/en/simulation/legacy/forces-1d
2. Open the forces in 1 dimension simulation, click on show horizontal forces, friction off, choose crate object, initial position 0 m, and click on graph position to display the position time graph (x – t) graph as shown in figure (1).
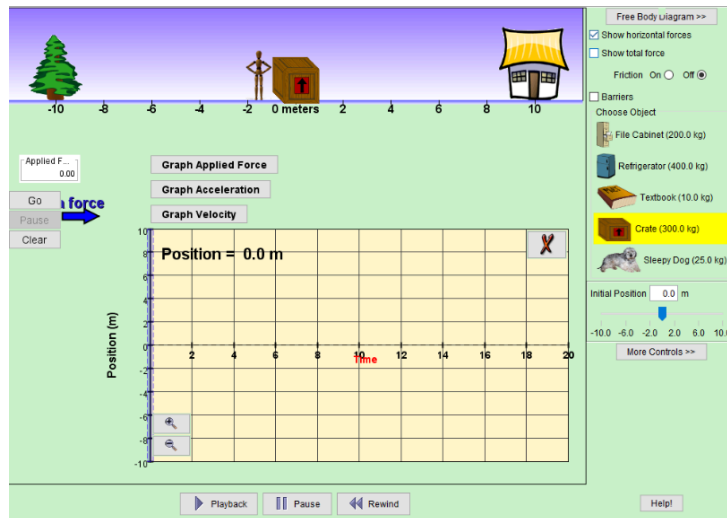

Figure (1)

3. Put the mouse on the crate and drag it to give it an initial force (push forward) so it start moving.
   (Note: you need to apply an initial force so the crate start moving, but you must not apply a continuous force to keep the object moving, explain).
4. Click on Pause when the plot of the position time graph reaches 20 seconds.
5. Click on playback then click on pause again so you can see a "ruler" sliding on the graph as shown in the figure (2).
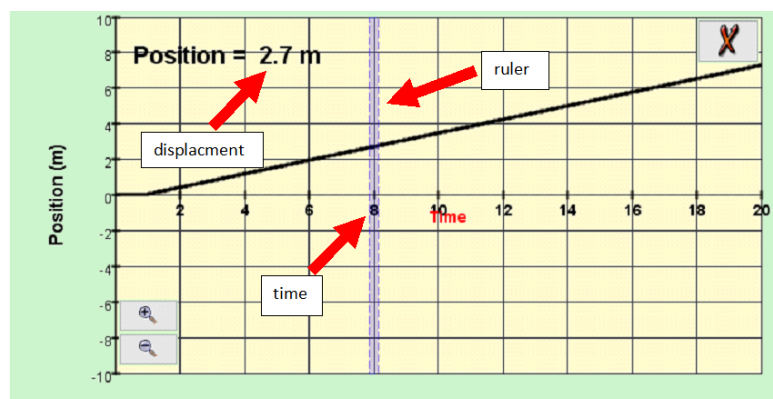

Figure (2)

6. Drag the ruler to the first position when the plot gets straight, why? Record the displacement and the time in table (1).

7. Drag the ruler to another point and record the second displacement with time.
8. Repeat step 7 until you fill table (1).

Data analysis:

1. The initial force needed to start the motion of crate, but it must not continue applying during the motion, explain.

2. Calculate the speed (v) for each displacement (x) and time (t), then record it in table (1).
3. Calculate the average speed of the crate and record your answer in table (1).

Table (1)

Trial	Time (sec)	Displacement (m)	$v = \frac{x}{t}$ (m/s)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
		Average speed	....

4. Use excel to plot x vs t graph and attach it with you report.
5. Find the slope of the x vs. t graph. How does it compare to the average velocity value you have calculated in step 3.

6. Find the percentage differences between the two values. Which one is more accurate and why?