

## Motion

### Speed and Velocity:

Speed	Velocity
It is distance travelled per unit time	It is change in displacement per unit time
	Speed in a particular direction. Rate of change of displacement.
Unit: m/s or ms <sup>-1</sup> Scalars	Unit: m/s or ms <sup>-1</sup> Vectors

**Average speed:** average speed = total distance/travelled total time taken.

Unit: m/s

**Uniform speed:** If an object is moving with constant speed then it is called uniform speed.

**Non-uniform speed:** If the speed of an object changes with time then it is called non-uniform or variable speed.

**Acceleration:** is the rate of change in velocity per unit time.

$$a = \frac{\Delta v}{\Delta t} = \frac{v-u}{\Delta t}$$

v: final velocity

u: initial velocity

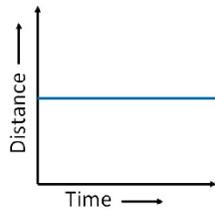
Unit: m/s<sup>2</sup> or ms<sup>-2</sup>

**Deceleration:** decrease in velocity per unit of time is called deceleration. Deceleration is a negative acceleration.

**Distance-Time Graph:** A distance-time graph shows how far an object has travelled in a given time. It is a simple line graph that denotes distance versus time findings on the graph.

1. Distance is plotted on the Y-axis.
2. Time is plotted on the X-axis.

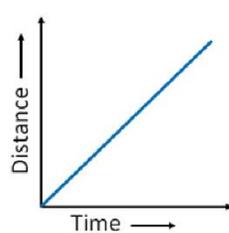
**Stationary Object**



*Straight line  
parallel to x-axis*

Object at rest

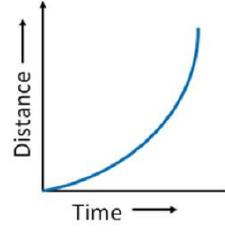
**Uniform Speed**



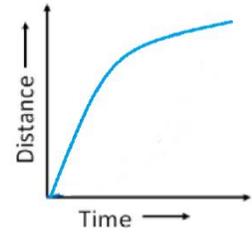
*Straight Line*

Uniform Speed

**Non-Uniform Speed Non-Uniform Speed**



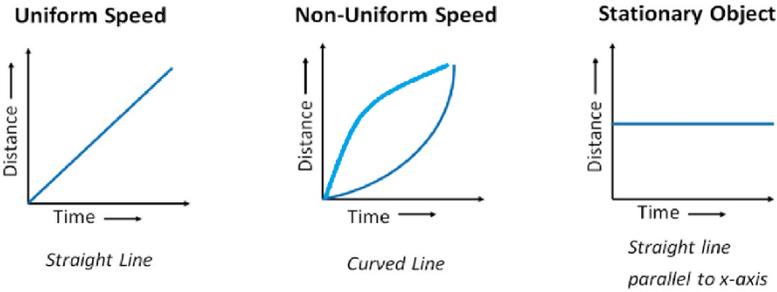
*Curved Line*



*Curved Line*

Non-uniform Speed

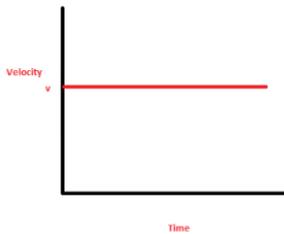
## Distance-Time Graph Summary



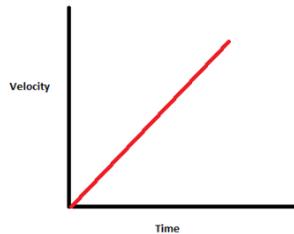
- If the distance-time graph is a straight line then the motion is uniform.
- If the distance-time graph of a body is given, its speed can be calculated using the slope of the graph.
- The gradient of the straight-line graph is the same irrespective of the interval which is chosen. This implies that the speed of an object under uniform motion remains constant.

**Speed-Time Graph/Velocity-Time Graph:** A speed-time graph shows how fast an object has travelled in a given time. It is a simple line graph that denotes speed versus time findings on the graph.

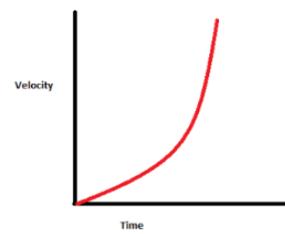
1. Speed/Velocity is plotted on the Y-axis.
2. Time is plotted on the X-axis.



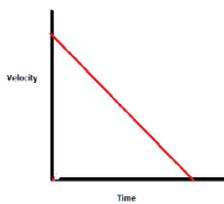
Velocity time graph with constant velocity. (zero acceleration)



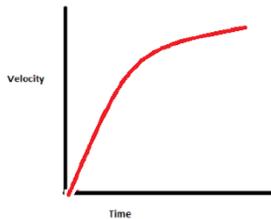
Constant Acceleration



Increasing Acceleration



Constant Deceleration



Decreasing Acceleration

Time/s	0	1	2	3	4	5
Velocity/ms <sup>-1</sup>	0	18	32	42	48	50

