The City School

North Nazimabad Boys Campus

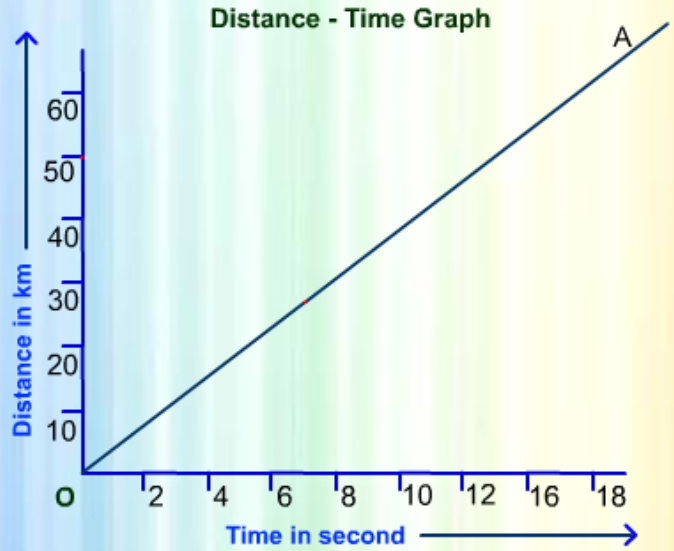
E-Notes

Teacher Name: M. Shaheryar khan | Class: 9

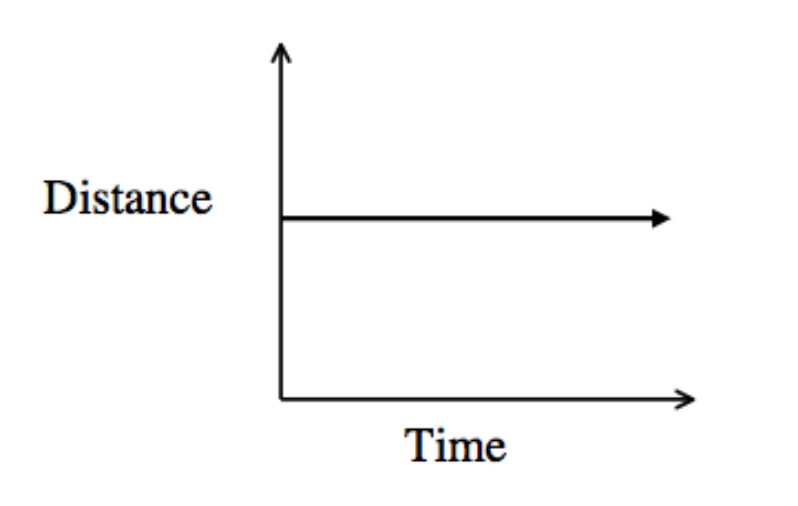
Subject: Physics (5054) | Date: 20 September 2018

Notes for 'Kinematics I'

- Speed is the amount of distance covered in a given amount of time.
- It is usually calculated in meters per second (m/s).
- It is calculated by $speed = \frac{distance}{time}$.
- Speed is a scalar quantity.
- Velocity differs from speed by the fact that velocity is a vector quantity, meaning it always has a certain direction.
- Velocity in the opposite direction is denoted with a negative sign.
- Acceleration is the change in velocity in a given amount of time.
- It is usually expressed in meters per second square (m/s^2).
- It is calculated by $a = \frac{v-u}{t}$.
- Where, a= acceleration, v = final velocity, u = initial velocity, t = time.
- It is a vector quantity.
- Positive acceleration means that the velocity is increasing.
- Negative acceleration means that the velocity is decreasing (also called deceleration or retardation).
- Uniform velocity means a zero acceleration.
- Uniform acceleration means a steady increase in velocity. This is only possible when there are no external forces acting on the body to oppose its motion.
- A body moving or falling which experiences any form of resistance to its motion will have a non-uniform acceleration. Which means that the velocity is not increasing or decreasing uniformly.
- Relation of distance, speed and acceleration with time can be understood or visualized using a distance-time or speed-time graph.
- Distance-time graph:

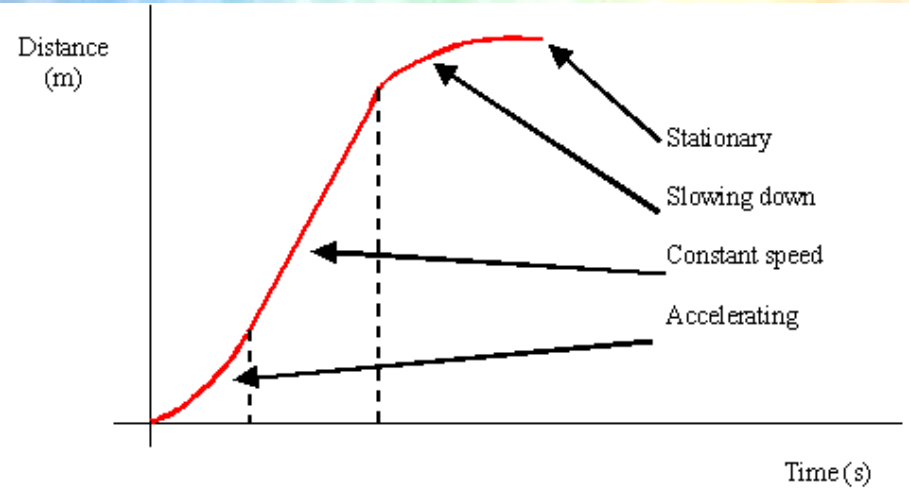


- The gradient or slope of the line provides the speed of the object.
- A sharp increase or decrease in the gradient of a distance-time graph shows instantaneous velocity.
- The above graph shows an object moving with constant speed.
- Further examples of such graphs are as follows:

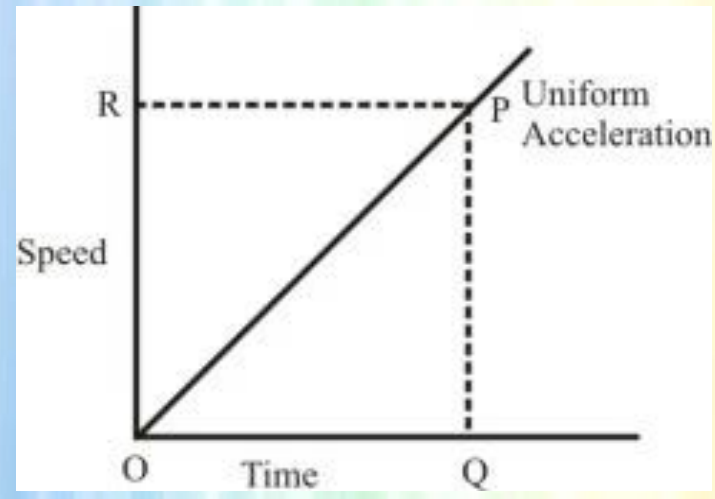


- The above graph shows an object which is stationary.

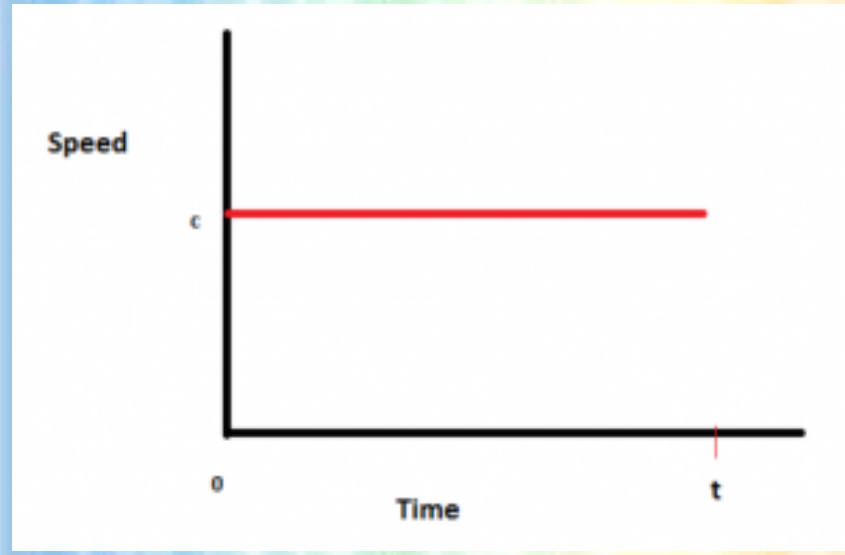
- The above graph shows a body moving with a non-uniform speed and a uniform acceleration.



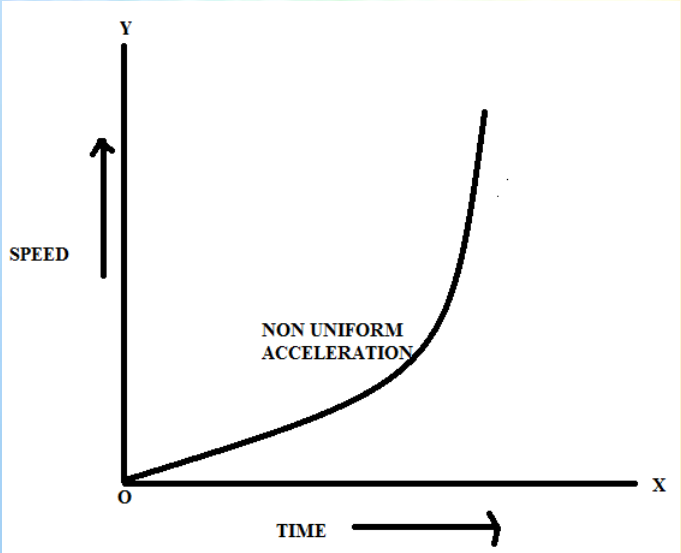
- The graph above shows a body moving with a non-uniform speed and a non-uniform acceleration.
- Speed-time Graphs:



- The gradient or slope of a speed-time graph provides the acceleration of the object.
- A sharp increase or decrease in the gradient of a speed-time graph shows instantaneous acceleration.
- The graph above shows an object moving with a constant acceleration.
- Further examples are as follows:



- The graph shows an object moving with a uniform speed and zero acceleration.



- The graph shows an object moving with a non-uniform acceleration.
- A good example of a typical speed-time graph is given below.

Figure 2.15 shows the speed-time graph for a journey of a boy from his house to school. Look at the shape of the graph and describe the type of motion in each stage.

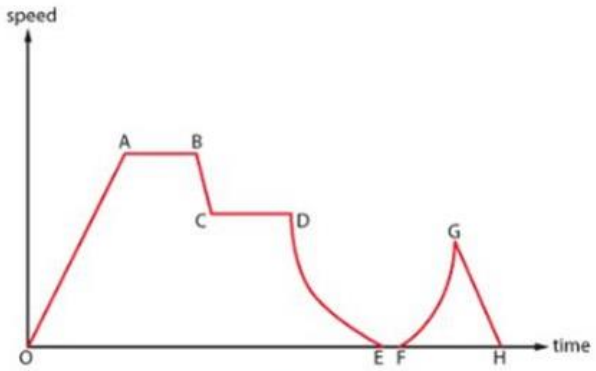


Figure 2.15

Solution

O	left home
O-A	moving with uniform acceleration
A-B	moving with uniform speed
B-C	moving with uniform deceleration
C-D	moving with uniform speed (speed lower than A-B)
D-E	moving with non-uniform deceleration (decreasing deceleration)
E-F	not moving
F-G	moving with non-uniform acceleration (increasing acceleration)
G-H	moving with uniform deceleration
H	reached school