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BISHOP GEORGE SCHOOL & COLLEGE

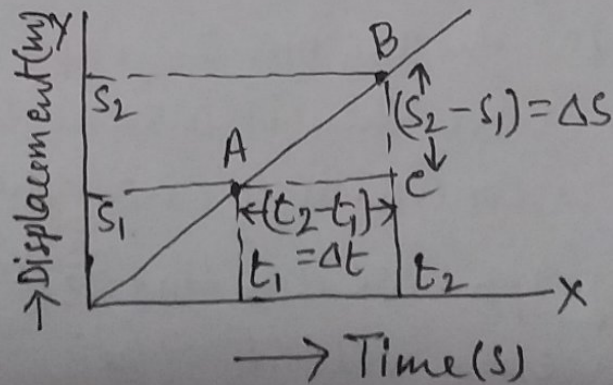
CLASS: XI

SUBJECT: PHYSICS

WORKSHEET NO: 14

Time-displacement graph:

If we measure the displacements with respect to some reference point of a moving object at different times and draw a graph between time (t) and displacement (s) then it is called a time displacement graph.

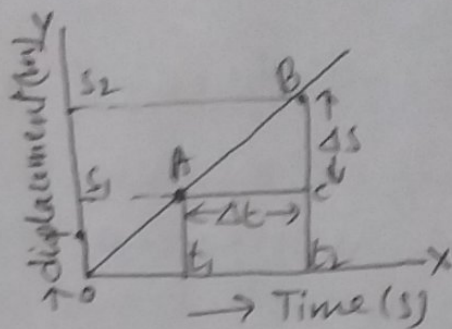


Determination of velocity from time-displacement graph:

If the time-displacement graph of a moving object is a straight line, then the slope of this line with the x-axis gives the velocity of the object.

From the graph velocity of the object is $V = \frac{\text{displacement}}{\text{time-interval}}$

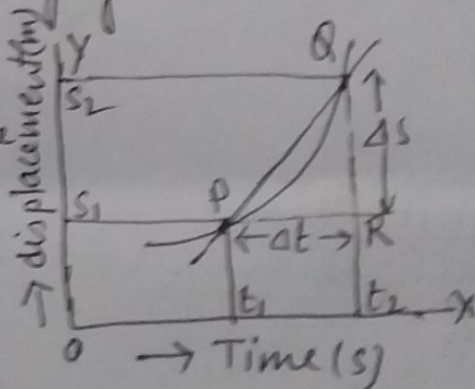
$$V = \frac{s_2 - s_1}{t_2 - t_1} = \frac{\Delta s}{\Delta t}$$



$V = \frac{BC}{AC} = \text{slope of the graph line with the x-axis.}$

If the time-displacement graph of an object is a continuous curve then it means that the velocity of the object is continuously changing.

From this graph, we can find out the average velocity of the object during some time-interval, or the instantaneous velocity of the object



The slope of the line PQ is

$$\frac{RQ}{PR} = \frac{s_2 - s_1}{t_2 - t_1} = \frac{\Delta s}{\Delta t} = \text{average velocity } \bar{v}$$

When Δt is infinitesimally small ($\Delta t \rightarrow 0$), then the point Q will be close to the point P. In this limit, the line PQ will be tangent at the point P. The slope of the tangent at the point P is

$$\lim_{\Delta t \rightarrow 0} \frac{\Delta s}{\Delta t} = \frac{ds}{dt} = \text{instantaneous velocity } v$$