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CHAPTER 1. (MOTION)(BASED ON NCERT PATTERN)

Graphical representation of motions

(i) **Distance-time graph**

For a distance-time graph time is taken on x-axis and distance is taken on y-axis.

[Note: All independent quantities are taken along the x-axis and dependent quantities are taken along y-axis.]

OA = CD = u

OE = CB = v

OC = AD = t

BD = BC – DC (Change in velocity)

AD is parallel to OC.

∴ BC = BD + DC = BD + OA

∴ BC = v and OA = u

We get v = BD + u

∴ BD = v – u ...(1)

In velocity-time graph, slope gives acceleration.

$$\therefore a = \frac{BD}{AD} = \frac{BD}{OC}$$

$$\therefore OC = t \text{ we get } a = \frac{BD}{t}$$

$$\therefore BD = at \qquad ...(2)$$

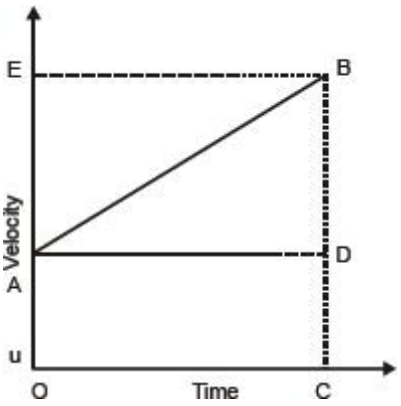
Substituting (2) in (1) we get

BD = v – u

at = v – u

∴ v = u + at

Equation for position-time relation:



Let us assume,

s = distance travelled by the object

t = in time t

a = with uniform acceleration.

∴ Distance travelled by the object is given by area enclosed with OABC in the graph.

∴ s = OABC

= (area of rectangle OADC) + (area of DABD)

$$= (OA \times OC) = \frac{1}{2}(AD \times BD)$$

Substituting

OA = u, OC = AD = t and BD = at

We get

$$s = ut + \frac{1}{2}(t \times at)$$

$$\therefore \ s = ut + \frac{1}{2}at^2)$$