Motion in a Straight Line MINDMAP

NEET SLAYER

Instantaneous Speed and Velocity →

$v = \frac{dx}{dt}$

$\underbrace{\Delta x}_{\text{displacement}} = \int v\,dt$

Equations of Motion (Constant acceleration) →

$v = u + at$

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

$v^2 = u^2 + 2as$

$S_n = u + \frac{a}{2}(2n-1)$

Acceleration →

- Average Acceleration

$\langle a \rangle = \frac{v-u}{t}$

- Instantaneous Acceleration.

$a = \frac{dv}{dt}$

Relative Motion →

$\vec{r}_{B,A} = \vec{r}_B - \vec{r}_A$

$\vec{v}_{B,A} = \vec{v}_B - \vec{v}_A$

$\vec{a}_{B,A} = \vec{a}_B - \vec{a}_A$

Distance and Displacement →

- Distance.
  Total path length travelled by object.
- Displacement. ($\Delta\vec{x}$).
  Vector joining initial to final position.

$\Delta\vec{x} = x_f - x_i$

Average Speed and Velocity →

Average Speed →

$\langle v \rangle = \frac{\text{Total distance}}{\text{Time}}$

- If particles travel with speed v_1 and v_2 for
- equal time interval –

$\langle v \rangle = \frac{v_1 + v_2}{2}$

- equal distance –

$\langle v \rangle = \frac{2v_1v_2}{v_1 + v_2}$

Average Velocity – $\frac{\text{Total displacement}}{\text{Time}}$

Non-uniform Acceleration (Variable Acceleration)

$a = \frac{dv}{dt}$

$\downarrow$

$v - u = \int_{t_1}^{t_2} a\,dt$

When acceleration is function of t

$a = v\frac{dv}{dx}$

$\int_u^v v\,dv = \int_{x_i}^{x_f} a\,dx$

When a is function of position x.

Motion Under Gravity

- projected up with velocity u.

Time of flight – $t = \frac{2u}{g}$

Max. height – $h = \frac{u^2}{2g}$

Final Velocity – u

- Dropped ($u = 0$) from height h.

Time of flight $t = \sqrt{\frac{2h}{g}}$.

Final Velocity $v = \sqrt{2gh}$

Graphs	$x-t$	$v-t$	$a-t$
Slope	Velocity	Acceleration	
Area Under Curve		Displacement	Change in Velocity