CH3 MOTION & FORCE.

Relative Motion.

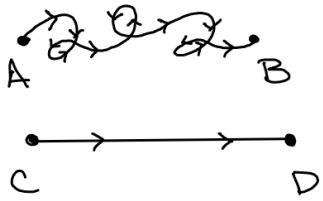
- **State of rest**
  - → State is invariant wrt Surroundings.
- **State of motion**
  - → State varies wrt Surroundings

$\Rightarrow$ No Absolute motion or rest motion!

DISPLACEMENT.

→ Vector representing change in position from start to end.

→ The length of the path b/w these points is termed as distance.



SPEED vs VELOCITY.

SPEED : Ratio of distance covered to the time taken. (SCALAR).

VELOCITY : Time rate of change of displ. (Vector).

ACCELERATION.

→ Time rate of change of velocity.

$$\vec{a} = \frac{\Delta \vec{v}}{\Delta t}$$

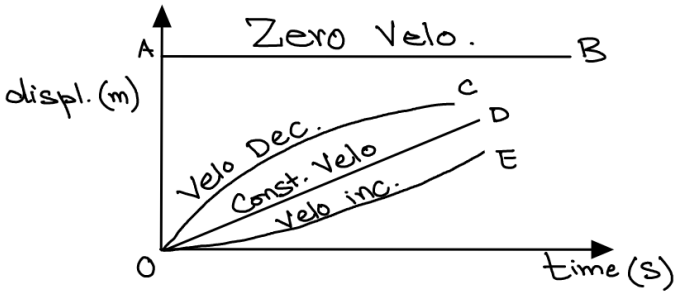
Q. How do I give rise to acceleration?

→ Vary the speed
→ Vary direction of motion
→ Vary both.

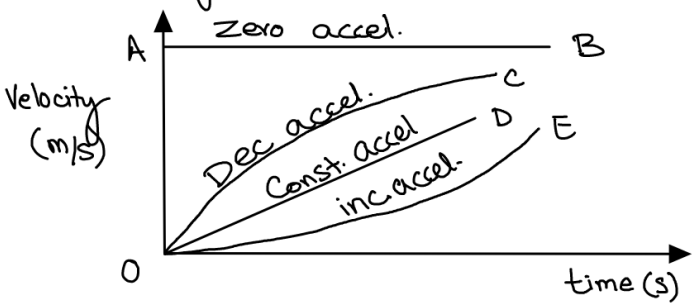
Types:

1) Uniform
2) Variable
3) Due to gravity $g = 9.8 \frac{m}{s^2}$
4) Deceleration $\Rightarrow \vec{v} \not\to 0$ but decreases.
5) Retardation. $\Rightarrow \vec{v} \to 0$

Displ.-time Graph.



Velocity-time Graph.



A Couple of Key points.

→ Slope of $\vec{d}-t \Rightarrow \vec{v}$ }
→ " " $\vec{v}-t \Rightarrow \vec{a}$ }

→ free fall / from rest $\Rightarrow \vec{v}_i = 0$

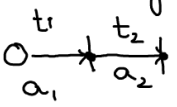
→ Velo. & accel. may not always be in same direction.

→ $\bar{v} = \frac{2v_1v_2}{v_1+v_2}$ ← Two parts of equal dist.

→ $\bar{v} = \frac{v_1+v_2}{2}$ ← Two parts of equal time.

→ If thrown up it rises to $h = \frac{v^2}{2g}$ until velocity → 0.

→ $\bar{a} = \frac{a_1t_1 + a_2t_2}{t_1+t_2}$



→ Time taken for object to reach the ground is indep. of mass.