

Accelerated motion↳ Projectiles

Q-1) What is acceleration?

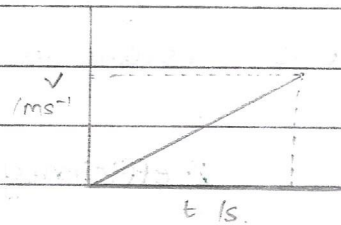
> Acceleration is the rate of change of velocity.

$$a = \frac{\Delta v}{t} = \frac{v - u}{t}$$

Q-2) Velocity time graphs.

* Acceleration is the gradient

* Displacement is the area under graph.



Q-3) Equations of motion.

$$① \quad v = u + at$$

$$② \quad s = \frac{1}{2}(u + v)t$$

$$③ \quad s = ut + \frac{1}{2}at^2$$

$$④ \quad v^2 = u^2 + 2as$$

Q-4) Projectiles.

> The path is a parabola.

* **Time of flight** : time the projectile remains in air.

* **Maximum height attained**

* **Range** : maximum distance covered by projectile in horizontal direction.


When calculating, consider either vertical or horizontal direction & use those components.

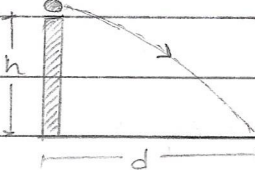
0-5) Rules for calculations for projectiles.

① $g = 9.81$ in vertical direction only.
 $g = 0$ in horizontal direction.

② \rightarrow perpendicular, vertical component = 0

\uparrow perpendicular, horizontal component = 0

③  Horizontal component of velocity remains constant throughout because there is no acceleration.

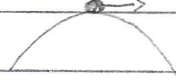
④  Time taken to cover h is the same as time taken to cover d .

⑤ To calculate K.E of projectile at any time on its path, take the resultant velocity.

$$v = \sqrt{v_v^2 + v_h^2}$$

v_v = vertical component

v_h = horizontal component

⑥  K.E of projectile at top-most point is NOT 0.
 $K.E = \frac{1}{2} m v_h^2$ ($v_v = 0$).

⑦ Do NOT use $d = s \times t$ in vertical direction, because, there is acceleration.