

Accelerated motion↳ Projectiles

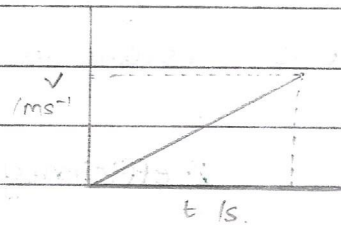
Q-1) What is acceleration?

> 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 $v = u + at$
- ② $s = \frac{1}{2}(u + v)t$
- ③ $s = ut + \frac{1}{2}at^2$
- ④ $v^2 = u^2 + 2as$

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.

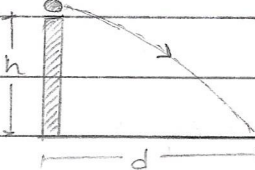
When calculating, consider either vertical or horizontal direction & use those components.

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.

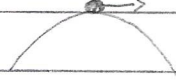
- ④  Time taken to cover h is the same as time taken to cover d.

- 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.