

Kinematics worksheet 3

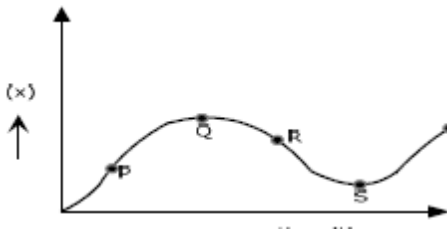
1. Under what condition the displacement and the distance of a moving object will have the same magnitude? 1

Ans. When object moves in a straight line

2. What is the shape of the displacement time graph for uniform linear motion? 1

Ans. Straight line

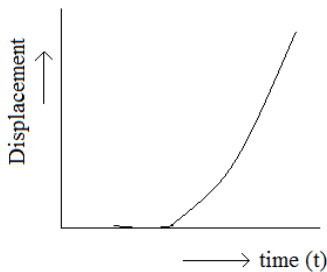
3. Figure shows a displacements time graph. Comment on the sign of velocities at point P, Q, R, S. 1



Ans. P – positive, Q,S – negative and R - negative

4. Draw displacement time graph for a uniformly accelerated motion? What is its shape? 2

Ans.



parabolic

5. The displacement x of a particle moving in one dimension under the action of constant force is related to the time by the equation $t = \sqrt{x} - 3$ where x is in meters and t is in seconds. Find the velocity of the particle at (1) $t = 3$ s (2) $t = 6$ s. 2

Ans. $t = \sqrt{x} - 3$

$$x = (t + 3)^2 = t^2 + 6t + 9$$

$$v = \frac{dx}{dt} = \frac{d}{dt}(t^2 + 6t + 9) = 2t + 6$$

$$v_3 = 2(3) + 6 = 12 \text{ms}^{-1}$$

$$v_6 = 2(6) + 6 = 18 \text{ms}^{-1}$$

6. A balloon is ascending at the rate of 4.9m/s. A pocket is dropped from the balloon when situated at a height of 245m. How long does it take the packet to reach the ground? What is its final velocity? 2

Ans.

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

$$245 = 4.9t - \frac{1}{2} \times 9.8 \times t^2$$

$$4.9t^2 - 4.9t + 245 = 0$$

$$(t - 7.6)(t + 5.6)$$

$$t = 7.6s$$

$$v = u + at = 4.9 - 9.8 \times 7.6 = 69.6ms^{-1}$$

7. A car moving on a straight highway with speed of 126km/hr. is brought to stop within a distance of 200m. What is the retardation of the car and how long does it take for the car to stop? 3

Ans.

$$u = 126kmhr^{-1} = 126 \times \frac{5}{18} = 35ms^{-1}$$

$$v = 0$$

$$s = 200m$$

$$v^2 - u^2 = 2as$$

$$0^2 - 35^2 = 2 \times a \times 200$$

$$a = -3.06ms^{-2}$$

$$v = u + at$$

$$0 = 35.9 - 3.06t$$

$$t = 11.4s$$

8. Derive (i) $v = u + at$ (ii) $v^2 - u^2 = 2as$ by calculus method

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