

Class - XI Physics  
Chapter -3  
Motion in a Straight Line  
Module - 3 Worksheet

**Each question carries 5 marks**

- 1) Obtain equations of motion for constant acceleration using method of graphical method.
- 2) A jet airplane travelling at the speed of  $500 \text{ km h}^{-1}$  ejects its products of combustion at the speed of  $1500 \text{ km h}^{-1}$  relative to the jet plane. What is the speed of the latter with respect to an observer on the ground ?
- 3) A ball is dropped from a height of 90 m on a floor. At each collision with the floor, the ball loses one tenth of its speed. Plot the speed-time graph of its motion between  $t = 0$  to 12 s.
- 4) Two parallel rail tracks run north-south. Train A moves north with a speed of  $54 \text{ km h}^{-1}$ , and train B moves south with a speed of  $90 \text{ km h}^{-1}$ . What is the
  - (a) velocity of B with respect to A ?
  - (b) velocity of ground with respect to B ?
  - (c) velocity of a monkey running on the roof of the train A against its motion (with a velocity of  $18 \text{ km h}^{-1}$  with respect to the train A) as observed by a man standing on the ground ?
- 5) A police van moving on a highway with a speed of  $30 \text{ km h}^{-1}$  fires a bullet at a thief's car speeding away in the same direction with a speed of  $192 \text{ km h}^{-1}$ . If the muzzle speed of the bullet is  $150 \text{ m s}^{-1}$ , with what speed does the bullet hit the thief's car ? (Note: Obtain that speed which is relevant for damaging the thief's car).
- 6) A ball is thrown upwards from the ground with an initial speed of  $u$ . The ball is at a height of 80 m at two times, the time interval being 6 s. Find  $u$ . Take  $g = 10 \text{ m/s}^2$
- 7) Velocity-time equation of a particle moving in a straight line is,
$$\mathbf{v = 10 + 2t + 3t^2}$$
Find (a) displacement of particle from the mean position at time  $t = 1 \text{ s}$ , if it is given that displacement is 20 m at time  $t = 0$ .  
(b) acceleration-time equation.

- 8) A particle is projected upwards with velocity 40 m/s. Taking the value of  $g = 10\text{m/s}^2$  and upward direction as positive, plot a-t, v-t and s-t graphs of the particle from the starting point till it further strikes the ground.
- 9) A car accelerates from rest at a constant rate  $\alpha$  for some time, after which it decelerates at a constant rate  $\beta$ , to come to rest. If the total time elapsed is  $t$  seconds, then evaluate (a) the maximum velocity reached and (b) the total distance travelled.
- 10) Two particles are moving along x-axis. Particle-1 is 40 m behind particle-2. Particle-1 starts with velocity 12 m/s and acceleration  $4\text{ m/s}^2$  both in positive x-direction. Particle-2 starts with velocity 4 m/s and acceleration  $12\text{ m/s}^2$  also in positive x-direction. Find (a) the time when distance between them is minimum. (b) the minimum distance between them.

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