## SECTION-A (ONE MARK EACH) - answer in one word or one sentence

1. An electron moving with a certain velocity collides against a stationary proton and sticks to it. Is the law of conservation of linear momentum true in this case?
2. A car is being driven at a uniform velocity u. The driver suddenly puts his foot on the accelerator and the speed increases to v. Unfortunately, after that his brakes failed. Show his velocity-time graph.
3. If a and b are two vectors, Under what condition the relation |a – b| = |a| – |b| holds good?
4. A constant retarding force of 50 N is applied to a body of mass 20 kg moving initially with a speed of 15 ms^{-2}. How long does the body take to stop?
5. A particle is projected in air at some angle to the horizontal, moves along parabola as shown in figure where x and y indicate horizontal and vertical directions, respectively. Show in the diagram, direction of velocity and acceleration at points A, B and C.
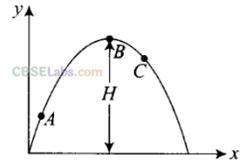
SECTION-B (TWO MARKS EACH)

6. Two bodies of masses 10 kg and 20 kg respectively kept on a smooth, horizontal surface are tied to the ends of a tight string. A horizontal force F = 600 N is applied to A. What is the tension in the string?
7. A bird is sitting on the floor of a wire cage and the cage is in the hand of a boy. The bird starts flying in the cage. Will the boy experience any change in the weight of the cage? Why?
8. Write down the vector whose head is at (4, 3, 2) and whose tail is at (3, 2, 1).
9. A train moves from one station to another in 2h time. Its speed during the motion is shown in fig. Calculate
   (a) the maximum acceleration during the journey.
   (b) the distance covered during 0.75 to 1.00 h interval.
10. A particle is projected from the ground with an initial velocity of 20m/s at an angle of 30° with respect to horizontal. Determine the time at which its vertical displacement is 3m.
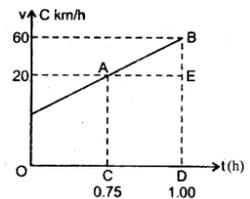
SECTION-C (FIVE MARKS EACH)

Answer any two questions in this section

11. a) State and Derive the impulse momentum theorem.
    b) A body is projected with a velocity of 40 ms^{-1}. After two seconds, it crosses a vertical pole of 20.4 m. Find the angle of projection and the horizontal range.

12. a) State and prove the law of conservation of linear momentum.
    b) A disc of mass 10 gm is kept floating horizontally by throwing 10 marbles per second against-it from below. If the mass of each marble is 5 gm, calculate the velocity with which the marbles are striking the disc. Assume that the marbles strike the disc normally and rebound downward with the same speed.

13. a) Prove that the distance travelled by an object in nth second is given by
    $S_{nth} = u + \frac{a}{2}(2n – 1)$
    b) A particle covered half the distance with a velocity v_0. The remaining half distance was covered with a velocity v_1 for half the time and with velocity v_2 for another half of the time. Find the mean speed of the particle averaged over the whole time of motion.