1. A ladder of 6 m length, which is in contact with a vertical wall and horizontal ground slides down the vertical plane. When the lower end is at a distance of 3 m from wall, its velocity is 4 m/s. What is the velocity of the upper end at that instant?

(a) $\frac{4}{\sqrt{3}} m/s$ (b) $-\frac{4}{\sqrt{3}} m/s$ (c) $\frac{4}{3} m/s$ d) $-\frac{3}{4} m/s$

2. Two particles are thrown up simultaneously with a velocity of 30 m/s, one thrown vertically up and another at 45^0 with respect to horizontal. Find out the distance between them at t = 1.5 s.

(a) 35.44 m (b) 34.44 m (c) 33.44 m d) 36.44 m

3. The radius of the earth's orbit around the sun (assumed to be circular) is 1.5 x 10^8 km and the earth travels around this orbit in 365 days. (i) The magnitude of the orbital velocity of the earth in m/s is $\frac{2\pi \times 1.5 \times 10^{11}}{365 \times 24 \times 3600}$ (ii) The radial acceleration of the earth toward the sun, in m/s^2 is $\frac{4\pi^2 \times 1.5 \times 10^{11}}{(365 \times 24 \times 3600)^2}$.

(a) Both (i) and (ii) are correct
(b) (i) is correct but (ii) is wrong
(c) (i) is wrong but (ii) is correct
(d) both (i) and (ii) are wrong

4. A canoe has a velocity of 0.40 m/s southeast relative to the earth. The canoe is on a river that is flowing 0.50 m/s east relative to the earth. Find the velocity (magnitude and direction) of the canoe relative to the river.

(a) 3.6 m/s, 38^0 west of south
(a) 3.6 m/s, 38^0 south of west
(a) 0.36 m/s, 38^0 south of west
(b) 0.36 m/s, 38^0 west of south

5. Passengers on a carnival ride move at constant speed in a horizontal circle of radius 5.0 m, making a complete circle in 4.0 s. What is their acceleration?

(a) 10.0 m/s^2 (b) 11.0 m/s^2 (c) 12.0 m/s^2 d) 20.0 m/s^2

6. An airplane's compass indicates that it is headed due north, and its airspeed indicator shows that it is moving through the air at 240 km/h. If there is a 100-km/h wind from west to east, what is the velocity of the plane relative to the earth?

(a) 260 km/h with 23^0 north of east
(b) 260 km/h with 23^0 south of east
(c) 260 km/h with 23^0 east of north
(d) 340 km/h with 23^0 north of east
(e) 140 km/h with 23^0 north of east

7. Suppose the nose of an airplane is pointed due east and the airplane has an airspeed of 150 km/h. Due to the wind, the airplane is moving due north relative to the ground and its speed relative to the ground is 150 km/h. What is the velocity of the air relative to the earth?

(a) 150 km/h from east to west
(b) 150 km/h from south to north
(c) 150 km/h from southeast to northwest
(d) 212 km/h from south to north
(e) 212 km/h from southeast to northwest

8. A particle experiences four times the acceleration at the bottom of a vertical loop as it does at the top of the loop. Compared to its speed at the top of the loop, is its speed at the bottom of the loop

(a) $\sqrt{2}$ times as less (b) $2\sqrt{2}$ times as great (c) 2 times as great (d) 4 times as great

Passage

(i) A car is speeding up along a circular path.
(ii) A car is slowing down along a circular path
(iii) A car is moving along a circular path with constant speed

9. Which of the following is wrong?

(a) For cases (i) and (ii) the acceleration is not directed along the radius
(b) For case (iii) the acceleration is not directed along the radius
(c) Component of acceleration perpendicular to velocity changes car's direction in all three cases
(d) Component of acceleration parallel to velocity changes car's speed in all three cases

10. Which of the following is correct?

(a) For cases (i) and (ii) the acceleration make acute angle with the velocity
(b) For cases (iii) the acceleration is perpendicular to the velocity
(c) For cases (i) and (ii) the acceleration make obtuse angle with the velocity
(d) For cases (i) and (ii) the acceleration make right angle with the velocity