

IX Physics Motion and Rest

CBSE chapter-wise MCQ Multiple Choice Questions, Test Paper, Sample paper on CCE pattern for class 9 science Motion. Distance and displacement, velocity; uniform and non-uniform motion along a straight line; acceleration, distance-time and velocity-time graphs for uniform motion and uniformly accelerated motion, equations of motion by graphical method; elementary idea of uniform circular motion.

IX Physics Motion and Rest solved Numerical:

Q. From the top of a tower 45 m high, two stones are released. One vertically downwards and the other with a horizontal velocity of 30 m/s. How long will each stone take to strike the ground and how far from the tower will each stone strike the ground? ($g = 10 \text{ m/s}^2$) [3sec, 90 m]

(Ans) Initial downward velocity of both the stones is 0. So both will reach the ground in same time.

$$s = 45 \text{ m}, u = 0, g = 10 \text{ m/s}^2$$

By second equation of motion

$$s = ut + (1/2)gt^2$$

$$45 = 0 + (1/2) \times 10 \times t^2 \Rightarrow 45 = 5t^2 \Rightarrow t^2 = 9 \Rightarrow t = 3 \text{ s}$$

So both stones will reach the ground in 3 s.

The stone which is projected horizontally has a horizontal velocity of 30 m/s.

$$\text{So its distance from the ground} = \text{velocity} \times \text{time} = 30 \times 3 = 90 \text{ m}$$

The other stone will fall just by the tower.

Q. A cyclist travels $3/4$ of a circular track from A to B as shown in figure. The radius of the circular track is 400 m.

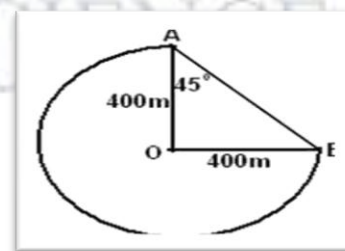
(i) What is the distance travelled by the cyclist? (ii) What is the displacement?

Ans: (i) The circumference of a circular path $= 2\pi r$ where r is the radius of the circular path. $\Rightarrow 3/4$ of circular track $= 3/4 \times 2\pi r = 3/4 \times 2\pi \times 400 \text{ m} = 600\pi \text{ m} = 600 \times 3.14 \text{ m} = 1884 \text{ m}$

So, distance travelled by cyclist is $= 1884 \text{ m}$

(ii) The displacement is the shortest path between A and B.

$$AB = \sqrt{(AO)^2 + (OB)^2} = \sqrt{(400)^2 + (400)^2} = 400\sqrt{2}$$



Q. A train travels at a speed of 60 km/hr for 0.52hr, at 30 km/h for the next 0.24 hr and then at 70 km/h for the next 0.71h. What is the average speed of the train?

Ans: i) In the first case, the train travels at a speed of 60 km/h for a time of 0.52 h.

Now, speed = distance / time = 60 km/h

$$\text{Distance} = 60 \times 0.52 = 31.2 \text{ km} \text{ ----- (1)}$$

ii) In the second case, the train travels at a speed of 30 km/h for a time of 0.24 h.

Now, speed = distance / time = 30 km/h

$$\text{Distance} = 30 \times 0.24 = 7.2 \text{ km} \text{ ----- (2)}$$

iii) In the third case, the train travels at a speed of 70 km/h for a time of 0.71 h.

Now, speed = distance / time = 70 km/h

$$\text{Distance} = 70 \times 0.71 = 49.7 \text{ km} \text{ ----- (3)}$$

From equation 1, 2 & 3 we get,

Total distance travelled = $(31.2 + 7.2 + 49.7) \text{ km} = 88.1 \text{ km}$.

Total time taken = $(0.52 + 0.24 + 0.71) \text{ h} = 1.47 \text{ h}$.

∴ average speed = Total distance travelled / total time taken = $(88.1 / 1.47) \text{ km/h}$

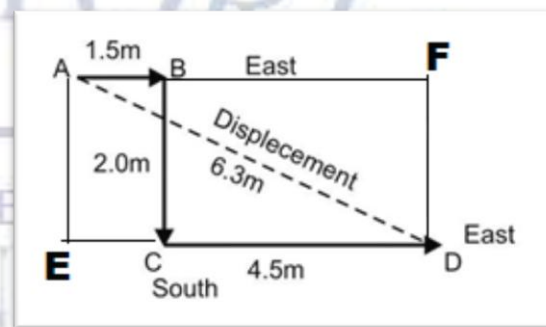
Hence, average speed = 59.9 km/h

Q. A man travels a distance of 1.5 m towards East, then 2.0 m towards South and finally 4.5 m towards East. i) What is the total distance traveled? ii) What is his total displacement?

Ans: i) Total distance travelled = $1.5 + 2.0 + 4.5 = 8.0 \text{ m}$

ii) His resultant displacement AD can be obtained by completing it to a rectangle. In $\triangle AED$, $AD^2 = AE^2 + ED^2 = 2^2 + 6^2 = 4 + 36 = 40$

$$AD = \sqrt{40} = 6.3 \text{ m}$$



Q. Two boys A and B, travel along the same path. The displacement – time graph for their journey is given in the following figure.

(a) How far down the road has B travelled when A starts the journey?

(b) Without calculation, the speed, state who is traveling faster A or B?

(c) What is the speed of A?

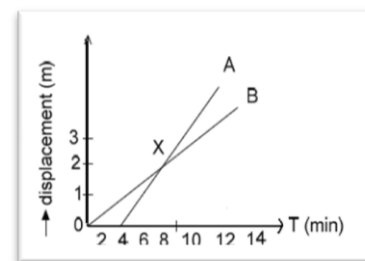
(d) What is the speed of B?

(e) Are the speed of A and B uniform?

(f) What does point X on the graph represent?

(g) What is the speed of approach of A towards B?

(h) What is the speed of separation of A from B?



Ans: (A) When A starts his journey at 4 sec, B has already covered a distance of 857m

(B) A travels faster than B because A starts his journey late but crosses B and covers more distance than B in the same time as B

(C) Let at $t = 12$ min, distance covered = 3500m

Speed of A = Distance covered/time taken = $3500/12 = 375$ m / min.

(D) Speed of B = Distance covered/time taken = $3000/12 = 214$ m / min

(E) Speed of approach of A towards B = 375 m/min - 214 m/min = 161 m/min

(F) Speed of separation of A from B = 161 m/min.

Q. Two cars A and B are moving along in a straight line. Car A is moving at a speed of 80KMph while car B is moving at a speed 50km/h in the same direction, find the magnitude and direction of

(a) The relative velocity of car A with respect to B (b) The relative velocity of car B with respect to A.

Ans: Relative velocity of car A with respect to B = velocity of car A + (- velocity of car B) = $80 + (-(-50)) = 80 + 50 = +130$ m/h

+130 km/h shows that for a person in car B, car A will appear to move in the same direction with speed of sum of their individual speed

Relative velocity of car B with respect to A = velocity of car B + (- velocity of car A) = $-50 + (-80) = -130$ km/h

- sign It shows that car B will appear to move with 130 km/h in opposite direction to car A

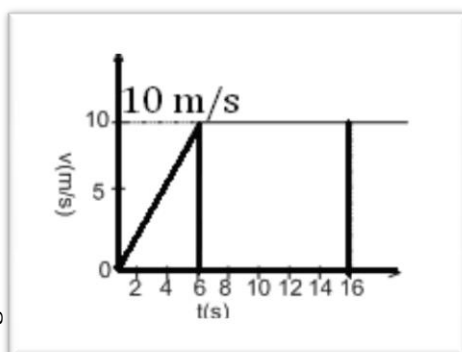
Q. A ball starts from rest and rolls down 16m down an inclined plane in 4 s. (a) What is the acceleration of the ball?

(b) What is the velocity of the ball at the bottom of the incline?

Ans: (i) From, $s = ut + \frac{1}{2} at^2 \Rightarrow 16 = 0 \cdot t + \frac{1}{2} a (4)^2 \Rightarrow a = 2 \text{ m/s}^2$

(ii) From, $v = u + at \Rightarrow v = 0 + 2 \times 4 \Rightarrow v = 8 \text{ m/s}$

Q. The velocity time graph of runner is given in the graph.



(a) What is the total distance covered by the runner in 16s?

(b) What is the acceleration of the runner at $t = 11$ s?

Ans: (a) We know that area under v-t graph gives displacement:-

So, Area = distance = s = area of



triangle + area of rectangle

$$\text{Area of triangle} = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 6 \times 10 = 30\text{m}$$

$$\text{Area of rectangle} = \text{length} \times \text{breadth} = (16-6) \times 10 = 10 \times 10 = 100\text{ m}$$

Total area = 180 m Total distance = 180m

(b) Since at $t = 11\text{sec}$, particles travels with uniform velocity so, there is no change in velocity hence acceleration = zero.

Q. The displacement – time graph for a body is given. State whether the velocity and acceleration of the body in the region BC, CD, DE and EF are positive, negative or Zero.

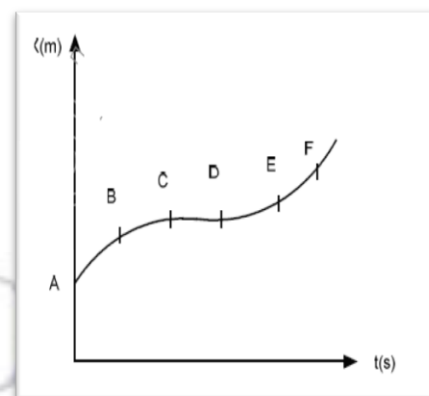
Ans: (1) For AB, the curve is upward stopping i.e. slope is increasing so velocity is positive and remains same so, $V = +ve$ but $a = 0$

(2) For BC, curve has still has +ve slope so, $V = +ve$ but velocity is decreasing with respect to time so, $a = \text{negative}$

(3) For CD, both velocity and acceleration are Zero because slope is Zero.

(4) For DE, velocity is the (v is increasing with respect to time) and so is acceleration is +ve.

(5) For EF, velocity is +ve (positive slope of x-t graph) but acceleration is Zero because velocity remains same with time.



	AB	BC	CD	DE	EF
V	+ve	+ve	0	+ve	+ve
a	0	-ve	0	+ve	0

